Reproductive Health, HIV/AIDS and Poverty in Africa

A presentation for the AERC/Hewlett Foundation Workshop, “Poverty and Economic Growth: The Impact of Population Dynamics and Reproductive Health Outcomes in Africa”

November 5-6, 2006
Brussels, Belgium

by
Peter Glick
Cornell University, USA
pjg4@cornell.edu

This presentation is based on a forthcoming background paper prepared for the African Economic Research Consortium
Reproductive Health, HIV/AIDS and Poverty in Africa

Few would disagree with the statement that of all the issues touching on demography and economics in Africa, the AIDS epidemic is the most pressing for research and policy. In this presentation I will make an attempt to examine the complex linkages of poverty, reproductive health, and HIV/AIDS in Africa. I will address the following questions: (1) what have we learned to date about these links? (2) what policy issues arise and correspondingly, what are the gaps in knowledge to be addressed by research? (3) what are the appropriate methodological approaches to these questions, and in particular, what methods and questions would be feasible for AERC researchers to address in the context of the Reproductive Health, Growth, and Poverty Reduction Project?

First, a few definitions are in order. The WHO definition of reproductive health is “a state of physical, mental, and social well-being in all matters relating to the reproductive system at all stages of life”. Corresponding to this broad definition of reproductive health, I will take a broad view as to what constitutes reproductive health services (RHS). This will obviously include traditional family planning and maternal and antenatal care. But it also will include programs and services such as STI control; HIV prevention, testing, and treatment; condom distribution; and efforts to promote and offer circumcision to men. For the present discussion we would hardly want to ignore these latter programs, which are all related in varying degrees to HIV prevention. Further, there is an ongoing debate over the advisability in the African context of integrating STI/HIV prevention and care services into existing reproductive health services; for this reason, too, it is pertinent to consider the full range of programs related to reproductive health. In a similar vein, the relevant behaviors for this discussion must include not just behavior explicitly related to demographic decisions (fertility and birth contraception, age at marriage), but also, clearly, sexual risk behaviors.
With these basics out of the way, we turn to Fig. 1, which provides a big picture view of the interactions among poverty, reproductive health (and reproductive health services and related behaviors and knowledge), and HIV/AIDS. The links are many and complex, with numerous possible feedback effects. To take one important example of the latter, patterns of sexual behavior such as multiple concurrent partnerships obviously affect HIV incidence and prevalence, but these behaviors may also change in response to recognition of high HIV prevalence hence risk of infection. Note as well that most of these processes and outcomes have both micro (individual) level and macro (population) level dimensions: individual HIV status and HIV prevalence rates, individual incomes or poverty and GDP growth or poverty rates, etc.

I now turn to a consideration of the key linkages in the figure: what we know about them, what we have yet to learn, and what this project can contribute to this effort.

**Linkages of Reproductive Health and HIV/AIDS**

I begin with the right hand side of Figure 1—the connections of reproductive health, reproductive health services (including HIV interventions), and behaviors to each other and to HIV/AIDS. Reflecting the importance of identifying effective prevention strategies, much of the discussion to follow will focus on what is known and not known about the effects of different HIV interventions or more broadly ‘reproductive health services’ on risk behaviors and HIV incidence.

That is not to say that direct links from reproductive health *per se* (represented by the topmost circle in Fig 1) to HIV are not important. At least two such links have probably played a major role in the spread of the disease in Africa. First, a significant cofactor for HIV infection is the presence of other sexually transmitted infections, which increases susceptibility to HIV via genital ulceration and possibly other mechanisms as well. A second cofactor is circumcision or more precisely, not having been circumcised, which increases male HIV susceptibility both directly and by increasing the risk of cofactor STIs. The high rates of male circumcision in West
Africa are thought to be a major reason why HIV prevalence remains much lower there than elsewhere in sub-Saharan Africa.

Further, while the links from sexual behavior patterns (multiple concurrent partnerships, unprotected sex with casual partners, early age at first intercourse) to HIV/AIDS are clear, fertility patterns (represented by the bottom circle) can also affect HIV incidence and prevalence. Married women who desire to limit family size and therefore reduce the frequency of unprotected intercourse via condoms or reduced overall frequency of sex lower their risk of contracting HIV from infected partners. In high fertility societies where young women get married (usually to older men) and begin childbearing early, the risk of infection is *cet. par.* higher. At the same time, however, early marriage will mean less risky premarital sex with non-steady partners, so the net effect on HIV risk is uncertain.

Turning now to interventions, the discussion of cofactors for HIV infection points to two essentially medical interventions which (via the direct link from ‘services’ to HIV shown in Figure 1) may have significant effects on the spread of the disease: STI control, and male circumcision. A recently concluded South African trial using HIV infection as the endpoint confirms the benefits of male circumcision in terms of transmission risk reduction. With respect to the effects of comprehensive STI treatment programs, findings from three randomized trials, two in rural Uganda and one in rural Tanzania, are mixed in terms of HIV incidence outcomes (though STIs themselves fell in each case); these programs seem to be effective when the epidemic is less mature, with transmission occurring primarily in specific high risk groups.

Other medical interventions include the use of single dose nevirapine to prevent mother to child HIV transmission, which has been shown to substantially reduce the child’s risk of contracting HIV, and antiretroviral therapy for HIV positive adults. ARVs are being provided at a rapidly growing number of sites in Africa, and several studies confirm their life extending benefits in the context of very poor countries.
Purely medical interventions are not the usual focus of social science research. However, in the case of AIDS, the public health effectiveness of many ostensibly purely medical services or procedures may be significantly compromised (or possibly, enhanced) by behavioral responses, which are the territory of social scientists. For example, there is concern that male circumcision will lead to ‘risk compensation’. It is hard to convey the concept of partial protection, which is what circumcision provides, so men may feel free to engage in more risky behavior than before. This can result in a net increase in their infection risk.

With regard to ARV therapy, patients receiving the drugs become much less infectious than before (the presence of the virus in their bloodstream drops precipitously), but if they had been very ill before treatment, they are also likely to become more sexually active. Perhaps more importantly, individuals who are not ill or knowingly HIV positive may experience ‘treatment optimism’: knowing that they can get treatment if they contract HIV encourages them to engage in more risky behaviors. The latter is an example of a negative externality, but there are also potential positive externalities, such as a reduction in AIDS stigma and a greater willingness to get tested if treatment is available. These issues have to date received little or no rigorous empirical study in Africa but understanding them is critical for the success of these policies in terms of prevention.

Explicitly behavioral prevention interventions include voluntary testing and counseling (VCT); condom provision and social marketing of condoms, public information campaigns emphasizing prevention behaviors, such as the ‘ABC’ approach (Abstinence, Be faithful, use Condoms); and a host of education programs aimed at youth to provide HIV knowledge and encourage safe behaviors, most commonly, later sexual debut. Note also that standard reproductive services will also potentially affect HIV via changes in behavior. For example, the provision of condoms for birth control will also reduce the risk of HIV. Clinics also generally provide HIV risk and prevention information to their clients, which can lead to behavior change.
Methodological issues in the evaluation of HIV interventions

There are many studies for Africa evaluating the effects of various interventions on behavior and (more rarely) HIV or other biological endpoints such as STI incidence or pregnancy. However, many questions remain as to which programs are truly effective. Conflicting or inconclusive results in the evaluation literature may reflect differences in study contexts as well as variation in the quality of programs or their implementation. But one factor that is undoubtedly crucial is variation in study design and evaluation methodology. There are many methodological challenges to evaluating behavioral HIV interventions and most existing evaluations do not meet these challenges completely.

The most serious challenge arises from the fact that people usually choose whether or not to participate in an intervention or to use a service, say VCT. We might expect those who do to be relatively responsive to the information or behavior change messages received. On the other hand if participants in a prevention program do have a greater propensity to adjust their behavior to information about HIV risk, they may already have changed their behavior prior to participating. In the first case, comparison of participants and non-participants will overstate the benefits of the program, while in the second case it will understate them.

Given these and other considerations, the optimal approach to evaluation is randomized controlled trials, or policy experiments, in which treatment is assigned randomly to some individuals (or areas) and not others. The use of this approach (which, it should be noted, has some pitfalls of its own) has been slow to gain ground in African HIV prevention research, and the number of examples remains small. However, experiments are becoming more common.

Individual level randomization, the standard design in medical trials, is relatively uncommon in HIV prevention research in Africa. In part this reflects ethical constraints, in that one generally cannot withhold treatment or care from a control group. One prominent application of individual randomized controlled trials (RCTs) is a much-publicized study of VCT conducted
in urban Kenya and Tanzania (as well as Trinidad). There were reductions in risky sex among serodiscordant couples (i.e., where one of the partners tests positive) and HIV positive testers in general while behavior change among negative testers was much smaller, results that jibe with several non-experimental evaluations of VCT. Another example is the RCT of male circumcision (the recent ANRS trial in South Africa noted earlier), which found a two-thirds reduction in HIV infection risk in the group of men offered the procedure.

Community (or more generally, group) level RCTs have also been implemented in Africa, and have several advantages. Outcomes measured at the level of the community—whether these are biological endpoints (which is preferable) or self-reported behaviors—capture the effects of local interactions and externalities that arise through social networks, learning, etc. The analysis at this level is intention to treat, since mean outcomes include both program participants and non-participants. Thus population level effects are measured, incorporating the crucial factor of uptake of the intervention. Prominent examples of this approach include the three community-randomized trials of STI control, in Masaka and Rakai regions, Uganda, and in Mwanza, Tanzania. As noted above, the results for HIV incidence were mixed, with reductions observed only in the lower prevalence (Tanzanian) setting. Other examples of group randomization are several evaluations of school-based prevention education programs, in (again) Rakai and Masaka, in rural Western Kenya, and in rural East Cape, South Africa. Here the randomization is fairly straightforward: the intervention is introduced in some schools and not others.

**Gaps in knowledge and feasible research strategies**

The search for effective HIV prevention strategies undoubtedly forms the most crucial research agenda among the areas discussed in this talk. There remains a great deal of uncertainty and debate about the best approaches to turning back the epidemic. Important areas for research and policy include:
Programs aimed at youth: the RCTs of school-based education interventions have yielded mixed findings, mirroring the findings of numerous non-experimental evaluations of such programs. It seems fairly easy to improve young people’s HIV awareness and attitudes but much harder to produce sustained changes in behavior. Perhaps the most interesting and promising recent finding, from one of the experiments in Kenya listed earlier, is that a program informing girls about the much higher HIV risk from older men than teenage boys led to a 65% decrease in the incidence of pregnancies by adult partners among teenage girls in the treatment group relative to the comparison. This program should be replicated and evaluated elsewhere, and a range of other interventions aimed at youth similarly need to be evaluated rigorously.

Effectiveness of behavior change promotion: condoms, partner limitation, and abstinence

The effectiveness of behavior change messages, and in particular, which messages (the A,B, or C) are most effective, has been the subject of heated and often politically charged debate. A major locus of debate has been the interpretation of Uganda’s celebrated reduction in HIV prevalence during the 1990s. To take as an example the case of condom promotion policies, doubts have been expressed by Edward Green and others about the prevention benefits in generalized epidemics (as opposed to, say, condom programs aimed at sex workers before AIDS has spread throughout the larger population). It is likely that increasing condom use played little role in Uganda’s historic early success, given that access to condoms remained limited during the period. Further, many countries have had policies promoting condoms for years with little to show for it; Botswana is a case in point. Nevertheless, access to and use of condoms is essential when (as in Uganda today) half or more of new infections occur in serodiscordant couples, for many of whom abstinence is presumably unattractive. Further, few studies have examined the demand for condoms using micro-level data and with appropriate controls for condom availability or cost, which remain highly variable across countries and within them.
Prevention impacts of ARV therapy scaling up: This scaling up is happening and will continue, and it is important, as indicated, to understand the population-level behavioral impacts of making ARV therapy widely available. This is a question that community-level randomized designs are well placed to answer; the evaluation can exploit the fact that rollout of ARV provision will necessarily occur in stages, so initially unserved areas can serve as controls.

Mandatory vs. voluntary HIV testing: Several studies of VCT indicate disappointingly small numbers of individuals coming forward to test even when the service is heavily promoted or even offered in the home. A growing number of public health researchers and officials are calling for replacing the voluntary (VCT) approach to HIV testing with mandatory or routine testing for anyone entering the health care system (the ‘opt out’ as opposed to ‘opt in’ approach to testing). Botswana appears to be the first African country to announce this as a national policy. The population level consequences for behavior change and for testing itself are unknown (with regard to the latter, certain groups may respond to the policy of automatic testing by deciding to stay away from the health system entirely).

Integration of HIV prevention and care into existing reproductive health service infrastructure. By and large, the current approach throughout Africa implements HIV prevention, testing, and care as separate services from traditional family planning and reproductive health care, with the exception of interventions to reduce mother to child transmission. Many, including UNFPA and UNAIDS, argue that integrating the two will increase efficiency given that reproductive health infrastructures already exit, and given the potential for economies of scale in service delivery. The arguments against integration include, most importantly, that HIV and reproductive health programs often target distinctly different clienteles. To date, the benefits or costs of integration have not been examined in any rigorous way.
AERC researchers can potentially make substantive contributions on such questions through research on the behavioral and HIV outcomes of different interventions and policies. It is unlikely that any individual researcher or group of researchers would be able to initiate a policy experiment; conducting experiments is costly, and in many cases where HIV is concerned they will also involve the provision of medical services that obviously are beyond the resources and expertise of social scientists. However, many such interventions, whether experiments or not, are underway or planned in African countries, by ministries of health or education, by NGOs, and by donors. Researchers potentially could link up with these efforts to contribute to the evaluation of outcomes, and even better, to help in the design of these evaluations. I would expect that the inclusion of economists or demographers in this process would significantly expand the range of behavioral outcomes considered. For example, evaluation of ARV provision could include baseline and follow-up random sampling of individuals in catchment areas (as well as in control or comparison areas) to collect information on risk behaviors and expectations about risk and treatment. Economists and demographers are also particularly well placed to undertake the population-based sampling and statistical analysis required to understand the demand for various HIV or reproductive health care services, something that others, including behavioral scientists in other disciplines, tend to ignore.

It is important to stress that evaluation of policies does not have to rely solely on strict experimental designs, despite their benefits. It is often possible to locate suitable comparison groups (as opposed to controls in randomized experiments) for baseline and follow-up. This opens up many more possibilities for policy evaluation. As noted for ARV provision, most programs are not rolled out all at once. The selection of communities that first receive the programs is typically not random, but it may be possible to select appropriate comparison communities among those not first in line to get the programs.

Instrumental variable regression is another alternative to experiments and is one that is very familiar to economists. Here, exogenous factors, including proximity to a service or
program, can be used to predict individual participation in the program and thus the effects of the program. Also familiar to economists (through perhaps somewhat less so) are propensity score matching techniques, whereby individuals with observed characteristics similar to those of program participants are used as controls. This approach would appear to have limits when it comes to looking at interventions to change sexual behaviors (say, VCT), since participants are likely to differ from non-participants with respect not just to observed characteristics but also to unobserved propensities, attitudes, or risk behaviors that affect HIV-related outcomes. The propensity score matching approach may be valid, however, for considering the effects of HIV/AIDS on outcomes of interest that are relatively far removed from sexual behaviors and attitudes. An example is Cynthia Donovan and Linda Bailey’s analysis of the effect of AIDS-related adult deaths on Rwandan agricultural households’ cropping strategies and other outcomes.

Reverse linkages: HIV/AIDS to reproductive/sexual behaviors

As indicated earlier, rising HIV prevalence is likely to feed back into behavior. When people see relatives and friends dying of a disease, it is expected that they will adjust their behavior provided they are aware of how the disease is linked to that behavior, though for most of Africa this response has been tragically slow. For Uganda, it has been speculated that much of the apparent behavior change occurring after the late 1980s was the result of ‘endogenous’ responses to the evidence provided by growing AIDS-related illness and mortality, rather than outcomes of the government’s aggressive education campaigns. The same has been said for more recent apparent reductions in risk behaviors recorded elsewhere, in particular, in the high prevalence countries of Zimbabwe and Zambia. Contrary to the thrust of these county level analyses, however, is the recent cross country study of Emily Oster, whose regressions using DHS survey data suggest that a 1% increase in HIV prevalence leads to only a 0.2% reduction in the share of single women reporting having premarital sex.
To the extent that changes in behavior have occurred, it is very difficult to distinguish how much this is due to endogenous responses to the epidemic, on the one hand, and to the prevention policies governments have put into place, on the other. The latter vary widely across countries and if this is related to prevalence the exclusion of policy measures from regressions will lead to omitted variable biases in the estimates of prevalence on behavior. In principle this can be overcome in cross-country regressions if there are reliable measures of policy intensiveness and type. The other, perhaps even more obvious, problem is that as the term ‘feedback’ and as Figure 1 imply, there is simultaneity in the behavior-prevalence relation. Estimation of the effects of HIV prevalence will be contaminated by the fact that incidence and prevalence are themselves functions of the level of risk behavior. Solutions are feasible, however: one can use lagged HIV prevalence rates, or better, instrument local HIV rates; Oster does this using alternately the distance from the epicenter of the epidemic in central Africa and the rates of male circumcision to predict local (i.e., country) HIV prevalence.

A different but related feedback effect is on fertility, via either biologically driven changes in fecundity or changes in fertility preferences and behavior. Among women who are infected with HIV, fecundity is reduced for several reasons, including higher rates of fetal loss and stillbirth and higher rates of coinfection with other sexually transmitted infections, causing secondary infertility. With respect to behavior, the desire for children may fall because of women’s fears of passing on the virus to their children, of not being alive to care for their children, or of their children contracting the disease themselves and dying. In a number of qualitative studies in Africa, women do express intentions of reducing the number of children they have should they be diagnosed as having the disease. Reductions in fertility could also occur as a side effect of prevention behavior, via reductions in unprotected sexual intercourse or increases in the age at sexual debut.

On the other hand, several studies looking at behaviors of women testing HIV positive show little change in fertility or contraceptive behavior (probability of having a birth, using
condoms, length of post-partum abstinence). It is possible that HIV positive women want to appear healthy or avoid stigma by continuing to deliver children, or facing early mortality would try to speed up the pace of childbearing to meet reproductive goals. For the population as whole (not just the infected) Sebnem Kalemli-Ozcan and others argue that in response to uncertainty about child survival, parents will choose to have more children (the ‘precautionary demand’ motive), ultimately slowing or reversing the demographic transition.

Very few studies have actually tried to link variation in childbearing to variation in HIV risk or prevalence. Two cross-country econometric exercises that do attempt this, by Allwyn Young and Kalemli-Ozcan, reach precisely opposite conclusions, the former concluding that fertility is reduced in response to AIDS, the latter that it increases—evidence at least that the issue is far from being sorted out. Therefore the existence and extent (and even direction) of feedback effects on both reproductive choices and risk behaviors remains an important area of future research, with broad implications for the future of the epidemic and, as noted below, for economic growth and poverty.

**Linkages with poverty**

*Pathways from Poverty to HIV/AIDS*

Next I turn to the left hand or poverty side of Figure 1: the effect of poverty on reproductive health, behaviors, and the use of services, and hence ultimately on HIV itself. I follow this with a discussion of the reverse pathway, that is, the implications of the AIDS epidemic for poverty.

First, what is the overall association of HIV/AIDS and poverty? At a global level, the association is positive. The countries most afflicted around the world—most of them in Africa—are among the poorest. This is assumed to reflect the association of a country’s level of income with the quality of its health infrastructure and the level of HIV awareness. At the micro level poverty potentially increases vulnerability to HIV via compromised reproductive health or
reduced HIV/AIDS awareness (links highlighted in the figure). The poor are less likely than the wealthy to know about prevention behaviors and less likely to have had an HIV test, as illustrated by Table 1 using DHS data on men from a number of African countries. The effects of household wealth on prevention knowledge and testing, estimated from probit models, tend to be positive, if not always statistically significant. The poor also have less access to, or ability to pay for, condoms, and are more likely to have untreated cofactor STIs that increase susceptibility to HIV infection. Another potential pathway from poverty to HIV is via overall poorer nutrition and health. It has been hypothesized that these factors compromise immune defenses or increase receptivity (via weakness in epithelial cells) to HIV infection.

In spite of these factors, however, both within and across countries in Africa, HIV infection tends to be associated with greater wealth, not less. HIV prevalence is highest in the relatively wealthy countries of Southern Africa (Botswana, South Africa). Since there are many potential confounding factors at the national level, micro evidence is more compelling, and it points in the same direction. A number of recent DHS surveys with sero testing, as well as some earlier micro level studies, show generally positive associations of HIV infection and wealth as measured by physical assets.

Why is a positive association of wealth and HIV observed? For one thing, the better off tend to have more concurrent sexual partners. Since such relationships (whether casual or not) have a financial cost, this is not surprising: in economic terms, having multiple partners is a ‘normal’ good. Table 2 shows estimates of the effects of wealth on the probability of having more than one partner for men in a number of African counties. The estimates are not always significant, but where they are, they are almost always positively signed. The same goes for the effects of level of education. The wealthy also tend to be more geographically mobile than the poor—for example, the better off within rural population are more likely to travel regularly to urban areas—and such mobility is strongly associated with the holding of multiple concurrent sexual partnerships.
Less causally, HIV prevalence is higher in urban areas, which are also wealthier. Also, the wealthy with HIV tend to survive longer than the poor. Their better nutrition keeps their immune systems stronger, and their superior access to health care also helps them deal with opportunistic infections. Hence they are more likely than poor individuals who are infected to show up in surveys and be recorded as HIV positive. This implies that the survey data may be overstating the actual association of wealth and HIV infection. On the other hand, to the extent that being HIV positive leads to reductions in work and income, the association will be underestimated.

The foregoing suggests several key research questions on the linkages from poverty to HIV/AIDS. First and most broadly, is there at some level a conflict between development and HIV prevention, given that the former is usually associated with increased geographic mobility, income, and urbanization—all of which increase HIV susceptibility? At the very least, the evidence should cause us to doubt the very common view that “the best way to reduce AIDS to is to reduce poverty”. Related to this, should prevention efforts be targeted more carefully at somewhat better off groups in the population? To what extent do the associations of wealth and seropositivity reflect direct ‘wealth effects’ on the demand for partners as opposed to structural cofounders such as urbanization and access to transportation networks?

In terms of dynamics, how does the wealth-HIV (or poverty-HIV) relation evolve over time as epidemics mature? It is noteworthy that even in Uganda, with probably the oldest epidemic and highest level of HIV awareness, one still observes a positive association of wealth and HIV positive status. Note that this does not mean that the situation has not changed. There have been some indications, including for Uganda, that the association of wealth and HIV weakens over time. This may be because of the natural spread of the epidemic beyond the initial affected population, or because the wealthier are in a better position to access or understand prevention messages, or to act upon them (e.g., by being able to purchase condoms). Part of the latter would be by virtue of the superior education of the well-off. In line with this hypothesis, a
micro level analysis in Masaka, Uganda by Damien De Walque indicates that while there was no significant association of education and HIV seropositivity in 1990, by 2000 the association was negative and significant. For Zambia, a similar pattern is reported by Michelo, Sandoy and Fylkesnes.

To address this dynamic issue requires panel data (repeated observations on a group of individuals) or repeated cross section data such as those used by de Walque from Masaka. The data must link individual characteristics to information on HIV status and be collected at several points in time. Panels in particular could also address the simultaneity problems inherent in the wealth-HIV association mentioned earlier.

Even without panel data, thoughtful statistical analysis using cross section surveys with linked HIV data will be able to clarify the links of poverty and HIV. This will be the case especially if these survey data can be linked to other data on local environmental factors such as access to transportation routes, population density, migration, and industry. Further, in the coming years AERC researchers should have access to second round DHS cross sections with HIV data for several countries. This will permit analysis of changes over time, if not of the individual level dynamics captured in panels.

Pathways from HIV/AIDS to poverty: macro level perspectives

The effects of the AIDS epidemic on African economic growth, and by extension, poverty, are not clear, especially with respect to the long term. There are many mechanisms through which the epidemic can harm economic growth. Striking adults in the prime of life, AIDS depletes the ranks of workers, and especially (given the evidence on the association of income and HIV), educated or skilled workers. There are many accounts of this process occurring in specific industries, as well as in the education sectors of hard hit African countries. The latter implies a reduction in the supply or quality of schooling. On the demand side, private investments in children’s schooling by households hit with AIDS illness or death will fall
(discussed below). These demand and supply side effects in education imply negative intergenerational trends in human capital, reducing growth. Faced with escalating turnover and training as well as health care costs, both local and foreign firms may reduce investment or pull up stakes altogether. Public sector budgets will be strained by the need to increase spending on care for those with AIDS-related illnesses, reducing allocations for development-enhancing health and other expenditures.

Despite these considerations, cross-country regression analysis on data through the mid or late 1990s (e.g., Bloom and Mahal; Dixon, McDonald, and Roberts) found either no statistical effects of HIV prevalence on economic growth (per capita) or ambiguous effects. However, future impacts may be very different. Here, predictions based on simulation modeling diverge considerably. Initial simulation modeling studies yielded relatively optimistic predictions, on the order of perhaps a 1% annual reduction in growth (summarized in Bell et. al. 2003)—far from trivial in the context of Africa’s already typically very low growth rates, but not devastating. Further, such ‘first generation’ models tend to show little decrease, or even an increase, in per capita GDP growth, because HIV-related declines in GDP are offset by increased mortality and population decline. Moreover, in a traditional Solow-type growth framework, reductions in growth are dampened by the fall in the supply of labor relative to capital, since this increases the productivity of labor. A recent similarly ‘optimistic’ set of projections has been put forth by Allywn Young, who as noted earlier emphasizes a different mechanism, that of reduced fertility in response to the epidemic. The reduction in the dependency ratio increases per capita consumption as well as savings, potentially increasing economic growth as well as providing the resources to care for those with AIDS.

Others are far less sanguine, however. The important recent work by Bell, Devarajan, and Gersbach, for example, yields a much grimmer picture. Bell at al. consider a different behavioral response: a reduction in investment in the human capital (schooling) of children as a result of AIDS-related illness and mortality, which occurs both because households are poorer
and because the returns to such investments have fallen. The cumulative result of reductions in human capital investments is a large decline in GDP. This and other pessimistic projections, including many less formal assessments, often emphasize less tangible implications of the epidemic. These include effects on children’s socialization and the fraying of social safety nets; the disruption of firm and government operations through high turnover and the thinning of workforces; consequent reductions in profitability and in the incentives of firms and households to invest and to save; and more generally, the deterioration in the functioning of a range of public and private institutions. Especially in Southern Africa, there is evidence that some of these effects are already occurring. At least, personnel losses of magnitudes that are potentially devastating have taken place, as documented by Husain and Badcock-Waters.

Clearly, there is a great deal of uncertainty about the long run economic and poverty implications of the AIDS epidemic in Africa. It is an area requiring further rigorous research, and is a fruitful focus for the current project. One fact brought out clearly by the debates is that projections of macro implications hinge crucially on assumptions made about micro-level behavioral responses of individuals as well as firms. Therefore learning more about these behaviors is essential.

**Poverty impacts of HIV/AIDS: micro/household level perspectives**

Many studies, both qualitative and quantitative, have investigated the effects of AIDS on poverty and other outcomes at the household level. The main areas of focus for this research have been the impacts of an AIDS illness or death on household income and consumption, on household structure (or dissolution), and on children, in particular, their schooling. The stress on household consumption levels comes through reductions in labor supply, incomes, or farm production as well as through the burdens of health care expenditures for the ill and funeral costs for the deceased. These burdens are typically very significant. For example, a South African
study found that households with an adult who is ill with AIDS spent on average about a third of monthly family income on care and treatment.

Coping strategies via changes in family structure vary: in Rwanda lost workers tend to be replaced by adding family members via marriage or through the addition of young relatives, but this was not found in research on Kenya and Mozambique. In many cases, the presence of AIDS means that the household will dissolve, as parents die and children are sent to relatives for care and upbringing. A study of rural South Africa suggested that households where an adult had died from AIDS were four times more likely to dissolve than those where no deaths had occurred.

Children who have lost one or more parents to AIDS (estimated to be about 9% of all children under 15 in sub-Saharan Africa) are typically taken in by members of the extended family. It is estimated that one out of every six households with children in the region is caring for at least one orphan. By and large it appears that this traditional safety net mechanism has performed very well in the AIDS epidemic, holding at bay the outright destitution of countless children. This does not mean there are not serious negative consequences of the epidemic for orphaned children or those in AIDS afflicted households. An analysis of DHS surveys from 40 sub-Saharan African countries found that in terms of access to schooling and other indicators of vulnerability, orphans fare worse than other children. Since cross-section analysis of this question is potentially affected by presence of unmeasured factors affecting both orphan status and human capital investments, the recent study by Evans and Miguel of panel data from Kenya is of particular interest. They find larger negative schooling effects of orphanhood than reported in cross section studies of orphans, as well as finding a negative enrollment effect of the presence in the household of an adult with AIDS-related illness.

More research is needed to better understand the intergenerational impacts of HIV/AIDS occurring through changes in schooling and health investments as well as in the socialization of children. It is important to investigate whether and how human capital investments are affected even in households that have not (or not yet) suffered an AIDS related illness or death, since these
investments should be conditioned by changing expectations about the mortality or life
expectancy of both parents and children. Further, while traditional safety nets have performed
well so far, will they prove robust as adult mortality rises, as it will continue to do in many or
most countries? What are the fertility responses to the epidemic and how can they be interpreted
in terms of behavioral models of fertility? What are the effects on household as well as firm
savings and investments? Answers to these questions are important in their own right, and as
emphasized above, are also necessary for understanding the larger implications for economic
growth and poverty.

In terms of analytic background, AERC researchers should be well poised to address
these micro-level questions. Standard cross section surveys like the DHS can be used, but for
many questions there will be limits to what can be inferred from such data. Incorporating
retrospective questions in standard surveys may yield some insights. But to appropriately capture
dynamic processes such as AIDS-induced changes in family income, structure and in investments
in children, panel data are called for. Ultimately there is a need to add to the relatively few panel
data sets currently available in African settings, such as those from Rakai and Masaka.
Figure 1

Interrelationships of Poverty, Reproductive Health, and HIV/AIDS
Table 1 – Men: Effects of Wealth on HIV Prevention Knowledge and Testing

<table>
<thead>
<tr>
<th>Sample/Outcome:</th>
<th>Knows that _ can prevent infection:</th>
<th>Had HIV test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Condom</td>
<td>Abstinence</td>
</tr>
<tr>
<td>Benin Rural</td>
<td>-0.008</td>
<td>-0.048 *</td>
</tr>
<tr>
<td>Benin Urban</td>
<td>0.046 *</td>
<td>0.008</td>
</tr>
<tr>
<td>Burkina Faso Rural</td>
<td>0.077</td>
<td>0.063</td>
</tr>
<tr>
<td>Burkina Faso Urban</td>
<td>-0.036</td>
<td>-0.003</td>
</tr>
<tr>
<td>Ghana Rural</td>
<td>0.095 **</td>
<td>0.059 **</td>
</tr>
<tr>
<td>Ghana Urban</td>
<td>0.009</td>
<td>-0.020</td>
</tr>
<tr>
<td>Kenya Rural</td>
<td>0.085 **</td>
<td>0.053</td>
</tr>
<tr>
<td>Kenya Urban</td>
<td>0.020</td>
<td>0.075 **</td>
</tr>
<tr>
<td>Mozambique Rural</td>
<td>-0.078</td>
<td>0.174 *</td>
</tr>
<tr>
<td>Mozambique Urban</td>
<td>0.002</td>
<td>0.000</td>
</tr>
<tr>
<td>Nigeria Rural</td>
<td>-0.027</td>
<td>0.018</td>
</tr>
<tr>
<td>Nigeria Urban</td>
<td>-0.048</td>
<td>0.054</td>
</tr>
<tr>
<td>Tanzania Rural</td>
<td>0.094 **</td>
<td>0.102 **</td>
</tr>
<tr>
<td>Tanzania Urban</td>
<td>-0.007</td>
<td>-0.003</td>
</tr>
<tr>
<td>Uganda Rural</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Uganda Urban</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Zambia Rural</td>
<td>0.137 **</td>
<td>0.094 *</td>
</tr>
<tr>
<td>Zambia Urban</td>
<td>0.004</td>
<td>-0.037</td>
</tr>
</tbody>
</table>

Note: marginal effects based on probit estimates using most recent DHS.
Source: Glick and Sahn (2006). **significant at 5%; *sig. at 10%
Table 2 - Men: Effects of wealth and education on the probability of having more than 1 sexual partner in the past year

<table>
<thead>
<tr>
<th>Country</th>
<th>Asset index</th>
<th>Years of Schooling</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rural</td>
<td>Urban</td>
</tr>
<tr>
<td>BENIN</td>
<td>0.021</td>
<td>-0.001</td>
</tr>
<tr>
<td>Rural</td>
<td>0.074 *</td>
<td>0.007 *</td>
</tr>
<tr>
<td>Urban</td>
<td>0.001</td>
<td>0.001</td>
</tr>
<tr>
<td>BURKINA FASO</td>
<td>0.087 *</td>
<td>0.001</td>
</tr>
<tr>
<td>Rural</td>
<td>0.062 *</td>
<td>0.001</td>
</tr>
<tr>
<td>Urban</td>
<td>0.001</td>
<td>0.001</td>
</tr>
<tr>
<td>GHANA</td>
<td>0.022</td>
<td>0.002 *</td>
</tr>
<tr>
<td>Rural</td>
<td>0.016</td>
<td>0.001</td>
</tr>
<tr>
<td>Urban</td>
<td>-0.028</td>
<td>0.000</td>
</tr>
<tr>
<td>KENYA</td>
<td>0.033 *</td>
<td>-0.001</td>
</tr>
<tr>
<td>Rural</td>
<td>-0.039</td>
<td>0.005 *</td>
</tr>
<tr>
<td>Urban</td>
<td>-0.015</td>
<td>0.004 *</td>
</tr>
<tr>
<td>MOZAMBIQUE</td>
<td>0.169 *</td>
<td>0.081 *</td>
</tr>
<tr>
<td>Rural</td>
<td>0.051 *</td>
<td>0.131 *</td>
</tr>
<tr>
<td>Urban</td>
<td>0.001</td>
<td>0.001</td>
</tr>
<tr>
<td>NIGERIA</td>
<td>-0.039</td>
<td>0.005 *</td>
</tr>
<tr>
<td>Rural</td>
<td>-0.015</td>
<td>0.004 *</td>
</tr>
<tr>
<td>Urban</td>
<td>-0.188 *</td>
<td>0.003</td>
</tr>
</tbody>
</table>

Note: marginal effects from ordered probit estimates using most recent DHS
Source: Glick and Sahn (2006). * significant at 10% or better.