# HIV/AIDS, Antiretroviral Treatment, and Socio-economic Status: Preliminary Evidence from Western Kenya[*]

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May 2005

[*] This project would not have been possible without the support and assistance from the Academic Model for Prevention and Treatment of HIV/AIDS (AMPATH). Joe Mamlin, Bob Einterz, and members of AMPATH and the Indiana University-Moi University partnership were instrumental in the development of the project from its early stages. We thank Giovanna d'Adda, Marieke Huysentruyt, Edward Liechty, T. Paul Schultz, John Sidle, William Tierney, Chris Udry, and Kara Wools-Kaloustian for helpful comments and discussions. The findings, interpretations, and conclusions expressed in this paper are entirely those of the authors. They do not necessarily represent the view of the World Bank or any other institution.

Many individuals contributed to the implementation of the household survey under the direction of the authors. Giovanna d'Adda provided vital support in managing the second round of the survey. The data collection was facilitated by the supervision of Irene Muhunzu in the field and David Marende in the office. We also acknowledge the contributions of Andrew Anyembe, Caroline Amuyunzu, Jayne Chaina, Norbert Ketter, James Mungai, June Ochanda, and Jacklyne Tetee for administering questionnaires. Chelimo Cherono, Maurice Mungai, Florence Oduor, and Martha Simiyu assisted in the computer entry of questionnaires. Finally, we are indebted to the clinical officers and staff of the Mosoriot Rural Health Training Center, the HAART and Harvest Initiative farm at Mosoriot, the chiefs and village elders in Kosirai Division, and the many individuals in Nandi District who participated in the survey.

Financial support for this project was received from the Economic and Social Research Council (UK), Pfizer, Inc., the World Bank, Center for Interdisciplinary Research on AIDS at Yale University School of Medicine, Social Science Research Council, Economic Growth Center at Yale University, and the Calderone Program at Columbia University.

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**Acronyms**

| | |
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| AIDS | Acquired immune deficiency syndrome |
| AMPATH | Academic Model for Prevention and Treatment of HIV/AIDS |
| ARVs | Antiretroviral medicines |
| HAART | Highly active antiretroviral therapy |
| HIV | Human immunodeficiency virus |
| HHI | HAART and Harvest Initiative |
| KDHS | Kenya Demographic and Health Survey |
| MMRS | Mosoriot Medical Records System |
| MRHTC | Mosoriot Rural Health Training Centre |
| VCT | Voluntary Counselling and Testing |

## 1. Introduction

Kenya and many other countries in sub-Saharan Africa are now facing an epidemic with important implications for the well being of current and future generations. Recent figures show that Kenya has an estimated 2.5 million HIV-infected persons, and an adult HIV prevalence rate of 15 percent (UNAIDS, 2004). Mortality from AIDS has resulted in large declines in life expectancy and has caused nearly one million children to lose at least one parent.

The breadth of this pandemic and its associated human costs have engendered a policy response built on prevention of transmission and, more recently, antiretroviral (ARV) treatment for infected individuals. As the scale of these prevention and treatment programs grows, we need to understand not only the impacts of HIV/AIDS, but also how the policy response is or is not changing the welfare and underlying social and economic behavior of infected individuals and those in their communities. To document many of the socio-economic factors relating to major diseases such as HIV/AIDS and the results of medical interventions that combat these diseases, we conducted a detailed socio-economic survey of households in a region of western Kenya where HIV/AIDS, malaria, and tuberculosis are prevalent. The topics addressed by the survey include health, education, agriculture and income, and health-related behavior. The presence of a large antiretroviral treatment program—the Academic Model for Prevention and Treatment of HIV/AIDS (AMPATH)—in the survey area also allows for an assessment of the socio-economic impacts of treatment. Analysis of the survey data can also inform the design of future interventions that address HIV/AIDS and other diseases. This preliminary report contains a summary of the initial survey data.

We find that, despite receiving free HIV care, patients and their households are worse off in a number of dimensions: they have higher health expenditures, they have lower labor supply, lower income, fewer assets, and children in these households seem to have poorer nutritional status. However, in terms of per capita consumption, the mean for the households of HIV patients is higher than that of the community at large. Part of this higher consumption may be explained by the higher level of transfers that HIV treatment households receive. In what follows, we explore these and other results.

Our results are based on a household survey conducted in the Kosirai Division in western Kenya. Between the months of March and August 2004, we conducted interviews with a total of 1,217 individuals (usually household heads and their spouses) in 823 households. An additional 367 youths in these households were also interviewed. Many of the survey respondents reside in the area served by the Mosoriot Rural Health Training Centre (MRHTC). The survey sample also includes households in which there is an HIV-positive patient who receives free HIV care (including ARVs) at the Mosoriot health centre. Some respondents reside outside the survey area but receive HIV care at the Mosoriot health centre. Our interviews yielded a range of socio-economic information on the 4,798 individuals who reside in the 823 survey households. A second round of the survey conducted between September 2004 and March 2005. This second round as well as future rounds of the survey will provide longitudinal information that will allow us to better estimate of disease and treatment impacts.

This preliminary report presents the results of selected socio-economic indicators from the first round of the survey. Although the survey gathered information on a range of diseases, an emphasis is placed on HIV/AIDS and the socio-economic characteristics of individuals infected with HIV/AIDS and members of their households. In part, this is due to the lack of socio-economic information about HIV/AIDS relative to other important diseases like malaria. The availability of treatment for HIV/AIDS (especially in our survey area) also raises the need for better information on a range of issues – not least among which is the socio-economic effects of antiretroviral treatment on patients and their households. A range of policy interventions (apart from the provision of ARVs alone) can be studied using these survey data. Examples include Kenya's recent policy to provide free primary education and the distribution of free food to patients receiving treatment for HIV/AIDS. Such analysis will be the subject of future research.

Finally, the data collected in the first round of the survey and summarized in this report are primarily intended to describe the socio-economic characteristics of survey households. The cross-sectional data alone do not enable us to properly evaluate the dynamic impacts of antiretroviral treatment. The data collected in the second round of the survey (as well as future rounds) will provide the longitudinal information necessary for examining changes in socio-economic status resulting from treatment. Subsequent analysis will therefore address the topic of treatment impacts more extensively. Future work will also examine other diseases in the survey area as well.

## 2. Sample Design

Survey area. The household survey was conducted in Kosirai Division, a rural area located in the Nandi North District of western Kenya. Kosirai division has an area of 195 square kilometers (76 square miles) and a population of 35,383 individuals and 6,643 households (Central Bureau of Statistics, 1999). The survey households are scattered across more than 100 villages where animal and crop farming is the primary economic activity. The survey's random sample of 512 households (described below) is intended to be representative of households in Kosirai Division. Information from these households thus presents an opportunity to understand the health and socio-economic characteristics of the population served by the Mosoriot health centre.

Sample Selection. A range of factors were considered when designing the sample of households in the survey. A random sample of households in Kosirai Division was created to provide representative information on the disease burden and socio-economic issues in the survey area. To further examine specific issues relating to HIV/AIDS (such as impacts of the disease and treatment), a separate sample of HIV-positive patients in AMPATH's HIV clinic was chosen. Finally, a small sample of VCT clients (who tested HIV-positive or HIV-negative) was chosen to examine issues relating to HIV testing. It should be noted that the random sample also serves as a comparison group to the HIV and VCT samples.

The sample of survey households is thus comprised of three different groups: (a) 512 households chosen randomly from a household census of Kosirai Division (the random sample), (b) 250 households with at least one HIV-positive individual who receives medical care at the HIV clinic in the Mosoriot health centre (the HIV sample, or "HIV households"), and (c) 61 households with an individual who has recently visited the VCT clinic in MRHTC (the VCT sample). Of the 250 households in the HIV sample, 167 are households in which

the HIV-positive individual is receiving antiretroviral (ARV) treatment at the Mosoriot HIV clinic. In the random sample, the HIV status of respondents is usually unknown, unless the respondent reported having gone for an HIV test and testing HIV-positive or negative. Finally, in the VCT sample, most respondents have tested HIV-negative.[5]

Mosoriot Rural Health Training Centre. The health centre is located approximately 25 kilometers south of Eldoret town and is the main health care provider in Kosirai Division. The health centre provides primary care services and is mainly an outpatient facility. In addition, a collaboration between Indiana University and the Moi University Faculty of Health Sciences has established an electronic medical record system (MMRS) at Mosoriot which contains a range of clinical information on all patients who visit the health centre (Hannan, et al. 2000). In 2001, this same collaboration also created the Academic Model for the Prevention and Treatment of HIV/AIDS (AMPATH). AMPATH's first rural HIV clinic was opened in Mosoriot in November 2001 (Cohen, 2004). Beginning in late-2003, the HIV clinic at Mosoriot has experienced tremendous growth, with the number of patients rising from less than 100 in 2003 to over 800 as of October 2004 (AMPATH data).

Interviews. Most interviews were conducted at the homes of the survey respondents. Teams of male and female survey enumerators interviewed the household head and spouse (if both were present) as well as a youth in the household. Some survey respondents were interviewed at the HIV clinic in Mosoriot or the HAART and Harvest Initiative (HHI) farm in Mosoriot. These respondents came to the HIV clinic from areas well outside the survey area of Kosirai Division, hence requiring a clinic/farm interview. 81 percent of the households in the entire sample were visited at home. In all cases, interviews were conducted after respondents were informed about the purposes of the survey and agreed to participate in the survey. The first round of the survey was conducted between March and August 2004. A second round of the survey was conducted between September 2004 and March 2005. This second round provides longitudinal information on all survey households and will be examined in future analysis. Future rounds of the survey are also planned for the remainder of 2005 and 2006, subject to funding.

Questionnaires. Multiple questionnaires were used in the survey, each one focusing on different issues such as health, education, agriculture, and income/employment. Each interview began with a listing of all household members. Information on characteristics of each member was collected – age, sex, relationship to household head, education, health status, and participation in income-earning activities. For children under the age of 5 years, height and weight measurements were also taken. In addition, the household and individual questionnaires also addressed the following additional topics:

- Ownership and purchases/sales of assets such as land, livestock, and durable goods
- Agricultural production and investment
- Allocation of time to income-earning and other activities
- Food consumption and expenditures
- Financial and non-financial transfers to and from the respondent
- Knowledge about diseases such as malaria and HIV/AIDS
- Health-related behavioral practices (including sexual behavior and HIV testing)

[5] This report does not contain analysis of data from the VCT sample. Future analysis will make use of these data to examine whether there are changes in economic behavior after individuals learn their HIV status.

In the second round, data are being collected on these additional topics:

- Housing characteristics
- Mortality within the household
- Marriage and family background (such as tribe, religion, inheritances, etc)
- Health-related social networks
- Individual preferences toward risk and present/future tradeoffs

## 3. Household Structure and Demographics

Table 1 summarizes basic characteristics of both the random sample of households in Kosirai Division as well as the households of HIV-positive patients at the Mosoriot clinic (HIV households). On average, households in the survey area have 6 members. HIV households tend to be smaller, with 5.4 members on average. The number of children under the age of 18 is also lower in HIV households, and household heads in HIV households also have fewer children living away. A significant difference between the HIV households and other households in the survey area is found in the sex and marital status of the household heads and the orphan status of children. HIV households are far more likely to be headed by a woman who has lost her husband, whereas in the random sample of households, the household head tends to be a married man. On average, the household head in the HIV households also tends to be younger than in the random sample.

Children living in HIV households are much more likely to be orphans. Orphans are considered to be children under the age of 18 who have lost their mother or father or both parents.[6] It should be noted that our survey found that there are very few children in the random sample who are double orphans (i.e., who have lost both biological parents). Among all the children under the age of 18, nearly 31 percent of those living in HIV households are orphans, whereas in the random sample, 8 percent of the children are orphans.

Table 2 shows characteristics of the 273 HIV-positive *individuals* in our sample who are patients at the Mosoriot HIV clinic. This excludes HIV-positive individuals found in the random sample who are not patients at Mosoriot. It does, however, include a few HIV-positive individuals who were found in the *random sample* and are also receiving HIV care at Mosoriot. A large fraction of the patients at Mosoriot are women. The average age of patients is 36 years, and the average years of school completed is 7.6 years (48 percent having completed primary school). Reflecting the composition of the HIV clinic's patient population, many of the patients in the HIV sample (59 percent) reside outside Kosirai Division. A large majority of patients are not married: 21 percent have never been married (typically these are younger patients) and 25 percent are widowed (it is quite possible that the spouse of these patients has died of HIV/AIDS). Additional analysis of these data (not reported) indicates that HIV-positive patients are much more likely to be widowed than adults in the random sample, even when controlling for age. Finally, future analysis will also examine the characteristics of individuals in the random sample who *self-report* being HIV-positive and are not patients at the Mosoriot HIV clinic. An important implication of the current method of analysis is that the random sample "control group" may include several individuals who are HIV-positive or households that are HIV-affected.

[6] This definition does not distinguish between single and double orphans, nor does it distinguish between single orphans who are living with a biological parent and those who are not.

## 4. Education

The educational attainment of both adults and children is informative for a variety of reasons. For adults, the educational background can be an important explanatory factor in understanding issues such as health-related behavior and patterns in income and agricultural production. For children, school enrollment and attendance data are relevant because of the importance of education in determining future well-being, such as occupation, income, and health status. The survey thus collected detailed information on the highest grade completed by each household member older than 6 years, and on the school enrollment and attendance of each household member between the ages of 6 and 25.

Educational Attainment. A salient issue in the literature on HIV/AIDS is the link between educational attainment and HIV status (Hargreaves and Glynn, 2002). This matter relates to broader debates on the link between AIDS and poverty, as well as the important risk factors associated with being HIV-positive. Historical evidence for some countries in sub-Saharan Africa has shown, for example, that higher educated (and often higher income) individuals were more likely to become infected during the early years of the HIV epidemic (Sewamkambo et al. 2000), but that more recently, lower educated (and often lower income) individuals are the ones who are more likely to become infected (de Walque 2002).

Results from examining the educational attainment data from our survey are presented in Table 1 and Table 3. We restricted our analysis of educational attainment to individuals older than 18 years simply because they are more likely to have completed all of their schooling.[7] As indicated in Table 1, adults in the random sample have completed an average of 7.65 years of education and 53 percent of them have completed primary school. Adults in the HIV sample have completed 7.37 years of education, and 49 percent of them have completed primary school. However, these averages mask substantial differences between older and younger adults, between men and women, etc.[8] Table 3 therefore provides a more careful examination of educational attainments.[9]

The results show that educational attainment is declining in age, as younger adults have completed more years of school and are also more likely to have completed primary school.[10] Women have generally completed one less year of school than men. However, as column 3 shows, the male-female gap in educational attainment has decreased substantially over time

[7] For individuals below the age of 18 years, we examined school enrollment and attendance. See below.

[8] When examined by age group, the educational attainment data from our survey are found to be very similar to those obtained from the nationally representative Kenya Demographic and Health Survey (Central Bureau of Statistics, 1998).

[9] The regression analysis allows us to simultaneously control for multiple variables when examining outcomes. This way, it is possible to understand which variables are more strongly associated with the outcome of interest. Two regression models are used throughout this report: the ordinary least squares (OLS) specification and the probit specification. Probit specifications are typically used when the outcome of interest is a binary variable equal to zero or one (i.e., whether or not a child is enrolled in school). Coefficients of the explanatory variables can generally be interpreted as the effect on the outcome of interest when there is a one unit change in the explanatory variable. Note that in the probit specifications, we report the marginal effect of the explanatory variable on the probability that the outcome of interest is equal to one.

[10] The relationship between age and years of schooling (as well as completion of primary school) is non-linear. Thus to confirm that older individuals have completed *fewer* years of schooling (or are less likely to have completed primary school), it is necessary to calculate the *full* effect of age on education – i.e., using the effect of both age and age-squared.

(which is shown through the introduction of a female-age interaction term in column 3). A 20-year old woman in the survey area, for example, has roughly the same amount of education as a 20-year old man, all else equal. Another important finding, in column 2, is that HIV-positive individuals in our sample have *not* completed significantly fewer years of schooling than non-diagnosed adults in the sample (and as column 5 shows, they are also not less likely to have completed primary school). Finally, we examine the hypothesis that individuals residing in HIV households have lower levels of educational attainment, for reasons that may have to do with greater poverty or lower levels of wealth in HIV households. Interestingly, we find some evidence that this is indeed the case. On average, those in HIV households appear to have completed .25 fewer years of education (columns 1 and 3 of Table 3) and are about 4 percent less likely to have completed primary school (column 4 of Table 3).[11] However, the reason for this association is not clear since most individuals in this sample have already completed their education prior to being infected with HIV or residing in an HIV household. The key findings reported here—that HIV-positive individuals themselves have not completed fewer years of school than other adults, but that members of HIV households have completed fewer years of school than other adults—warrant further examination.

School Enrollment and Attendance. Families facing hardships due to adverse health and economic situations are likely to have a greater need for labor, both to care for sick persons and also to compensate for the loss in labor provided by the sick person. In many cases, children's education is likely to be affected. Our survey data presents an opportunity to examine whether the school enrollment and attendance patterns of children are disrupted by the presence of an HIV-positive individual in the household. The survey collected information on whether household members between ages 6 and 25 years were enrolled in school during 2004, and also whether they were enrolled in school during 2001 and 2002. Our analysis of these school enrollment data are restricted to persons between the ages of 6 and 18, since an overwhelming number of persons older than 18 years are not enrolled in school.

Table 1 presents basic summary statistics of the enrollment data for 2001, 2002, and 2004. Enrollment rates for children are remarkably high, in both the random sample and the HIV sample. Somewhat consistent with other data for Kenya, 95 percent of children in the survey area are enrolled in school.[12] In households with at least one HIV-positive individual who is a patient at the Mosoriot HIV clinic, 93 percent of children are enrolled in school. Table 4 provides a more in-depth examination of 2004 enrollment rates, using the sample of 1,691 individuals between the ages of 6 and 18. The results show that the probability of being enrolled in school is declining past the age of 11 years, which is roughly around the time when children are nearing the completion of primary school. An important finding here is that children living in households with an HIV-positive member are less likely to be enrolled in school during 2004. The small difference in average enrollment rates between the random and HIV samples is found to be statistically significant when we control for other factors such as age and gender. Under most empirical specifications, the coefficient on the HIV household indicator variable is negative and statistically significant. We also find evidence that girls are disadvantaged in comparison to boys – it appears that girls are less likely to be enrolled in school; according to the results in column 3 of Table 4, the probability that a girl

[11] These results are significant at the 10 percent level.
[12] It should be noted, however, that being enrolled in school does not always imply that attendance is also high.

is enrolled in school is about 2 percentage points lower than for boys.[13] However, we do not find evidence that this disadvantage for girls is heightened in HIV households (see results in columns 2 and 4). Another noteworthy result from the analysis is that orphaned children are not less likely to be enrolled in school. This suggests that orphaned children who are residing in homes do not appear to be educationally disadvantaged. However, since most orphans in the survey are single orphans (i.e. they have lost only one biological parent), our survey cannot address the issues facing double orphans – who may not reside in a stable home and be enrolled in school.

Finally, in contrast to all these results on 2004 enrollment, school enrollment data from 2001 and 2002 do not indicate that children in HIV households are less likely to have been enrolled in school (results not reported). The results from 2001 and 2002 also need to be compared to the 2003 and 2004 enrollment figures more carefully. This is due to the introduction of free primary education throughout Kenya beginning in 2003 – future research will examine these patterns, particularly the apparent absence of a significant change in enrollment rates after the policy change (see Table 1).

As Table 5 indicates, school attendance data show that among those enrolled in school during 2004, children in HIV households are less likely to be attending school. The survey recorded the number of hours of school that each enrolled child attended in the past week, and whether this number of hours differed from the usual hours. A positive response to the latter question therefore indicates "unusual attendance" – this often means the child missed some school in the past week. Only 4.1 percent of children in the random sample are reported to have missed some school, whereas in the HIV sample, attendance is unusual twice as often – 7.9 percent of children had unusual attendance (see Table 1).

## 5. Anthropometrics, Vaccinations, and Health

Anthropometrics

During the household visits for the survey, interviewers also took measurements of the heights and weights of all children under the age of 5 years. These anthropometric data are important indicators of children's nutritional status, and can be of use in understanding whether children living in HIV households are disadvantaged in nutritional terms. The standard anthropometric measure of child nutrition and health status is weight/height. Table 6 presents basic summary statistics of the heights, weights, and weight/height measures, by one-year age categories. The relationship between weight/height and age is known to be non-linear at young ages, so to better control for age effects and also examine whether the nutrition status of children in HIV households is worse, Table 7 presents regression results with weight/height as the dependent variable. A pattern that is immediately evident is that children in HIV households are worse off, having a weight/height index value that is significantly lower. It is worth noting that the deficit in weight/height of children living in HIV households in sizable: the effect is nearly one-half of one standard deviation in magnitude. The results presented here point to the potential economic disadvantage of many HIV households as a possible causal mechanism, but it should also be kept in mind that young children living in HIV households may be HIV-positive themselves. If some of these children have reached the advanced stages of HIV/AIDS, then their reduced weights and

[13] This result is surprising in light of the earlier finding that the gap between male and female educational attainment appears to have disappeared for younger adults.

heights could be due to health reasons alone.[14] The fact that a child is an orphan is not associated with lower nutrition in these data. However, being a girl is significantly associated with worse nutrition, but this effect is not more pronounced in HIV-positive households.

Vaccination of Children

Childhood vaccinations are an important indicator of future health standards. Typically, children are to receive a BCG vaccine against tuberculosis (recommended at birth); three doses of the DPT vaccine against diphtheria, pertussis, and tetanus (at 6 weeks, 10 weeks, and 14 weeks); at least three doses of the vaccine against polio (at birth, 6 weeks, 10 weeks, and 14 weeks); and one dose of the vaccine against measles (at 9 months). The survey collected information on the coverage for these major vaccines for all children under the age of 12.

Vaccination cards issued by the Ministry of Health contain a comprehensive record of all major vaccines received by the child, including the date when the vaccine was received. The survey enumerators recorded vaccination data directly from these cards if they were made available by the respondent. However, if the cards were missing or not found, vaccination information was based on verbal reports from the household head or spouse.

Table 8 summarizes the key vaccination data for the 1,445 under-12 children in survey households. Vaccination cards were made available for only 48 percent of these children. However, when we consider only those households that were visited at home (i.e. excluding interviews conducted at the Mosoriot HIV clinic since respondents there invariably did not have their children's cards with them) vaccination cards were obtained for 55 percent of children.[15] Not surprisingly, respondents were much more likely to have shown vaccination cards for younger children – for older children the cards were likely to have been lost or misplaced.

One drawback of relying on self-reported vaccination data is that parents or custodians may not recall whether a child received a specific vaccine (or in the case of polio and DPT, the number of times the vaccine was received). This might explain why vaccination rates measured by our survey are very high. For BCG, nearly 98 percent of children are reported to have received the vaccination (and the rates are almost identical for children with and without cards). For polio and DPT, between 96 and 97 percent of children are reported to have received at least one vaccination (and again, rates are similar for children with and without cards).[16] For the measles vaccine, typically obtained at 9 months of age, coverage rates are lower and there are also large differences between children with and without vaccination cards. Among children for whom cards are available, only 83 percent have received the measles vaccine. However, among children for whom parents reported on vaccinations, nearly 94 percent have received the measles vaccine. Many of these rates (including those recorded from cards) are higher than those measured by other surveys such

[14] Future work will address this question by controlling for reported health status of the child.

[15] Due to the in-clinic interviews with HIV-positive patients, we are much less likely to have seen the vaccination cards for children in HIV households. However, even when we restrict attention to households visited at home, cards were less likely to be available for children in HIV households – they were seen for only 40 per cent of children in the home-visited HIV households, compared to 57 percent of children in the home-visited random sample households. This may be indicative of poorer health-seeking behavior in HIV households.

[16] It should be noted that vaccination rates are not the same of all doses of the DPT and polio vaccines. At-birth vaccination rates are generally lowest and the final vaccinations are also low. Future analysis will examine the variation in these rates more carefully.

as the 2003 Kenya Demographic and Health Survey (Central Bureau of Statistics, 2004). This could be indicative of better health-seeking behavior in our survey area. Future analysis of our vaccination data will separately examine the self-reported and card-based vaccination rates.

Health Outcomes

The household survey included a health module designed to capture recent illnesses, chronic conditions, health history, and the incidence of AIDS-related symptoms. These data allow us to compare the health status of HIV-diagnosed individuals with the general population. We are also concerned that there may be "spillover" health effects (or at least correlations in health status) *within* HIV households, i.e. adverse health impacts on non-infected individuals in these households. As such, we divide the sample into two comparison groups: 1) all individuals, which compares HIV-positive individuals with all others, regardless of where they live, and 2) non-diagnosed individuals, which compares those living in households with an HIV-positive member (but does not include that member him or herself) with the population in the random sample.

As the results in Table 9 indicate, HIV-diagnosed individuals are twice as likely as non-diagnosed individuals to have had an illness in the four weeks preceding the interview. These episodes last much longer, and result in about five times as many days of work missed, when compared to non-diagnosed individuals. Somewhat surprisingly, among non-diagnosed individuals we find that individuals who live in HIV households actually are less likely to get sick than those living in random sample households. However, when they do, they miss more days of work. For those who missed work (defined here as "usual activities" and thus including work around the house), HIV-diagnosed individuals showed no significant difference from others in receiving help from inside the household – both were quite high. However, HIV-diagnosed individuals were twice as likely to receive help from outside the household, which suggests that stigma is not an issue with regards to assistance in times of illness. There may be some within-household substitution here – when comparing only the non-diagnosed individuals, members of HIV households were less than half as likely as members of random sample households to receive help from outside individuals.

HIV-diagnosed individuals are more likely to seek medical care of some sort for their first reported acute illness episode[17]. Conditional on seeking care, they also have significantly higher levels of health expenditures: aggregated for all acute episodes they spend 7 times as much as non-diagnosed individuals. As we will see below, this is more than twice the average per person monthly food expenditure. Roughly ten percent of this cost is covered by other individuals from outside of the household, which is significantly higher than the assistance received by non-diagnosed individuals. Comparisons among non-diagnosed individuals reveal no significant differences in any of these dimensions. Table 10 provides a breakdown of the first place where individuals sought care for these acute illness episodes. The most common choice for all individuals was the Mosoriot Rural Health Centre; this is significantly more pronounced among HIV-diagnosed individuals.

In looking at the frequency of chronic illness, we compare only non-diagnosed individuals as many of the HIV patients report HIV as their chronic illness (and the questionnaire only asks for the primary chronic condition). Here, we see a similar pattern to acute episodes, non-diagnosed individuals in HIV households are less likely to report chronic illnesses. When we

[17] We allow for multiple episode reporting and future analysis will look at these episodes.

include HIV among the chronic conditions and turn our attention to care-seeking, we find that HIV diagnosed individuals are significantly more likely to seek care, and also spend more on that care. Total health expenditure on acute and chronic illnesses inclusive of medicine and transportation costs (for all individuals, irrespective of whether or not they were sick) is 20 times higher for HIV diagnosed individuals – 1,885 shillings in past 4 weeks compared to 90 shillings. This amount, which is roughly twice the average per capita food expenditure over the same period, is mostly accounted for by spending on chronic illnesses among the HIV sample[18]. This is rather surprising given that many of the HIV-positive patients are receiving free prophylaxis or antiretroviral therapy.

We also asked individuals about their history of major illnesses: malaria (since 2002), tuberculosis, typhoid and meningitis (all since 2000)[19]. As shown in Table 11, HIV diagnosed individuals were significantly more likely to have experienced all of these diseases in recent years. They were roughly twice as likely to have had malaria, 50 times more likely to have had tuberculosis, 7 times more likely to have had typhoid and 18 times more likely to have had meningitis. Turning to the comparison of non-diagnosed individuals, we can see that members of HIV households are more likely to have had both malaria and tuberculosis. The difference in relative malaria incidence is quite small, however, members of HIV households were 10 times more likely to have had tuberculosis. Given the infectiousness of tuberculosis, this seems to suggest a negative health spill-over of the opportunistic infections associated with HIV.

Table 12 presents self reports of a number of symptoms often associated with AIDS. Not surprisingly, reports of these symptoms are far higher for individuals diagnosed with HIV. Among those diagnosed, patients on antiretroviral treatment report a higher overall number of these symptoms. They report significantly higher incidence of diarrhea, weight loss and skin rash. This is likely due to the fact that individuals on ARVs have progressed to a more advanced stage of disease. Among those not diagnosed with HIV, individuals in households with HIV infected individuals are significantly more likely to report diarrhea, weight loss and fatigue. The total number of symptoms reported are not significantly different.

## 6. Agriculture, Income, and Employment

Agriculture

Agriculture represents the primary source of employment and income for many households in the survey area. The primary crop cultivated by most households, maize, is generally planted and harvested once every year. Other crops include beans, tea, and a range of vegetables (usually grown by women for home consumption). The survey collected information on land ownership as well as agricultural production. Detailed information was recorded on harvests of major crops during 2001, 2002, and 2003. We also recorded expenditures on important farm inputs such as labor, seeds, and fertilizers.

There is a striking difference between HIV households and other households in the survey area. The bulk of these results suggest that households of HIV-positive patients are considerably worse off. The main results in Table 13 can be summarized as follows:

[18] Keep in mind that 16% of the HIV-positive sample report no chronic illness. Within this sample, ARV patients are more likely to report a chronic condition.

[19] Note that these are self-reported and not all of these diagnoses were made by trained health care professionals.

- Households of HIV-positive patients own less land on average (4.6 acres compared to 6.7 acres), and are much more likely to be landless (28 percent compared to 13 percent).
- The 2003 crop sales are much lower in HIV households. Not controlling for amount of land owned, average maize sales in HIV households are about one third of maize sales in random sample households. A similar pattern seems to also appear for maize sales in 2002 and 2001.
- The amount of maize in storage during the time of the round 1 interview is also lower in HIV households.
- Changes in maize sales between 2002 and 2003 are also interesting – it appears that the income from selling maize decreased between 2002 and 2003 in HIV households, but increased in random sample households.
- There are also large differences in money spent on farm inputs such as labor, fertilizers, and seeds. The recall period for questions on farm inputs was the past 12 months – so generally this will refer to inputs during the 2003 planting and harvesting season. However, for households interviewed late in round 1, it is likely to include the 2003 harvesting season and the 2004 planting season.

One important consideration when examining agricultural outputs is landholdings. More detailed analysis of the survey data, reported in Table 14, shows that even when we control for the amount of land cultivated, there is still a significant difference between HIV households and random sample households in agricultural yields. We also find that the amount spent on fertilizers is associated with much higher agricultural yields. As column 4 of Table 14 shows, on average households are obtaining 4 additional bags of maize (each bag worth approximately 1,000-1,200 shillings) for every 1,000 Shillings spent on fertilizers in the 12 months prior to the interview.[20] Thus, the HIV households' lower investment in inputs like fertilizers is an important issue to examine – it *may* be due to constraints caused by health expenses that they spend less on fertilizers, but it may also be due to their lower landholdings.

One possible explanation for the data on landholdings and agricultural activities may be that many of the households in the HIV sample come from urban areas/centers in the survey area and beyond, so they are less likely to rely on farming for their main source of income. Individuals in the survey area, however, can also be engaged in managing small enterprises as well as casual agricultural labor. To capture these other sources of income and employment, the survey asked about the allocation of each household member's time toward income-earning activities. We focused on the past week for time allocation and past month for income – in large part to capture current economic status and also to avoid issues of recall bias.

Employment Status

A general pattern that emerges from the employment and income data is that individuals in HIV households are working and earning less than those in random sample households. Information was collected on all household members older than 8 years. We included questions about children between the ages of 8 and 18 because of the common reliance on children's labor during peak farming periods such as during planting and harvest.

[20] The survey did not collect information on fertilizer use in each plot or type of fertilizer purchased. Thus Table 14 merely reports the general association that we find between expenditures on fertilizer and crop outputs.

Results for persons older than 18 years are reported in Table 15. Two measures of *current* employment status are summarized: 1) an indicator of having done specific activities (such as farming, wage work, or business work) in the past week; 2) the number of hours worked in the past week.

*Labor force participation*

- Among adults in the random sample, 80 percent are reported to have engaged in some work on their household's own farm in the past week. However, among adults in HIV households, only 64 percent are reported to have engaged in own-farm work.
- Fewer individuals engage in wage or business work (17 and 14 percent respectively in the random sample). Differences between the HIV and random samples in the likelihood of adults having done wage and business work are also small and not statistically different.
- Another important finding concerns the fraction of individuals who did no work in the past week. A much higher fraction of individuals in HIV households had done no work in the past week (22 percent in HIV sample, compared to 12 percent in random sample). Hence, we can conclude that HIV positive individuals are simply working less. They work less in farm activities and do not compensate for this with other activities.

*Hours worked past week.* The results on work indicators in the past week are also evident in measures of total number of hours worked in the past week

- On average, adults in the random sample worked 34.2 hours in the past week (note this excludes work devoted to non income-earning activities, such as cooking, collecting firewood, etc.). Adults in the HIV households, however, worked an average of only 23.7 hours in the past week.

Income in the Past Month

Another measure of economic status is income earned from a range of employment activities. However, while income data gives us some sense of the flows coming into the household, assets and expenditure are generally preferred as metrics of welfare, for reasons we discuss below. The survey recorded income earned in the *past month* by each household member older than 8 years. As Table 15 indicates, income in HIV households is considerably lower than that found in random sample households. The main results can be summarized as follows:

- *Total income in the past month for HIV households is less than half of that in random sample households***.** The average of total monthly income in the HIV sample is 3,422 Shillings (about $45) compared to 7,250 Shillings (about $95) in the random sample. However, these statistics may not be an accurate representation of living standards since they do not control for other important variables such as household size, composition of household, urban/rural residence.
- *Per-capita income in the past month, a better measure of household welfare, is also considerably lower in HIV households.* In HIV households, the average of income per-capita is 702 Shillings per month (about $9) whereas in random sample households, the average is 1,276 Shillings per month (about $17). These correspond to annual per-capita income levels of $108 and $204 in the HIV households and

random sample households, respectively.[21] Detailed analysis of the household income data, reported in Table 16, shows that in addition to household size, whether or not households are headed by a single person also explains some of the variation. In particular, single-headed households have significantly lower levels of income (even when controlling for household size and HIV-status of the household).

- When we examine the components of total household income in the past month (from wage labor, farm labor, or business work), income levels of HIV households are lower in every category. *Differences in monthly income levels are particularly large for farm income* – HIV households earn less than one-third of that earned in random sample households, a result that follows in part from the lower landholdings of HIV households as well as the lower likelihood that HIV households are engaged in farming activities.
- Among all adults in the sample, income earned in past month is also lower for those residing in HIV households (adults are defined here as individuals older than 18 years). In the HIV sample, average income in the past month is 1,366 Kenya Shillings (about $16) compared to 2,723 Kenya Shillings (about $30) in the random sample.
- More detailed analysis of the income data for adults, shown in Table 16, indicates that *education levels are important determinants of income*. The completion of primary school only is associated with a significantly higher amount of income (compared to those who have not completed primary school), as is the completion of secondary school. An especially noteworthy result here is that income levels of *all* individuals in HIV households are lower than those of individuals in random sample households. It is not just the HIV-positive individual whose income is lower, but also the individuals living in his/her household.

One issue that complicates the analysis of employment and income data is the seasonality of agriculture. During planting and harvest seasons, for example, many more individuals are likely to be engaged in farming activities (as well as casual labor). As such, the month in which a person is interviewed will be correlated with the likelihood of having done agricultural work. This also affects the measure of income in the past month. Future statistical analysis will better control for seasonality, through the use of month-of-interview fixed effects in the income regressions.

## 7. Assets

Assets provide a measure of the stock of household wealth. Table 17 summarizes measures of asset holdings for HIV and random sample households. Land is by far the most important asset for survey households, accounting for 85-90 percent of total wealth. On average, HIV households own significantly less land than the random sample households on average (4.6 acres compared to 6.7 acres). We asked respondents not only for both the size of their land holdings and its total value, which allows us to calculate a price per acre. One surprising result is that HIV households tend to report a higher average value of land per acre (152,380

[21] However, as we discuss below, due to the seasonality of income in agricultural areas, these annual figures should be interpreted with caution.

compared to 112,252 shillings)[22], whereas the median price for both samples is 100,000 shillings per acre.[23]

Livestock, particularly cattle, is the second largest component of total assets. Here again, HIV households have smaller ownership – the value of their livestock holdings is about half of the value for random sample households. Looking at different types of animals, HIV households have significantly less of every type (in terms of value). Turning to large farm equipment, while HIV households have less than the random sample, this difference is not significant. However, HIV households do have significantly less small equipment (machetes, axes, etc.). In an attempt to examine the capital intensity of farming in the two samples, we also examined large (and small) equipment value *per acre of land owned*. There was no significant difference across the groups, which indicates that the lower ownership of farm equipment in HIV households is primarily due to their lower landholdings. For non-farm vehicles (mostly bicycles, with a few cars and larger vehicles) there was again no significant difference between the two samples. The same result was found for consumer durables.

The last three rows of Table 17 present total asset holdings.[24] If we value land at the price reported by the respondent, there is no significant difference in total asset holdings between the HIV households and the random sample. However, if we value all land at the median price per acre, there is a significant difference, with the asset holdings of HIV households being worth about 250,000 shillings less than that of random sample households. HIV households also have significantly lower total non-land asset holdings. In an effort to measure the distribution of total assets in the two groups we have graphed the cumulative density functions of assets in Figure 1. The cumulative density function tells us, for a given level of assets, what fraction of households within that group fall at or below that level of asset holdings. Note that in this figure we are using assets per capita to account for differing household sizes between the HIV and random samples. The vertical line in this graph is the median asset holding for the combined sample. What we can see from this figure is that below the median, HIV households are poorer – there is a greater fraction of this sample at each asset level. Above the median, however, the curves cross and run fairly close together, making it harder to infer who is poorer. This latter result is driven in part by the large variation in land prices at higher asset levels.

The survey also collected information on sales and purchases of major assets since 2000. In an attempt to trace the path by which HIV households arrived at lower current asset holding than random sample households, we examined asset sales in recent years. In Table 18 we can see that HIV households are more likely to have sold land since January 2000. However, looking at the value of average sales (across those who sold, as well as those who did not) there is no significant difference between the samples. This is made clear in the third row of the table: the average sale value (among those who sold) appears to be much lower for HIV households, and this difference is nearly significant. Livestock sales are much less frequent among HIV households and the unconditional value of those sales is also significantly lower.

[22] A quick examination of the data shows outliers in both the HIV and random samples which we are in the process of examining more closely.

[23] This was the figure that was also given to us by agricultural extension workers in this area as the average price for land.

[24] Note that total assets exclude bank account holdings, which are discussed in the section on transfers. This is due to the fact that we collected bank data on the individual level and therefore, for households outside of Kosirai division, we are missing the bank account details of the patient's partner. In contrast, the asset data we report are collected at the household level. At any rate, the results indicate that bank accounts are a small fraction of total assets.

However, when they do occur, there is no significant difference in the value of sales. Sales of non-farm vehicles are also less frequent among HIV households, with no significant difference in either the conditional or unconditional value of the transactions.

This history of transactions does not account (yet) for purchases, which we will tackle in the future in order to develop a more comprehensive picture of the asset trajectories of HIV households. However, at this juncture it is worth examining the reason that the respondent reported for the sale. Table 19 and Table 20 show these responses. Land sales (Table 19) to cover health expenditures are a much more common motivation among HIV households than in the random sample. On the other hand, in the random sample, selling land to cover school fees is a much more common response. Interestingly, land sales for business/investment purposes is the most common justification in both groups (tied with health in the HIV sample). Table 20 presents the reasons for livestock sales. Here, sales to cover health expenses dominates the reasons cited by HIV households, while school fees dominates the reasons cited by random sample households.

## 8. Consumption

While assets give us a sense of the stock of household wealth, we are also interested in a more immediate measure of well-being. In most developing countries, poverty is measured by expenditure, used as a proxy for consumption. The other logical choice for measuring current well-being would be income, but there are two primary reasons why consumption is preferred. First, in developing countries, factors such as agricultural production for home consumption and the fact that many transactions are not recorded make income quite hard to measure. Second, households may be able to deal with fluctuations in income through help from friends or loans, and hence consumption informs us of the welfare levels attained *after* households have tried to cope with unexpected shocks to their income. Hence, as opposed to the section on income, this section is better interpreted as a discussion of household welfare. As we will see, the results tell quite a different story.

In this section we look at household expenditures on food and fuel, which captures the basic elements of household expenditure (later work will examine expenditure on other goods as well). Table 21 shows the average monthly expenditure per capita in random sample and HIV households. What is striking is that HIV households have a much higher average food and fuel expenditure, close to 25 percent higher than random sample households. It should be recognized, however, that this measure of per-capita expenditure assigns equal weight to all household members (adults and children). Future work will present results that better account for household demographics. Nonetheless, Table 22 presents a regression of expenditure per capita to examine its relation with a number of household characteristics. The regression results indicate that when we control for various other households characteristics, the difference in expenditure levels between HIV and random sample households is not as large as reported in Table 21, although HIV households still spend significantly more per person. Single headed households spend far more (per-capita) than other households, but this effect is about equal and opposite for female headed households. The coefficient on household size is negative and significant. Coupled with the earlier result that child nutrition measures are worse in larger households, this result may suggest that larger households are poorer, but we need to do further work to disentangle this from other possible explanations. Finally, there appears to be no significant seasonal variation in food expenditure during the six months covered by this round of the data.

All the statistics reported thus far describe average differences across groups. Figure 2 provides the cumulative density function of expenditure per capita, with the median expenditure represented by the vertical line. What we can see is that above roughly 500-600 shillings, the distribution of HIV households lies to the right of the distribution of random sample households. Thus, above this level of expenditure, a greater fraction of households in the random sample are consuming at or below this level than their HIV counterparts. Below this level, however, there is no appreciable difference in expenditure patterns. Hence, among the poorest households, households in the HIV sample and the random sample spend about the same.

When we break expenditure down by purchased food and home produced food (valued by the respondent), we can see (in Table 21) that HIV households procure a much larger fraction of their food from the market.[25] Given the lower level of agricultural production among HIV households, this is not a surprising result.

In light of the data on employment status and earned income, the higher levels of food consumption in HIV households may result from transfers of food or money received by these households from individuals and organizations. These findings therefore point to the potential importance of a transfers for food support in our survey area. We will see some estimates of the value of transfers below, but it is worthwhile pointing out the major food-support program in this area. In collaboration with AMPATH, the HAART and Harvest Initiative (HHI) farm provides food (on a weekly to monthly basis) to some AMPATH patients. The exact quantities of food supplied to any given patient usually depends of demographic characteristics of the patient's household as well a nutritionist's assessment of the patient's needs. Receipt of grains and vegetables from the HHI farm may thus explain why the HIV households in our sample appear to be better off than households in the random sample. Future analysis will make use of the HHI farm's food distribution records to estimate exactly how much of HIV sample/random sample discrepancy is due to the food distribution program.

## 9. Inequality

In an effort to examine the level of inequality in the HIV and random samples, Table 23 presents estimates of the Gini coefficient for assets and food expenditure. The Gini coefficient measures inequality, ranging from zero (perfect equality) to one (perfectly unequal). Inequality in assets and food expenditure is significantly higher among HIV households. In other words, in terms of wealth and consumption, the random sample households tend to be a more homogenous group than the HIV households. This pattern is more pronounced for assets than consumption, which may in part be due to the high level of transfers that HIV households receive.

## 10. Transfers

[25] Note that our survey recorded consumption of food received in-kind in the same category as consumption of home produced food. As a result, it is not possible to calculate the exact *quantity* of home produced food that is consumed by the household. However, since the value of in-kind food received is recorded elsewhere, it is possible to calculate the *value* of home produced food that is consumed by the household.

Transfers of money and goods from friends and relatives are often an important mechanism through which individuals and households cope with hardship induced by illnesses or unexpected agricultural events. Our survey collected detailed information on loans and transfers received by respondents. Respondents were asked about four different types of transfers: transfers sent to and received from individuals, transfers received from organizations (such as government agencies and support groups), transfers made as part of rotating savings and credit organizations, and transfers within the household (to the spouse, if alive). Table 24 summarizes the main results.

When we examine the reports of money or goods *received by* respondents from other individuals, we find that adult respondents in HIV households are significantly more likely to have received some transfers since January 2003 than adult respondents in random sample households (51 percent compared to 38 percent). However, among all individuals who received such transfers there is not a significant difference between the *amounts* received by those in HIV households and random sample households. That is, while individuals in HIV households are more likely to receive transfers, the size of those transfers are the same as the transfers received by individuals in random sample households.

For transfers *sent by* respondents to other individuals, we find that respondents in HIV households are significantly less likely to have sent some transfers since January 2003. While 49 percent of adult respondents in random sample households reported having sent some money to other individuals, only 32 percent of adult respondents in HIV households sent money. This also suggests that the economic circumstances of those in HIV households do not allow them to support others in their social networks.

Participation in informal savings organizations, such as rotating savings and credit organizations (merry-go-rounds) does not appear to differ between individuals in HIV households and random sample households. In both samples, approximately 20 percent of individuals claim to participate in such organizations, which often can serve as risk-coping mechanisms by providing funds when individuals experience income shortfalls. Finally, our data show that women are significantly more likely to participate in such groups (30 percent of all women, in comparison to 10 percent of all men).

Finally, loans and transfers from organizations such as microfinance organizations and community groups can also facilitate risk-coping and the undertaking of important investments. As mentioned in Section 8, food from the HHI farm on a weekly or monthly basis is an important transfer for many HIV households. The frequency and value of transfers from such organizations is reported in Table 24. There is a significant difference in transfers received by adult respondents in the HIV sample and the random sample. While 17 percent of respondents in the HIV sample received some transfers from organizations in the past month, only 3 percent of those in the random sample reported having received something. In terms of the value of these transfers, respondents in the HIV sample (unconditional on having received a transfer) also received significantly more in the past month (263 shillings compared to 91 shillings).

## 11. HIV/AIDS-related Knowledge and Behavior

Efforts aimed at preventing the spread of HIV/AIDS are most likely to be successful when based on a good understanding of knowledge levels in the population as well as individual

and community behavior. We attempted to gather information on the respondents' knowledge about a range of topics related to HIV/AIDS. We also asked questions about respondents' testing behavior and sexual behavior. Table 25 contains the results from our interviews with the household heads and spouses in all the random sample households as well as respondents in the HIV households. Where possible, we provide comparisons of our results to those obtained in the 2003 Kenya Demographic and Health Survey (Central Bureau of Statistics, 2004). In most cases, we rely on the KDHS results reported for the sample in Rift Valley Province, which is a large region that includes our survey area. In future analysis, we will make further use of the KDHS data files to conduct detailed comparisons to our own survey data. For example, several other questions and topics in our survey were also covered in the 2003 KDHS. This will allow us to not only assess the validity of our own data but also compare our survey area to other regions of Kenya.

Knowledge and Behavior in the Random Sample

The data from the random sample are likely to resemble the knowledge levels and behavioral practices in the general population of the survey area. Some of the important findings from the random sample can be summarized as follows:

- An overwhelming majority of adults (over 90 percent usually) think that HIV/AIDS a) can be treated; b) cannot be cured; c) can be transmitted from a mother to her child; and that d) it is possible to have HIV and look healthy. The two exceptions are that only 76 percent of men think that HIV/AIDS can be treated, and only 79 percent of women think that a person can have HIV and look healthy.[26] However, these findings suggest that most adults in the communities have at least some basic awareness about HIV/AIDS. For the question whether an infected person can look healthy, it is worth noting that the results in the 2003 KDHS (for Rift Valley Province) closely parallel our results – with 74 percent of women and 89 percent of men having correct beliefs.
- The impacts of HIV/AIDS on the communities are made clear by the large fraction of adults who report that they know somebody who died from HIV/AIDS (87 percent of men and 69 percent of women). This compares to figures of roughly 70 percent (for men and women) that were obtained in the 2003 KDHS in Rift Valley Province.
- Many adults in the communities of Kosirai Division know somebody who is receiving treatment for HIV/AIDS.[27] However, here again men are more likely to report knowing someone – 59 percent of men and 33 percent of women claimed to know somebody receiving treatment.
- 90 percent of all adults also know that treatment for HIV/AIDS is available in Mosoriot, although people have a range of beliefs about the ease with which treatment is available. An interesting result is that men are much more likely to say that treatment is "easily available" (71 percent of men compared to 31 percent of women). This could be consistent with the finding above that more men report knowing somebody on treatment.
- The results on knowledge of persons receiving treatment and the availability of treatment are somewhat surprising in light of the fact that in most HIV and VCT clinics in the region (including the Mosoriot HIV clinic) patients and clients are more

[26] These results exclude cases in which the response to our question was "don't know". For some questions, such responses were quite common (particularly for female respondents). Future work will more carefully examine such response patterns.

[27] Our survey did not establish whether this treatment referred to antiretroviral therapy. The respondents may well have been referring to somebody they knew who was taking traditional medicines for treatment.

likely to be women. Future work will examine the responses to these questions more carefully.

The survey also collected information on sexual behavior. Questions administered in our survey are similar to those used in other surveys conducted in the region, such as the Behavioral Surveillance Surveys and Demographic and Health Surveys. Our main findings are reported in Table 25. The average age at first intercourse is about 17 years for both men and women. Men report having had many more partners than women (8.6 compared to 1.7). There are also significant differences between men and women in beliefs about their partner's faithfulness. When asked if they think their main partner also has other partners, 15 percent of women respond that they do, compared to 2 percent of men.[28] Finally, condom use with the main partner (during last time of intercourse) is not very common – 7 percent of men and 9 percent of women report having used condoms.

Knowledge and Behavior among HIV-positive Individuals

For many of the questions pertaining to AIDS-related knowledge and behavior, the responses of HIV-positive persons in our HIV sample are also of interest. Behavioral practices of HIV-positive persons, for example, can influence transmission rates of the disease. The findings from our survey (also reported in Table 25) highlight several important differences between the HIV sample and the random sample:

- Compared to men and women in the random sample, a much higher fraction of HIV-positive persons in the HIV sample think that AIDS can be cured. Excluding the 15 percent who said they don't know, 37 percent said they think AIDS can be cured (compared to 8 percent in the random sample).
- Mosoriot is mentioned as the nearest place for treatment by only 63 percent of HIV-positive respondents in the HIV sample. This could mean that some patients are bypassing other HIV clinics that are near their home due to stigma associated with being HIV-positive.
- HIV-positive patients in our sample are less likely to have been sexually active in the 6 months prior to interview. Among those who are sexually active, 29 percent report having used condoms during the last time of intercourse.
- HIV-positive patients are much more likely to say that they think their spouse or main partner has other partners. 38 percent of all patients (men and women) say so, compared to about 9 percent of respondents in the random sample.

HIV-related Stigma

Levels of stigma associated with HIV/AIDS are an important factor to be considered when designing treatment and prevention programs. Perceptions of stigma within a community are likely to be critical in influencing individual behavior such as the decision to be tested for HIV, to breastfeed if HIV-positive, or to seek treatment when sick. Levels of stigma may also explain differences in socio-economic outcomes between HIV-positive and HIV-negative individuals, such as employment opportunities or transfers from individuals within the village or community groups. In order to measure levels of stigma in our survey area and also understand individual attitudes about HIV/AIDS, we asked respondents for their

[28] Another 30 percent of the women respond that they don't know if their spouse/partner has other partners, suggesting to some degree that these women also don't trust their partner. Among male respondents, an additional 21 percent respond that they don't know.

assessment of the community opinion as well as for their own personal opinion on several specific statements concerning the disease. Examples of these statements include:

- "Most people I know would agree that a female teacher who has AIDS but is not sick should be allowed to continue teaching in the school"
- "If I was a teacher infected with the AIDS virus but was not sick, I would find that I should be allowed to continue teaching in the school"

Some results are reported in Table 25 and can be summarized as follows:

- Levels of stigma within the community appear to be high, but do not indicate very much intolerance against HIV-positive individuals.
- When asked about the degree to which their community members associate having HIV/AIDS with immoral behavior, 60 percent of male respondents and 53 percent of female respondents in the random sample indicated that such views were very common.
- Only 16 percent of male respondents and 24 percent of female respondents said that their community members feel that a female teacher who is HIV-positive should *not* be allowed to continue teaching. This compares to results in the 2003 KDHS which indicate that roughly 42 percent of men and 47 percent of women in Rift Valley Province feel that a female teacher should *not* be allowed to continue teaching.
- When asked about their own opinion, respondents generally expressed more moderate views on each of the statements.
- Among HIV-positive respondents in the HIV sample, it is interesting to note that perceived levels of community stigma are actually *lower* than what is reported in the random sample.

HIV Testing Behavior in the Random Sample

Apart from improving the knowledge of HIV/AIDS in the general population, encouraging people to learn their HIV status is another important component of many prevention programs. The Mosoriot survey presents an opportunity to not only find out what fraction of the population has already been tested, but also to examine the central factors associated with the decision to go for an HIV test. As Table 25 indicates, 18 percent of all adult respondents in the random sample (12 percent of men and 22 percent of women) claim to have gone for an HIV test.[29] Women are much more likely to have been tested probably because HIV testing at antenatal clinics has become more routine.[30] It is worth noting that in the 2003 KDHS, about 12 percent of men and 15 percent of women reported having ever been tested.

Table 26 contains additional analysis of individual testing decisions in the random sample of Kosirai Division. Using regression analysis, we try to understand the various factors that drive individual testing decisions. The key results in Table 26 can be summarized as follows:

[29] Note that among those in the random sample who have gone for an HIV test, 5 percent of the men and 4 percent of women *reported* that they tested HIV-positive. As stated earlier, this report considers these individuals as part of the random sample (not the HIV sample) since the persons are not patients at the Mosoriot HIV clinic. Future analysis will examine how the results change when the households of these HIV-positive testers are included in the HIV sample.

[30] In the first round of the survey, we did not establish whether the HIV test took place at an antenatal clinic, a voluntary counseling and testing (VCT) clinic, or a laboratory. This will be done in the second round of the survey.

- Among the adult respondents in the random sample, a higher level of education is associated with a greater likelihood of having gone for an HIV test.
- Not surprisingly, the coefficient on gender of respondent is equally significant, with women being much more likely to have tested.
- Another important factor that emerges from the analysis has to do with personal experience – those who have personally known somebody who died of AIDS are much more likely to have gone for an HIV test. The coefficient on this variable is always found to be significant.
- Knowledge about the availability of treatment for HIV/AIDS in Kosirai Division and personally knowing somebody who is receiving treatment does not appear to be a significant factor in testing decisions. The coefficient has the expected positive sign but is not statistically significant when we control for personal knowledge of someone who died of AIDS.
- Having a partner who has tested for HIV/AIDS is associated with a much greater likelihood of having gone for an HIV test. However, this does not establish causality – it remains to be examined whether this is due to joint decision-making among couples or due to the efforts one partner to learn his/her status and then convince the other to test.
- Finally, the survey tried to assess respondents' perceptions of stigma toward HIV/AIDS in their communities. Preliminary analysis indicates that those individuals who feel there is more community-level stigma are less likely to have gone for an HIV test.

Given the importance of regular HIV testing in efforts to prevent the transmission of the disease, future work will more carefully examine the determinants of testing behavior in the general population of our survey area. Factors that we will examine include distance to clinic (calculated with GPS data which was collected in the survey), income and general economic status, as well the role of individual social networks.

## 12. Conclusions

The results presented in this report point to a range of important differences between HIV households and households in the random sample of the survey area. The differences are initially apparent in the demographic structure – HIV households are smaller, usually due to the presence of fewer adults. They are also much more likely to contain (single) orphaned children. The economic situation of HIV households is fundamentally different. They work less overall, both in terms of participation in various income-earning activities and as well as in number of hours. The difference is driven largely by the reduced participation of HIV households in agricultural activities. This translates into a lower level of reported income, even when we account for the number of household members.

Nonetheless, reported income does not give us a good sense of economic welfare in this developing country context. Asset holdings and food consumption levels are usually better indicators of welfare. Turning to the accumulated stock of household wealth, we can again observe the more precarious situation of HIV households. They hold less of the major assets—land and cattle—than households in the random sample. However, when we examine a measure of *current* welfare—household expenditures on food and fuel—we find a surprising reversal. On average, HIV households consume more per person than non-HIV households. This higher consumption may be explained by the higher frequency with which

HIV households receive transfers in cash and kind from individuals and organizations, combined with the fact they are less likely to give such transfers.

While current consumption per person may be higher, results on child nutrition indicate that this may be a fairly recent development. Children under 5 years in HIV households show much lower levels of height for weight, a common anthropometric indicator. The education of children between the ages of 6 and 18 years has also suffered in the recent past as they are less likely to have been enrolled than their random sample counterparts. Even when enrolled, they are more likely to be absent from school.

Turning to health status, we find a significant difference between HIV-diagnosed individuals and individuals who had not been diagnosed. HIV-diagnosed individuals were more likely to have an acute illness in the previous four weeks and were more likely to miss work as result. Taking chronic and acute episodes together, HIV-diagnosed individuals had far higher medical expenses than others. Against these burdens, they received more support, they received higher assistance with medical bills and were more likely to receive (non-remunerated) labor assistance from individuals outside the household than non-diagnosed individuals. This is supplemented by asset sales: HIV households were more likely to sell land and livestock for the purpose of covering health expenses than those in the random sample. Turning to comparisons within the group of non-HIV diagnosed individuals, those living with an HIV patient were less likely to report an acute illness, but when they did it is more severe (in terms of days of work missed). These individuals were also significantly more likely to report a case of tuberculosis in the past four years.

In order to better understand the dynamics of who comes in for HIV testing and treatment, we also examined the factors associated with the decision to get an HIV test. Not surprisingly, more education and knowing someone who has died from AIDS increase the probability of being tested. Individuals who perceive lower levels of community stigma are also more likely to be tested. This result also seems to hold through beyond the test, our overall analysis of perceived stigma showed that HIV-positive individuals hold the view that stigma in the community is lower than the level expressed by the community itself (via the results from the random sample). HIV clinic patients also show significantly different knowledge and behavior patterns from adults in the random sample. Two results of note include a) much higher level of belief among HIV clinic patients that AIDS can be cured and (b) far higher level of condom use by HIV clinic patients.

One central goal of this project is to examine the welfare of the HIV-positive patients' households as compared to households in the general population. According to a number of indicators they seem to be doing worse: they have lower asset levels, lower labor supply as well as income, and their children seem to be worse off. However, in an important measure of *current* welfare they are better off–they spend more per person on food and fuel than households in the random sample. Part of this difference between income and consumption is due to the higher level of support they receive–more frequent transfers from individuals and organizations.

It is important to keep in mind that this report has reported mostly comparisons of averages, with a few simple statistical regressions—all of which has been aimed at comparing HIV households to random sample households. As we move to more sophisticated analyses, and start to control for other factors, these results may change significantly. Furthermore, another important objective of this project is to document the impact of the antiretroviral therapy that

many of the HIV-positive patients in our sample are receiving. This analysis will rely on a critical set of data that are currently being gathered, such as longitudinal information on many outcomes such ranging from employment to children's school enrollment. We will also make use of clinical information such as the amount of time that individuals have received ARV therapy and the initial health conditions prior to initiation of ARVs. As we examine all of these data, we will gain a much clearer understanding of the impacts of HIV/AIDS as well as the ameliorative effects of ARV therapy. Nonetheless, this report provides strong evidence that HIV households have considerably different socio-economic status than other households residing near them. Better understanding these differences, and how they might be mitigated through ARV therapy, is the main theme of the work to come.

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## Table 1. Basic Summary Statistics

| | Random Sample (N=510) | | HIV Sample (N=252) | | |
|---|---|---|---|---|---|
| | Mean | Std. Error | Mean | Std. Dev. | P-value |
| **Household Structure** | | | | | |
| Household Size | 6.03 | 0.123 | 5.39 | 0.15 | 0.0022 |
| Average Age | 24.9 | 0.5 | 23.8 | 0.6 | 0.2217 |
| Number of Under-18 Children | 3.11 | 0.1 | 2.76 | 0.1 | 0.0232 |
| Extended Family Members | 0.91 | 0.058 | 1.10 | 0.093 | 0.0807 |
| Number of Children Away | 1.85 | 0.1212 | 1.41 | 0.1365 | 0.0296 |
| Percent of Under-18 Children who are Orphans | 8.2% | | 30.6% | | 0.0000 |
| *Household Head Characteristics* | | | | | |
| Male household head | 81% | | 54% | | 0.0000 |
| Single household head | 23% | | 50% | | 0.0000 |
| Age of household head | 47.83 | 0.681 | 44.84 | 0.871 | 0.0084 |
| **Education** | | | | | |
| *Adults (older than 18 years)* | N=1749 | | N=713 | | |
| Years of School Completed | 7.65 | 0.0874 | 7.37 | 0.1411 | 0.0836 |
| Completed Primary School | 53% | | 49% | | 0.0757 |
| *Children (ages 8-18 years)* | N=1010 | | N=431 | | |
| Currently enrolled in school (2004) | 95% | | 93% | | 0.3416 |
| Enrolled in school - 2002 | 95% | | 94% | | 0.5680 |
| Enrolled in school - 2001 | 93% | | 92% | | 0.5795 |
| *Current School Attendance - ages 6 - 18 ( among children enrolled )* | | | | | |
| Percent who missed school in past week * | 4.8% | N=980 | 7.9% | N=457 | |
| Percent who missed some school in past week ** | 7.4% | N=663 | 9.0% | N=423 | |

* considered to be usual hours if reason for unusual hours is holidays
** variable set to missing if reason for unusual hours is holidays

## Table 2. Characteristics of HIV-Positive Individuals in the Survey

| | HIV+ Individuals (N=273) | |
|---|---|---|
| | Mean | Std. Dev. |
| Age | 36.1 | 10.2 |
| Female | 75% | |
| Years of School Completed | 7.6 | 3.4 |
| Completed Primary School | 48% | |
| Head of household | 56% | |
| Resides outside Kosirai Div. | 59% | |
| Receiving ARVs | 67% | |
| *Marital Status* | | |
| Married | 41% | |
| Separated | 11% | |
| Widowed | 25% | |
| Never Married | 21% | |

## Table 3. Educational Attainment

Educational Attainment of individuals older than 18 years

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Dependent variable: | Number of years completed | | | Completed Primary | |
| Specification: | OLS | OLS | OLS | Probit | Probit |
| Age | 0.069 | 0.068 | 0.095 | 0.021 | 0.022 |
| | (3.97)*** | (3.87)*** | (5.45)*** | (4.45)*** | (4.57)*** |
| Age-squared | -0.002 | -0.002 | -0.002 | -0.00037 | -0.00038 |
| | (10.83)*** | (10.57)*** | (10.79)*** | (6.58)*** | (6.63)*** |
| Female | -0.947 | -0.965 | 1.189 | 0.302 | 0.304 |
| | (7.63)*** | (7.71)*** | (4.07)*** | (4.97)*** | (4.99)*** |
| Female * Age | | | -0.059 | -0.013 | -0.013 |
| | | | (8.06)*** | (7.09)*** | (7.11)*** |
| HIV household | -0.225 | | -0.241 | -0.039 | |
| | (1.65)* | | (1.79)* | (1.63) | |
| Individual HIV+ | | -0.034 | | | -0.045 |
| | | (0.17) | | | (1.31) |
| Constant | 8.826 | 8.775 | 7.842 | | |
| | (25.03)*** | (24.59)*** | (21.26)*** | | |
| Observations | 2462 | 2462 | 2462 | 2465 | 2465 |
| R-squared | 0.31 | 0.31 | 0.33 | | |

Absolute value of t statistics in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Note: Probit coefficients are the marginal effect on probability of being enrolled

## Table 4. Analysis of 2004 School Enrollment Rates

Current (2004) Education Enrollment (children between ages 6 - 18)

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Dependent variable: | Child enrolled in school during 2004 | | | | |
| Specification: | OLS | OLS | Probit | Probit | Probit |
| Age | 0.085 | 0.085 | 0.037 | 0.037 | 0.037 |
| | (8.32)*** | (8.32)*** | (5.13)*** | (5.13)*** | (5.17)*** |
| Age-squared | -0.004 | -0.004 | -0.002 | -0.002 | -0.002 |
| | (9.92)*** | (9.92)*** | (6.43)*** | (6.43)*** | (6.46)*** |
| Female | -0.021 | -0.019 | -0.016 | -0.017 | -0.016 |
| | (2.06)** | (1.57) | (2.37)** | (2.01)** | (2.36)** |
| HIV household | -0.022 | -0.019 | -0.016 | -0.018 | -0.014 |
| | (1.94)* | (1.18) | (2.09)** | (1.47) | (1.72)* |
| Female * HIV hh | | -0.006 | | 0.002 | |
| | | (0.27) | | (0.15) | |
| Orphan | | | | | -0.009 |
| | | | | | (1.06) |
| Constant | 0.607 | 0.606 | | | |
| | (10.52)*** | (10.48)*** | | | |
| Observations | 1691 | 1691 | 1691 | 1691 | 1691 |
| R-squared | 0.12 | 0.12 | | | |

Absolute value of t statistics in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Note: Probit coefficients are the marginal effect on probability of being enrolled

## Table 5. Analysis of 2004 School Attendance Rates (ages 6-18 years)

Current School Attendance regressions: ages 6 - 18

| | (1) | (2) | (3) |
|---|---|---|---|
| | Unusual hours of school in past week | | |
| | OLS | OLS | Probit |
| Age | -0.006 | -0.006 | -0.006 |
| | (0.55) | (0.55) | (0.53) |
| Age-squared | 0 | 0 | 0 |
| | (0.46) | (0.46) | (0.44) |
| Female | -0.011 | -0.007 | -0.01 |
| | (0.93) | (0.54) | (0.92) |
| HIV household | 0.037 | 0.042 | 0.037 |
| | (2.96)*** | (2.42)** | (2.89)*** |
| Female * HIV hh | | -0.011 | |
| | | (0.45) | |
| Constant | 0.09 | 0.088 | |
| | (1.39) | (1.36) | |
| Observations | 1598 | 1598 | 1598 |
| R-squared | 0.01 | 0.01 | |

Absolute value of t statistics in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

## Table 6. Heights and Weights of Children Younger than 5 years

| | | Height (cms) | | Weight (kgs) | | Weight/Height (kg/cm) | |
|---|---|---|---|---|---|---|---|
| Age category | Obs. | Mean | Std. Dev. | Mean | Std. Dev. | Mean | Std. Dev. |
| 0 - 1 year | 85 | 63.8 | 8.7 | 7.3 | 2.1 | 0.11 | 0.02 |
| 1 - 2 years | 100 | 76.3 | 4.9 | 9.9 | 1.4 | 0.13 | 0.02 |
| 2 - 3 years | 78 | 86.5 | 5.5 | 11.8 | 1.7 | 0.14 | 0.01 |
| 3 - 4 years | 94 | 94.0 | 7.3 | 13.4 | 1.8 | 0.14 | 0.01 |
| 4 - 5 years | 105 | 102.4 | 6.2 | 15.2 | 1.8 | 0.15 | 0.01 |
| 5 - 6 years | 54 | 105.2 | 7.0 | 16.2 | 1.6 | 0.15 | 0.01 |

## Table 7. Analysis of Child Height/Weights for Children Under 5 Years

Dependent Variable: weight/height (kg/cms)

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| Age | 0.008 | 0.008 | 0.008 | 0.008 |
| | (17.71)** | (17.76)** | (17.85)** | (17.85)** |
| Age-squared | -0.0001 | -0.0001 | -0.0001 | -0.0001 |
| | (15.10)** | (15.11)** | (15.20)** | (15.17)** |
| Female | -0.004 | -0.004 | -0.004 | -0.004 |
| | (3.05)** | (3.03)** | (2.91)** | (2.85)** |
| HIV household | -0.006 | -0.005 | -0.005 | -0.006 |
| | (3.03)** | (2.54)* | (2.61)** | (2.04)* |
| Orphan | | -0.004 | -0.004 | -0.004 |
| | | -1.28 | -1.27 | -1.25 |
| HH Size | | | -0.001 | -0.001 |
| | | | (2.03)* | (2.02)* |
| Female * HIV hh | | | | 0.002 |
| | | | | -0.43 |
| Constant | 0.118 | 0.118 | 0.122 | 0.122 |
| | (72.44)** | (72.36)** | (50.57)** | (50.36)** |
| Observations | 514 | 514 | 514 | 514 |
| R-squared | 0.39 | 0.4 | 0.4 | 0.4 |

Absolute value of t statistics in parentheses

* significant at 5%; ** significant at 1%

## Table 8. Vaccination of Children Under 12 Years

| | Percent of Children Receiving Vaccine | | |
|---|---|---|---|
| Vaccine | All Children | Children with Vaccination Card | Children with Parent's Report |
| No. of children: | 1445 | 699 (48%) | 746 (52%) |
| BCG | 98% | 98% | 98% |
| At least one dose Polio | 97% | 97% | 97% |
| At least one dose DPT | 97% | 97% | 96% |
| Measles | 89% | 83% | 94% |

## Table 9. Recent Illness, HIV-diagnosed vs. non-diagnosed

| | All Individuals | | | Non-Diagnosed Individuals | | |
|---|---|---|---|---|---|---|
| | Non-Diagnosed | HIV-Diagnosed | P-value | Non-HIV Household | HIV Household | P-value |
| **Acute Illness in past 4 weeks** | | | | | | |
| Episode Frequency | 16% | 33% | 0.0000 | 17% | 14% | 0.0123 |
| Episode Duration (days) | 7.46 | 17.26 | 0.0000 | 7.67 | 6.67 | 0.2986 |
| | (0.39) | (2.5) | | (0.48) | (0.56) | |
| Days of Work Missed | 1.73 | 9.8 | 0.0000 | 1.57 | 2.31 | 0.0949 |
| | (0.18) | (1.97) | | (0.21) | (0.37) | |
| Debilitation Ratio | 0.25 | 0.48 | 0.0000 | 0.21 | 0.37 | 0.0000 |
| (work missed / illness duration) | (0.02) | (0.05) | | (0.02) | (0.04) | |
| **Help with Missed Work** | | | | | | |
| From Inside household | 83% | 75% | 0.2068 | 81% | 88% | 0.2564 |
| From Outside household | 21% | 42% | 0.0020 | 25% | 10% | 0.0244 |
| Any help | 91% | 96% | 0.2351 | 90% | 94% | 0.4044 |
| **Care Seeking** | | | | | | |
| Did you seek care? | 72% | 82% | 0.0380 | 71% | 75% | 0.3687 |
| (first illness episode only) | | | | | | |
| Health Expenditure | 294 | 2,020 | 0.0000 | 300 | 270 | 0.7805 |
| | (45) | (603) | | (55) | (53) | |
| Net Health Expenditure | 289 | 1,680 | 0.0000 | 294 | 269 | 0.8165 |
| | (45) | (523) | | (55) | (53) | |
| Help from outside household | 3 | 210 | 0.0001 | 4 | 1 | 0.5078 |
| | (2) | (144) | | (3) | (1) | |
| **Chronic Illness** | | | | | | |
| Episode Frequency (non-HIV) | | | | 9% | 6% | 0.0151 |
| **Care Seeking** (all conditions) | | | | | | |
| Did you seek care? | 88% | 99% | 0.0000 | 88% | 87% | 0.6813 |
| Health Expenditure | 534 | 1,485 | 0.0101 | 542 | 506 | 0.9052 |
| | (127) | (411) | | (157) | (159) | |
| **Total Health Expenditure** | 90 | 1885 | 0.0000 | 96 | 73 | 0.4317 |
| (not conditional on illness) | (13) | (403) | | (17) | (16) | |

## Table 10. First Place Care Was Sought for Recent Acute Illness Episode

| | Non-Diagnosed Individuals | | | |
|---|---|---|---|---|
| *Percent individuals reporting:* | All | In HIV-Affected Households | **HIV-Diagnosed Individuals** | **Total** |
| National Referral Hospital (Kenyatta, Moi) | 1.89% | 3.77% | 5.33% | 2.72% |
| Government District/Provincial Hospital | 6.49% | 18.87% | 14.67% | 9.98% |
| Mosoriot Rural Health Center | 34.32% | 24.53% | 61.33% | 36.12% |
| Government Health Center (excluding Mosoriot) | 4.86% | 9.43% | 5.33% | 5.81% |
| Government Dispensary | 11.89% | 16.04% | 2.67% | 11.43% |
| Mission Hospital/Clinic | 1.62% | 0.00% | 1.33% | 1.27% |
| Other Private Hospital/Clinic | 6.49% | 4.72% | 6.67% | 6.17% |
| Chemist/Pharmacy | 16.49% | 10.38% | 1.33% | 13.25% |
| Private Doctor | 2.97% | 4.72% | 0.00% | 2.90% |
| Mobile Clinic | 0.81% | 0.94% | 0.00% | 0.73% |
| Community Health Worker | 0.00% | 0.00% | 0.00% | 0.00% |
| Retail Shop | 6.76% | 5.66% | 1.33% | 5.81% |
| Herbalist/Traditional Healer | 5.14% | 0.94% | 0.00% | 3.63% |
| Relative/Friend | 0.00% | 0.00% | 0.00% | 0.00% |
| Other | 0.27% | 0.00% | 0.00% | 0.18% |
| Total | 100% | 100% | 100% | 100% |

## Table 11. Health History

| | All Individuals | | | Non-Diagnosed Individuals | | |
|---|---|---|---|---|---|---|
| | Non-Diagnosed | HIV-Diagnosed | P-value | Non-HIV Household | HIV Household | P-value |
| *Percent individuals reporting:* | | | | | | |
| Malaria since Jan 2002 | 20.91% | 51.09% | 0.0000 | 20.28% | 22.74% | 0.0906 |
| Tuberculosis since Jan 2000 | 0.46% | 27.01% | 0.0000 | 0.13% | 1.43% | 0.0000 |
| Typhoid since Jan 2000 | 2.29% | 16.06% | 0.0000 | 2.45% | 1.81% | 0.2284 |
| Meningitis since Jan 2000 | 0.14% | 2.55% | 0.0000 | 0.19% | 0.00% | 0.1536 |

## Table 12. AIDS Symptoms

| | HIV-Diagnosed | | | Non-Diagnosed | | |
|---|---|---|---|---|---|---|
| | No ARVs | ARVs | P-value | Random household | HIV household | P-value |
| Diarrhea (month or more) | 6.90% | 18.38% | 0.0125 | 0.36% | 1.06% | 0.0069 |
| Continuously lost weight (past few months) | 43.68% | 59.46% | 0.0147 | 1.84% | 3.58% | 0.0012 |
| Recurring fever (month or more) | 40.23% | 49.73% | 0.1440 | 2.78% | 3.68% | 0.1438 |
| Skin rash (past year) | 45.98% | 65.41% | 0.0023 | 4.43% | 5.22% | 0.2916 |
| Persistent sore throat (past 3 months) | 31.03% | 36.76% | 0.3577 | 2.58% | 2.80% | 0.7027 |
| Much more tired (past 3 months) | 64.37% | 68.11% | 0.5426 | 3.62% | 4.94% | 0.0607 |
| Sweating during the night (past 3 months) | 38.37% | 43.24% | 0.4509 | 4.78% | 3.79% | 0.1866 |
| Number of Symptoms (sum of 7 above) | 2.69 | 3.41 | 0.0056 | 0.2 | 0.24 | 0.1524 |

## Table 13. Agriculture and Landholdings

| | Random Sample Household | | | HIV Households | | | P-value |
|---|---|---|---|---|---|---|---|
| | N | Mean | Std. Error | N | Mean | Std. Error | |
| **Farm Outputs** | | | | | | | |
| Total Crop Sales 2003 (KSh) | 485 | 28,034 | 3,592 | 235 | 11,527 | 2,306 | 0.0426 |
| Total Crop Sales 2002 | 485 | 21,130 | 2,682 | 235 | 12,406 | 4,146 | 0.0704 |
| Total Crop Sales 2001 | 485 | 17,582 | 2,892 | 235 | 8,282 | 2,766 | 0.0023 |
| Bags of Maize produced 2003 | 484 | 36.3 | 3.3 | 211 | 17.7 | 2.6 | 0.0004 |
| Maize Sales 2003 (KSh) | 485 | 25,393 | 3,470 | 235 | 8,361 | 1,873 | 0.0010 |
| Maize Sales 2002 | 485 | 19,941 | 2,612 | 235 | 10,383 | 3,775 | 0.0373 |
| Maize Sales 2001 | 485 | 16,842 | 2,844 | 235 | 6,530 | 2,340 | 0.0194 |
| Other Crop Sales 2003 (KSh) | 485 | 2,641 | 475 | 235 | 3,166 | 807 | .5527 |
| Other Crop Sales 2002 | 485 | 1,189 | 229 | 235 | 2,022 | 586 | 0.1120 |
| Other Crop Sales 2001 | 485 | 740 | 153 | 235 | 1,751 | 576 | 0.0273 |
| Value of maize storage - Rd 1 | 484 | 6,119 | 464 | 211 | 2,658 | 702 | 0.0000 |
| **Farm Inputs** | | | | | | | |
| Expenditures in past 12 months | | | | | | | |
| Labor | 494 | 2,361 | 351 | 222 | 1,417 | 201 | 0.0814 |
| Seeds | 494 | 3,941 | 370 | 222 | 2,461 | 361 | 0.0141 |
| Fertilizer | 494 | 4,582 | 460 | 222 | 3,331 | 488 | 0.0998 |
| **Land** | | | | | | | |
| Percent owning no land | 497 | 13% | | 252 | 28% | | 0.0000 |
| Acres of Land owned | 495 | 6.7 | 0.5 | 249 | 4.6 | 0.6 | 0.0060 |
| Acres cultivated in 2003 | 493 | 3.0 | 0.3 | 236 | 2.5 | 0.5 | 0.3021 |

## Table 14. Analysis of Agricultural Sales and Yields

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | Total Value of All Crop Sales | | | Bags Maize |
| | 2003 | 2002 | 2001 | 2003 |
| Household from Mosoriot HIV sample | -13,132 | -5,663 | -6,789 | -12.8 |
| | (2.68)*** | (1.29) | (1.59) | (3.69)*** |
| Acres of land cultivated | 4,878 | 4,218 | 3,652 | 1.4 |
| | (13.76)*** | (13.26)*** | (11.81)*** | (4.95)*** |
| Household owns no land | -5,799 | -6,161 | -4,464 | -7.3 |
| | (0.96) | (1.14) | (0.85) | (1.61) |
| Amount spent on fertilizer, past 12 mths (1000s Shillings) | | | | 4.0 |
| | | | | (23.86)*** |
| Constant | 13,872 | 9,021 | 6,984 | 12.2 |
| | (4.49)*** | (3.25)*** | (2.59)*** | (5.54)*** |
| Observations | 717 | 717 | 717 | 692 |
| R-squared | 0.22 | 0.21 | 0.17 | 0.57 |

Absolute value of t statistics in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

## Table 15. Income and Employment

| | Random Sample households | | HIV Sample households | | |
|---|---|---|---|---|---|
| | Mean | Std. Error | Mean | Std. Error | P-value |
| **Income and Employment** | | | | | |
| *Adults (older than 18 years)* | N=1549 | | N=696 | | |
| Activities in past 7 days | | | | | |
| Worked for a wage | 17% | | 19% | | 0.4986 |
| Worked on own farm | 80% | | 64% | | 0.0000 |
| Worked in own business | 14% | | 12% | | 0.1352 |
| No work done in the past week | 12% | | 22% | | 0.0000 |
| Activities in past 1 year | | | | | |
| Worked for a wage | 22% | | 27% | | 0.0131 |
| Worked on own farm | 94% | | 83% | | 0.0000 |
| Worked in own business | 18% | | 19% | | 0.8005 |
| Total hours worked in past week | 34.3 | 0.68 | 23.6 | 0.92 | 0.0000 |
| Total income in past month | 2354 | 244 | 1244 | 130 | 0.0030 |
| | | | | | |
| *Households* | N=503 | | N=253 | | |
| Total income in past month | 7250 | 743 | 3422 | 360 | 0.0004 |
| Wage | 3360 | 333 | 2060 | 298 | 0.0117 |
| Farm | 1984 | 565 | 608 | 125 | 0.0868 |
| Business | 1906 | 229 | 754 | 136 | 0.0007 |
| Total per-capita income in past month | 1276 | 114 | 702 | 72 | 0.0007 |

## Table 16. Analysis of Monthly Income Data

Dependent variable: Total income in past month (for households or adults)

| | Household Income | Individual Income (over 18 years) | |
|---|---|---|---|
| | (1) | (1) | (2) |
| | | Total income | Total income |
| Constant | 4,813.92 | 2,354.30 | -4,931.26 |
| | (3.39)*** | (11.32)*** | (4.63)*** |
| Household size | 540.711 | | |
| | (2.76)*** | | |
| Single-headed household | -3,750.02 | | |
| | (3.23)*** | | |
| HIV-affected household | -2,401.40 | -1,255.86 | -849.429 |
| | (2.16)** | (2.81)*** | (1.93)* |
| HIV+ individual | | 379.217 | -119.137 |
| | | (0.59) | (0.18) |
| Age | | | 333.678 |
| | | | (6.76)*** |
| Age-squared | | | -3.126 |
| | | | (5.92)*** |
| Female | | | -1,826.35 |
| | | | (5.30)*** |
| Completed Primary School only | | | 1,405.63 |
| | | | (3.26)*** |
| Completed Secondary Sch or more | | | 2,748.42 |
| | | | (6.13)*** |
| Observations | 756 | 2245 | 2241 |
| R-squared | 0.05 | 0.00 | 0.06 |

Absolute value of t statistics in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

## Table 17. Asset Ownership

| | Random Households | | HIV Households | | |
|---|---|---|---|---|---|
| | Mean | Std. Error | Mean | Std. Error | P-value |
| Land Ownership | | | | | |
| Acres | 6.74 | 0.45 | 4.63 | 0.57 | 0.0060 |
| Value per acre | 112,252 | 3,559 | 152,380 | 16,112 | 0.0006 |
| Livestock (value) | | | | | |
| Cows | 47,879 | 3,504 | 29,143 | 3,675 | 0.0009 |
| Calves | 7,464 | 453 | 4,689 | 631 | 0.0004 |
| Goats | 905 | 196 | 461 | 156 | 0.1410 |
| Sheep | 3,574 | 403 | 1,580 | 339 | 0.0015 |
| Chickens | 1,076 | 60 | 713 | 67 | 0.0002 |
| Total value | 60,820 | 4,128 | 35,922 | 4,395 | 0.0002 |
| Farm Equipment | | | | | |
| Large Equipment | 13,834 | 3,307 | 7,978 | 3,327 | 0.2681 |
| Small Equipment | 1,376 | 56 | 782 | 38 | 0.0000 |
| Transport (cars, bikes, etc.) | | | | | |
| Total Value | 14,846 | 3,378 | 14,726 | 6,212 | 0.9853 |
| Consumer Durables | | | | | |
| Total Value | 7,227 | 651 | 6,329 | 834 | 0.4147 |
| Total Assets | 780,912 | 56,404 | 676,534 | 95,513 | 0.3195 |
| Total Assets (land value at median) | 767,966 | 51,239 | 515,166 | 63,706 | 0.0034 |
| Total Assets (w/o land) | 98,285 | 8,053 | 65,264 | 11,694 | 0.0200 |

Note: All values are in Kenya shillings.

## Table 18. Asset Sales

| | Random Household | | HIV Household | | |
|---|---|---|---|---|---|
| | Mean | Std. Error | Mean | Std. Error | P-value |
| Land Sales since Jan. 2000 | | | | | |
| Percent who sold | 6% | | 10% | | 0.0942 |
| Value of land sale | 12,014 | 4,087 | 7,935 | 1,976 | 0.4981 |
| Value of land sale (non-zero values) | 188,844 | 56,346 | 81,000 | 12,864 | 0.1089 |
| Livestock Sales since Jan. 2000 | | | | | |
| Percent who sold | 46% | | 31% | | 0.0001 |
| Value of sale | 8,256 | 744 | 4,972 | 816 | 0.0067 |
| Value of sale (non-zero values) | 18,055 | 1,371 | 16,027 | 2,148 | 0.4509 |
| Transport (cars, bikes, etc.) | | | | | |
| Percent who sold | 10% | | 3% | | 0.0004 |
| Value of sale | 4,096 | 1,520 | 1,633 | 1,332 | 0.2984 |
| Value of sale (non-zero values) | 39,625 | 13,866 | 57,143 | 44,677 | 0.6715 |

## Table 19. Reasons for Land Sales

| | Random Household (N=36) | HIV Household (N=28) |
|---|---|---|
| Health | 8.3% | 39.3% |
| School Fees | 33.3% | 10.7% |
| Business/Investment | 41.7% | 39.3% |
| Other | 16.7% | 10.7% |
| | 100% | 100% |

## Table 20. Reasons for Livestock Sales

| | Random Household (N=331) | HIV Household (N=97) |
|---|---|---|
| Health | 7.6% | 35.1% |
| School Fees | 36.0% | 17.5% |
| Business/Investment | 22.1% | 15.5% |
| Money for planting | 19.3% | 9.3% |
| Wedding/Ceremony | 3.6% | 1.0% |
| Other | 11.5% | 21.6% |
| | 100% | 100% |

## Table 21. Food and Fuel Expenditure

Note: food expenditure includes fuel

| | Random Household | | HIV Household | | |
|---|---|---|---|---|---|
| | Mean | Std. Error | Mean | Std. Error | P-value |
| Total monthly per capita food expenditure | 842 | 21 | 1080 | 56 | 0.0000 |
| Home-produced food (value) | 341 | 12 | 283 | 32 | 0.0632 |
| Purchased food | 440 | 15 | 718 | 52 | 0.0000 |

## Table 22. Correlates of Food Expenditure per capita

| Dependent Variable: | food & fuel expenditure per capita |
|---|---|
| hh head is single | 500.67 |
| | [169.30]*** |
| hh is HIV sample | 121.21 |
| | [59.94]** |
| # of hh members | -94.42 |
| | [10.79]*** |
| sex of hh head=female | -484.47 |
| | [178.31]*** |
| mth of interview=4 | -11.43 |
| | [59.71] |
| mth of interview=5 | -88.21 |
| | [59.81] |
| mth of interview-6 | 80.68 |
| | [85.96] |
| mth of interview=7 | 27.5 |
| | [56.84] |
| mth of interview=8 | -65.68 |
| | [65.32] |
| Constant | 1,897.65 |
| | [224.57]*** |
| Observations | 757 |
| R-squared | 0.25 |

Robust standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

## Table 23. Measure of Inequality – Gini Coefficients

| | Random Households | HIV Households |
|---|---|---|
| Total assets | 0.61 | 0.76 |
| Total assets, land valued at median | 0.59 | 0.72 |
| Food & fuel expenditure per capita | 0.27 | 0.34 |

## Table 24. Transfers of Money and Goods

| | Random Sample | | HIV Sample | | |
|---|---|---|---|---|---|
| | Mean | Std. Error | Mean | Std. Error | P-value |
| **Tranfers and Credit** | | | | | |
| *Adult Respondents* | N=820 | | N=295 | | |
| Money and Goods Received & Sent | | | | | |
| Percent who received since Jan. 2003 | 38% | | 51% | | 0.0001 |
| Percent who sent since Jan. 2003 | 49% | | 32% | | 0.0000 |
| Percent who received from organization | 3% | | 17% | | 0.0000 |
| Value of total received since Jan. 2003 | 1513 | 185 | 2591 | 419 | 0.0068 |
| Value of total sent since Jan. 2003 | 1244 | 156 | 1044 | 232 | 0.5016 |
| Amount rec'd from organizations, past month | 91 | 33 | 263 | 60 | 0.0096 |
| Value of total received (conditional on receiving) | 4004 | | 5126 | | 0.1872 |
| Value of total sent (conditional of sending) | 2531 | | 3320 | | 0.2656 |
| | | | | | |
| Participated in Informal Savings Organization | 23% | | 21% | | 0.3252 |
| Total value of all bank accts and savings | 4810 | 695 | 2960 | 568 | 0.1255 |

## Table 25. Knowledge and Behavior

| | Random Sample only | | | HIV Sample |
|---|---|---|---|---|
| | Men | Women | | All |
| Number of respondents: | 351 | 470 | P-value | 232 |
| **Knowledge about HIV/AIDS** | | | | |
| Person can look healthy and have HIV | 89% | 79% | 0.0006 | 87% |
| AIDS can be cured (excludes Don't Know) | 7% | 8% | 0.6603 | 37% |
| AIDS can be treated (excludes Don't Know) | 76% | 94% | 0.0000 | 95% |
| HIV can be transmitted from mother to child | 96% | 94% | 0.1855 | 98% |
| Personally know someone who died from AIDS | 87% | 69% | 0.0000 | 88% |
| Personally know someone receiving treatment | 59% | 33% | 0.0000 | 73% |
| Nearest place for treatment | | | | |
| Mosoriot | 89% | 90% | | 63% |
| Availability of treatment in Kosirai Division | | | | |
| Easily available | 70% | 32% | | 57% |
| Available, but not for everyone in need | 14% | 21% | | 32% |
| Not available at all | 7% | 13% | | 3% |
| Don't Know | 9% | 34% | | 8% |
| **HIV Testing** | | | | |
| Ever been tested for HIV | 12% | 22% | 0.0001 | |
| Result of HIV test among those who tested | | | | |
| HIV-Positive | 5% | 4% | | |
| HIV-Negative | 93% | 93% | | |
| Won't say | 2% | 2% | | |
| **Sexual behavior** (standard errors in parentheses) | | | | |
| Age at first intercourse | 16.87 | 17.3 | 0.0384 | 16.83 |
| | (0.17) | (0.13) | | |
| Number of sexual partners in life | 8.6 | 1.7 | 0.0000 | 5.177 |
| | (0.56) | (0.06) | | |
| Sexually active in past 6 months | 75% | 64% | 0.0008 | 30% |
| Thinks main partner has other partners | 2% | 15% | 0.0000 | 38% |
| Thinks main partner has other partners (Don't Know as Yes) | 23% | 46% | 0.0000 | 68% |
| Used condoms at last intercourse | 7% | 9% | 0.0000 | 29% |
| **Measures of Stigma** | | | | |
| *Associate infection with the AIDS virus as a sign of immoral behavior* | | | | |
| Strongly agree that this is the community view | 60% | 53% | 0.0556 | 45% |
| Strongly agree if respondent himself/herself were HIV+ | 45% | 32% | 0.0001 | 14% |
| *Female teacher who has AIDS but isn't sick should not be allowed to continue teaching* | | | | |
| Strongly or somewhat agree that this is the community view | 16% | 24% | 0.0028 | 9% |
| Strongly or somewhat agree if respondent were HIV+ | 17% | 23% | 0.0346 | 10% |

## Table 26. Determinants of HIV Testing Decisions

Dependent variable: Individual has been for an HIV test (random sample only)

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|---|
| Age | -0.0251 | -0.0259 | -0.0253 | -0.0249 | -0.0257 | -0.0263 | -0.0237 |
| | (5.60)*** | (5.81)*** | (5.65)*** | (5.56)*** | (5.75)*** | (5.84)*** | (4.86)*** |
| Age-squared | 0.0002 | 0.0002 | 0.0002 | 0.0002 | 0.0002 | 0.0002 | 0.0002 |
| | (4.45)*** | (4.64)*** | (4.48)*** | (4.42)*** | (4.59)*** | (4.70)*** | (4.01)*** |
| Female | 0.0863 | 0.1022 | 0.1015 | 0.1032 | 0.1142 | 0.1056 | 0.1457 |
| | (3.24)*** | (3.79)*** | (3.71)*** | (3.71)*** | (4.07)*** | (3.83)*** | (4.84)*** |
| Years of School Completed | 0.018 | 0.0169 | 0.0165 | 0.0162 | 0.0156 | 0.0167 | 0.0151 |
| | (4.36)*** | (4.10)*** | (3.96)*** | (3.86)*** | (3.70)*** | (4.00)*** | (3.37)*** |
| Personally know someone who died from AIDS | | 0.10 | | | 0.0755 | 0.0748 | 0.0634 |
| | | (3.21)*** | | | (2.31)** | (2.30)** | (1.81)* |
| Personally know someone receiving treatment | | | 0.06 | | 0.0321 | 0.0435 | 0.041 |
| | | | (2.42)** | | (1.11) | (1.55) | (1.38) |
| Says treatment easily available in Kosirai Division | | | | 0.0599 | 0.0276 | | |
| | | | | (2.08)** | (0.89) | | |
| Feels there is HIV-related stigma in community | | | | | | -0.0525 | -0.0517 |
| | | | | | | (2.08)** | (1.93)* |
| Partner has tested for HIV | | | | | | | 0.2276 |
| | | | | | | | (5.98)*** |
| Constant | 0.6643 | 0.6082 | 0.643 | 0.6209 | 0.5896 | 0.6389 | 0.5186 |
| | (5.81)*** | (5.29)*** | (5.62)*** | (5.36)*** | (5.08)*** | (5.49)*** | (4.17)*** |
| Observations | 819 | 819 | 818 | 819 | 818 | 807 | 719 |
| R-squared | 0.15 | 0.16 | 0.16 | 0.16 | 0.16 | 0.17 | 0.2 |

Absolute value of t statistics in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

**Figure 1. Assets per capita**

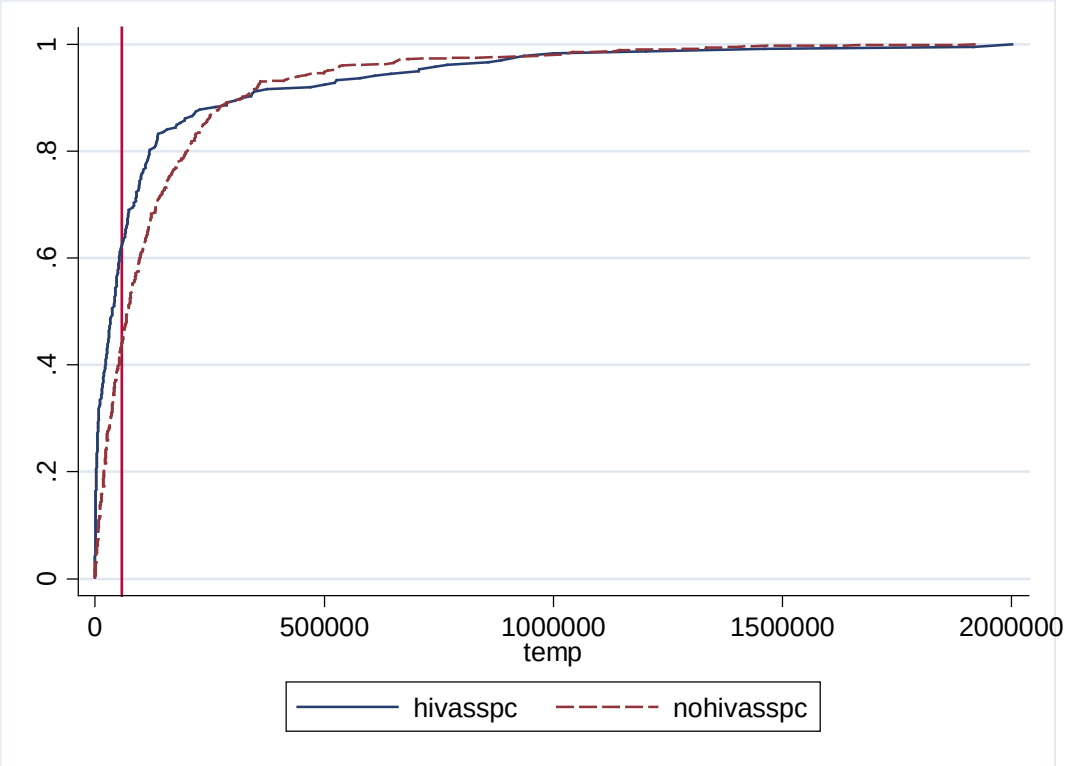


**Figure 2. Food and fuel expenditure per capita**