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Food and Agricultural Policy to Mitigate The Impact of HIV/AIDS

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July 13, 2006

Invited paper presented at the AAEA session on "Agriculture, Nutrition, and Health in High- and Low-Income Countries: Policy Issues" at the IAAE Conference in Brisbane, Australia, August 13-18, 2006[2]

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Introduction

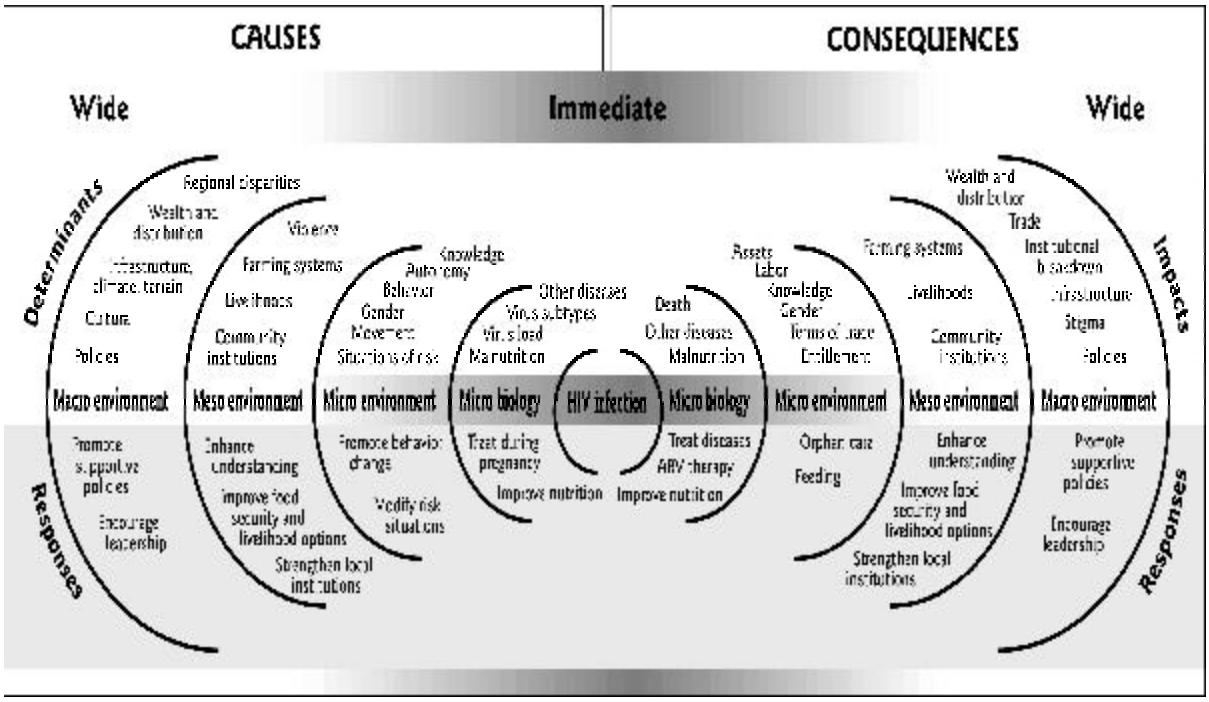
For HIV/AIDS the universe of policy issues is huge. With time flowing from left to right, Figure 1 shows the waves and layers of determinants, impacts and societal and individual responses to HIV/AIDS. HIV infection in an individual is the epicenter of Figure 1.

1. The determinants of HIV incidence and prevalence are shown in the top left quadrant and can be divided into thee different groups:

- *Environmental factors*, including cultural factors, the distribution of assets and wealth, local livelihood and farming systems, community institutions, gender relations, and the prevalence of violence in the society, etc.
- The *riskyness* of a person's behaviors: While conditioned by the environmental factors, riskyness ultimately depends on personal preferences, opportunities, knowledge and autonomy, etc,
- The chance of being *infected* with the virus once exposed, which depends on *biological-medical* factors, such as the virulence of the strain of the virus circulating in the population, the viral load of those already infected, the prevalence of malaria, sexually transmitted diseases or parasitic infections, and the nutrition status of the transmitting and exposed individual.

In this paper we will explore the relative importance of these groups of factors, with special attention to food and nutrition issues

Figure 1: HIV/AIDS Determinants, Impacts and Responses



Source: Loevinsohn and Gillespie 2003

2. *Impacts:* Following HIV infection, in the top right hand quadrant, we can see the various impacts of HIV/AIDS infection at the individual, family, community and societal levels. The initial impact of an HIV infection does not usually arise for periods of three to 18 years, when opportunistic infections start, soon to be followed by the death of the individual. The *vulnerability* of an individual to HIV/AIDS, i.e., the speed of the destruction of the immune system, the nature and severity of the opportunistic infections, and the speed with which they are followed by death, may in turn depend on many of the same environmental factors which determine susceptibility to infection. Again we will explore the role of food and nutrition in determining vulnerability.

The secondary impacts on the survivors and their society are themselves conditioned by the *vulnerability* of families, communities and societies to AIDS-related impacts. As figure one shows, these secondary impacts in turn affect the environmental factors and some of the epidemiological factors which are determinants of the HIV infections, such as household composition, incomes, wealth, the distribution of incomes, and gender relations. Key questions pursued in this literature are what, how large and how persistent these effects are. We shall see that little is known on these issues.

3. Responses or interventions which enhance the resistance of societies, communities and individuals to HIV/AIDS infections are shown in the left bottom quadrant of figure one. They include adjustments made by the actors themselves, and programs to promote behavior change and make behavior less risky, nutrition interventions, prevention of mother and child transmission, etc. We will look at the implementation difficulties which arise for these programs in rural areas, and how they can be overcome.

4. Responses and interventions to reduce the impacts and consequences of HIV infection and death are shown in the bottom right quadrant, going from treatment of opportunistic infections to anti-retroviral therapy, orphan care, agricultural, food and nutrition interventions. These interventions enhance *resilience,* the active responses that enable people and communities to avoid the worst impacts of AIDS, and to recover faster to a level accepted as normal. We will look at what is known about the effectiveness of these interventions, and how they can be implemented in rural areas.

Research also needs to take account of the fact that impact waves later can become causal waves. One example is transactional sex. Here, a woman – possibly due to her husband's illness or death from AIDS -- is forced to trade sex for cash to feed her children, and in the process drastically increases her risk of becoming infected herself. It is therefore of interest to study how some of the main impacts may also themselves enhance risk, and some of the main mitigation responses may also *prevent* future infection.

The state of knowledge on the various topics discussed above as they relate to food and nutrition has recently been reviewed by been at the center of Gillespie and Kadiyala (2005). The review of Gillespie and Kadiyala brings together many of the studies of HIV/AIDS on the role of nutritional deficiencies in increasing susceptibility to HIV infection; and how HIV/AIDS impacts on nutritional status, and thus disease progression.

Almost all of these studies were either experimental studies or longitudinal observational studies, and therefore fulfill the exacting scientific standards. The resulting research and policy agenda was subsequently summarized for a recent conference.[3]

"Knowledge of the devastating interactions between HIV/AIDS and food and nutrition security has been growing in recent years, but the crucial next step - of using this knowledge to improve and scale up effective actions - has yet to be taken…
"When it comes to actions aimed at combating the HIV/AIDS-food insecurity nexus, the empirical base is still thin. Where organizations have launched actions that address these interactions, they have tended to be in isolation, and they are rarely monitored and evaluated." [4]

Methodological and data considerations

The discussion of figure 1 above shows how complicated the interaction are which determine the incidence, prevalence and consequences of HIV/AIDS, and the potential and effectiveness for interventions. Some of the studies in the field which led to widely accepted policy conclusions used case study methods or cross section comparisons among households, rather than experimental methods or longitudinal data. A major difficulty encountered in such studies is that many of the variables that could have an impact on the probability of infection, the rate of progression to death, or the impact of morbidity and death on family welfare may themselves be choice variables of the individuals or household who are observed. For example, individuals and households incurring adult mortality have often had higher occupational status and income, and migrated more frequently than those not experiencing a death. If in a sample of households we observe that, on average those with a recent death are not worse off than those without one, this may therefore simply reflect that the households experiencing a death had been better off before the death, and may now have experienced an income and welfare loss which brings them to the same level as other households. More generally, if prime-age AIDS mortality remains correlated with individual and household characteristics such as social status, wealth, and mobility – which are also important determinants of household composition, household income expenditures, investments in human capital – failure to control for these characteristics may generate biased estimates of the impact of adult mortality on these outcomes.

For example, in many cross country studies, lower GDP is generally associated with much higher HIV/prevalence rates, suggesting that poverty is a major determinant of HIV/AIDS. However it is now abundantly clear that high prevalence rates are often caused by factors which are not reflected in the cross-country data, such as the prevalence of HSV-1 (herpes simplex) (Auvert et al. 2001). If such factors are negatively correlated with income, the coefficients of income are biased to the extent that they may even have the wrong sign.

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[3] IFPRI Conference on "HIV/AIDS and Food and Nutrition Security: From Evidence to Action," April 14-16, 2005, Durban, South Africa. For conference conclusions see Gillespie, (2005 a,b)
[4] See (www.ifpri.org/renewal)

The area where the evidence base on the impact of HIV/AIDS is strong is on demographic impacts of HIV/AIDS (Zaba, et al., 2004). Demographers have access to large national databases from censuses, vital registration data, and Demographic and Health Surveys, and therefore can most easily measure the impact of the epidemic on the variables which they are studying. Even they typically do not know the HIV-status of the individuals in their data sets who are still alive or have died, but have to make indirect inferences on the causes of the trends they observe. But economists and other social scientists are in much worse shape. Large nationally representative panel data which link detailed demographic and health data to economic, agricultural, food and nutrition, environmental and behavioral data are only slowly emerging. Such data is needed to fully disentangle the plethora of potential causes and impacts of the epidemic. The RENEWAL initiative of IFPRI[5] is engaged in one such study data collection effort in Zambia. The most notable effort has been spearheaded by Michigan State University in its Food Security III program[6], which has been promoting the addition of a demographic/health/mortality component to nationally representative surveys primarily oriented toward agricultural and income information. We will see below how such data have already significantly changed our understanding of the causes of HIV infection and the impacts of mortality on rural households. The more recent studies using panel data sets are have used household fixed effects models and propensity score matching (PSM) methods to address issues of self-selection and omitted variable biases (Mahter et al., 2004, Gertler et al., 2004).

There are other measurement challenges. Ethical considerations often preclude direct comparisons of AIDS-related and non-AIDS related deaths. Menon et al. (1998), Janjeroen et al. (1998), Bechu et al. (1998), Urassa et al. (2001), Morris et al. (2000), Rugalema (1999) and Fox et al. (2004) are important examples of studies that directly compare the impact of AIDS death vs. death due to other causes. These studies use various methodologies to identify HIV status. Urassa et al (2001) and Menon et al 2001 use sero-epidemilogical surveys, indicating that such approaches are indeed possible, despite the difficulties. Fox et al. (2004) and Morris et al (2004) use medical records to ascertain sero-status of individuals. Some studies use verbal autopsy methods or purposively choosing sample based on reported HIV status. Many studies have used proxy indicators such as chronic illness or presence of orphans to compare AIDS affected and non-affected (FASAZ 2003, SADC FANR, 2003, studies by MSU). The use of these proxies have certain limitations – "illness", for example, can range from complete debility to not feeling well. Mather et al (2004) provide convincing analysis of the strong contribution of AIDS to prime age adult mortality in high prevalence countries such as Kenya, Malawi and Zambia. Innovative ways of assessing the impact of HIV/AIDS continue to emerge -- Gertler et al (2003), for example, use self-reported ability to perform activities of daily living to measure chronic illness.

To study the impact of HIV-AIDS, some cross section studies have collected recall data on health and demographic composition and events, and used propensity score matching to construct a control group (e.g. Donovan et al. 2003). But recall data is unlikely to be

[5] Ibid
[6] See http://www.aec.msu.edu/agecon/fs2/

reliable for other than demographic variables and capital stocks, and can therefore not be used to study many determinants, impacts and program effects of interest to HIV/AIDS researchers.

The unit of analysis of most studies is the household. As Barnett and Whiteside (2002) note, households that dissolve or disappear, arguably the most affected, are thus lost to research. Household level analyses also fail to capture the complex interactions and relations between and within households, household clusters and communities. Other studies employing methods and tools from disciplines such as sociology, political science and anthropology are clearly needed to better understand, for example, the complex interactions between households and communities, and issues of power and capacity to respond at various levels.

Except for the studies of the impacts of nutrition interventions on prevention of mother to child transmission and disease progression, little rigorous evidence exits on what interventions work to respond effectively to HIV/AIDS in rural communities of the developing world (see section on interventions below). Evaluation of interventions is urgently required. Evaluation usually will require experimental and/or panel data sets with strong baselines, which cover a broad range of demographic, health, bio-medical, socio-economic and environmental data. Given the costs of assembling such data sets, a number of strategies can be pursued, all of which will require collaboration among economist who have a joint interest in such data for very different reasons, and with doctors, demographers, and other disciplines.

Determinants of the spread and impacts of HIV/AIDS

HIV incidence and prevalence

Because the HIV virus is transmitted via bodily fluids from another person, via sexual intercourse, sharing of needles, or blood transfusion, most of the transmission of HIV/AIDS ultimately depends on the behavior of individuals. However, not all sexual behavior is freely chosen, but is either determined or strongly influenced by the environment. Whether a given sexual behavior will result in infection is conditioned by biological-medical factors. Key questions, therefore, are (i) how important individual riskyness of behavior is for the transmission of HIV/AIDS relative to the environmental and biological-medical factors, and (ii) how environmental and epidemiological factors condition the riskyness of behavior. The approach to HIV/AIDS prevention depends on clear answers to these questions, and on the ease and costs with which the environmental, the biological-medical factors can be altered relative to the riskyness of individual behavior.

The huge disparity in prevalence rates across sub-Saharan Africa, both across and within countries, has long suggested that cross country and within country environmental and biological-medical factors may be equally or more important than behavioral differences. Stillwaggon, 2005 summarizes the bio-medical research on these topics:

- Malnutrition, combined with micronutrient deficiency (in particular of vitamin A) produces greater susceptibility to STDs and, particularly of the ulcerative type, and can contribute to higher viral loads, and therefore tend to increase mother to child transmission, as well as transmission among adults.
- Parasitic diseases such as malaria, helminthic and filarial infections stimulate HIV viral loads and increase malnutrition, and therefore correlate with risk of HIV transmission
- Genital schistosomasiasis is second only to malaria in its prevalence. Because its some schistosomasiasis species colonize the genitourinary tracts, it is perhaps the most important parasitic co-factor in HIV/AIDS transmission. Yet, unlike STDs, its treatment and eradication is not addressed in HIV prevention programs.

This literature does not directly show that better nutrition status reduces the rate of HIV infection in adults. The only area where such evidence exists is for mother to child transmission (MTCT). The literature suggests that micronutrient supplementation of pregnant women may improve pregnancy and birth outcomes, including neonatal child survival and birth weight (Kumwenda et al 2002 Coutsoudis et al 1999; Fawzi et al 1998; Friis et al 2004). In addition, multivitamin supplementation during lactation (with vitamins B,C and E, not A) may reduce MTCT through breastfeeding, especially among women with compromised immunological and nutritional status (Fawzi et al, 2002). On the other hand there is no convincing evidence that micronutrient supplementation during pregnancy reduced the risk of MTCT through in-utero, intra-partum and early breast feeding routes (Kumwenda et al 2002, Coutsoudis et al, 1999; Fawzi et al 2000).

Epidemiological studies, however, cast doubts on a strong link between nutrition status and risk of HIV infection. A four cities study by Auvert et al, (2001) compared two low prevalence cities (Cotonu, Benin, and Yaounde, Cameroon with two high prevalence cities (Kisumu, Kenya, and Ndola, Zambia, to investigate the relative importance of environmental, biological-medical and behavioral factors, using samples of 1000 men and women in each cities, for whom extensive blood tests, socio-economic background variables (but not nutrition) and sexual behavior variables were gathered. The study concludes that

(i) **Behavior:** High risk sexual behavior was not more common in the high prevalence cities than in the low prevalence ones; but the rate of partner change was still contributing to HIV+ status.

(ii) **Culture:** in the high prevalence cities men and women tended to *marry earlier*, and women had *earlier sexual debuts*; *male circumcision* was much more prevalent in the low prevalence cities.

(iii) **STDs**: HSV-2 (herpes simplex) infections were much more common in the high prevalence than low prevalence cities; and HSV-2 infection was strongly associated with HIV status within all the cities and both sexes; associations with other STDs was mixed.

(iv) **Socio-economic status:** among men, having a job was associated with higher probability of HIV infection in all cities, but there was no association with education or traveling in the past year.

(v) *Attribuable fractions of HIV cases of more than 30 percent within the cities could be found only for HSV1 infection, lack of circumcision, and being married or having been married.*

The striking result of this study is that only three factors explain the largest share of difference in prevalence across cities, and being HIV+ within cities: Lack of circumcision, HSV-1 infection and marriage (being married, having been married or marrying early). Behavioral variables do contribute to the probability of being infected within cities, but not nearly as much as the other three factors. The only one of the three socio-economic variables included that makes any contribution is whether one has a job or not. While nutrition status was not investigated, the fact that the soci-economic variables had no impact or in the "wrong" direction suggests *that the nutrition factors, may not be as important in determining the spread of HIV as the literature reviewed by Stillwaggon (2005) or Gillespie and Kadiyala, (2005) would suggest.*

In a third study of Kenya (Bloom et al. 2002), community environmental effects were compared to individual behavior effects, using open cohort data with demographic surveillance and epidemiological surveys, as well as qualitative research. Data on the HIV/AIDS prevalence in 1994/5 and on the incidence between 1994/5 and 1996/7 among 2271 men and 2752 women were available. Adjusting for individual effect, all four community factors had strong impacts on probabilities of being HIV positive: social and economic activity, ratio of bar workers per male population, level of community mobility, and distance to the nearest town. These factors were not related to differences in sexual behavior among the communities. After adjusting for community effects for men, *household assets, education, and type of work no longer mattered, while the protective effect of circumcision did*. Condom use was low, but higher among those with more partners. Among men it was associated with higher probability of infection, suggesting perhaps that it was a proxy for multiple partnerships.

Again it appears that the environmental factors, rather than individual behavior differences and socio-economic factors are the most important ones. All socio-economic variables suggest that higher status is associated with higher risk. This again suggests that differences in nutrition could not be as important as the available reviews discussed above suggest.

Progression from infection to death (in the absence of Anti-Retroviral Therapy)

In four longitudinal studies in Africa, the median survival rate after infection with HIV was estimated as between 8 and nine years for individuals who were infected between 20-29 years of age (Porter and Zaba 2004). The largest and most reliable study of survival rates was carried out in Masaka district of Zambia, where the median survival rate was estimated at 8.6 years. Survival rates decline significantly with age at infection.

The rate observed in the Masaka study is only a little over two years less than the median survival rate of 10.9 years observed in developed countries prior to the introduction of

HAART. The authors cite the following factors that could account for the difference between Africa and the developed world: background mortality rates from other causes than AIDS that are much higher in Africa than the developed world; the HIV-subtype (although little is known about the impact of subtype on disease progression), and the mode of transmission, which in Africa is mainly between males and females.

Other factors which could account for the difference are nutrition and morbidity from other infectious diseases, which is also generally much worse in Africa than the developed world, but they are not discussed by the authors. A reason for not discussing these factors may have been that in a landmark San Francisco study of survival rates, no lifestyle factors were found to predict the rate of disease progression. Rather it was only the number of CD8 cells, and the related viral load after the first viremia following infection, which predicted the length of survival of an individual.

On the other hand, there are indications in the literature that food and nutrition status can influence survival rates in the absence of ART. Energy requirements are raised by 10-30% following HIV infection in adults, and 50-100% among children experiencing weight loss[7] (WHO 2003). Nutritional support has the potential to prolong the asymptomatic period of relative health prior to the onset of AIDS (Piwoz and Preble 2001). Three different types of nutrition supplements have been considered: food rations to manage mild weight loss and nutrition-related side effects of ARV therapy and to address nutritional needs in food insecure areas; micronutrient supplements for specific HIV-positive risk groups; and therapeutic foods for rehabilitation of moderate and severe malnutrition in HIV-positive adults and children, but few of these interventions have been evaluated.

In a pathbreaking study in Tanzania, Fawzi et al (2004) found that women who were randomly assigned to receive multivitamin supplementation were less likely to have progression to advanced stages of HIV disease, had better preservation of CD4+ T-cell counts and lower viral loads, and had lower HIV-related morbidity and mortality rates than women who received placebo. Vitamin A appeared to reduce the effect of multivitamins and, when given alone, had some negative effects. The authors concluded: *"Multivitamin supplements delay the progression of HIV disease and provide an effective, low-cost means of delaying the initiation of antiretroviral therapy in HIV-infected women."*

We therefore have a major puzzle: Both nutrition and a variety of infectious morbidities have been shown in the reviews of Stillwaggon and Gillespie and Kadiyala to be potentially important factors influencing survival rates. And vitamin supplementation has in some cases also been shown to be beneficial for survival. But the survival studies leave

[7] Energy requirements are likely to increase by 10% to maintain body weight and physical activity in asymptomatic HIV-infected adults, and growth in asymptomatic children. During symptomatic HIV, and subsequently during AIDS, energy requirements increase by approximately 20% to 30% to maintain adult body weight. Energy intakes need to be increased by 50% to 100% over normal requirements in children experiencing weight loss (WHO 2003).

little room for major impacts of these factors, as the rates in the developing World are too similar to the developed country rates, and background mortality alone is likely to explain a lot of the difference.

The discussion of factors influencing HIV incidence and prevalence, and the studies on the length of survival suggest the following implication:

(1) Quantifying the impact of nutrition on HIV/AIDS incidence and prevalence will require large data sets, which combine medical, socio-economic, nutrition, behavioral and biological-medical information. Only this way can the quantitative impact relative of nutrition relative to other environmental and behavioral factors be disentangled.
(2) The two studies reviewed show that higher socio-economic status rather than lower status is associated with higher probabilities of being infected. This is also what most other early studies of the relationship between income and rates of infection showed. (There are now some small scale studies which suggest that as the epidemic matures, poorer groups may end up being at higher risk. But the evidence is not strong. (Bloom et al. 2001)).
(3) Socio-economic status is likely to be correlated with better nutrition and lower prevalence of other infections. It is therefore unlikely that poor nutrition per se has a strong impact on risk of infection, not withstanding the prima facie case coming from the medical literature.
(4) Studying the impact of nutrition on survival rates in the absence of ART is even more challenging, as the data sets combining all the elements discussed under (1) would have to be carried for five to nine years in populations which do not have access to ART. It is unlikely that any population which would be followed for such a long time could be denied ART by the researchers. The window of opportunity for such studies has therefore closed. However, given what we already know, it is probably not likely that such studies would uncover large impacts of nutrition and morbidities from infections.
(5) On the other hand food and nutrition interventions may prolong survival of patients under ART, because they may have complementary effects to the ART, and because they may improve patient adherence.
(6) The above suggests that it is unlikely that food and nutrition interventions would have a strong impact on HIV incidence or (in the absence of ART) on survival rates once infected. Food and nutrition interventions are of course important in their own right, and also important to mitigate the impact of AIDS.

Impacts of AIDS on agriculture, food and nutrition

The most dramatic welfare consequences of the epidemic are the enormous suffering of the dying person, his or her loss of life and human capital, and emotional pain suffered by the survivors.[8] The demographic literature on the impact of HIV/AIDS, in all the dryness

[8] In some of the economic literature on the impact of AIDS these enormous losses seem to be of little concern, and the focus is instead on the economic consequences for the survivors. The most striking

of its statistics, concentrates on these morbidity and mortality effects, and on the consequences for the demographic composition of the affected families, communities, and countries. Because the vital statistics and the demographic and health surveys used by demographers are well developed, and combine health and demographic information, these immediate consequences of the epidemic are far better documented than the subsequent secondary impacts on the economic welfare of the survivors (Zaba et al, 2004).

The economic literature is primarily concerned with the welfare impacts on surviving family members, orphans, communities, and countries. It also focuses on the adaptations which household make to compensate for the losses of their members, and the speed and completeness with which they recover from these losses. Reviews of this literature and of the many remaining open research questions are Gillespie and Kadiyala, (2005), Gillespie (2005a), Mather et al., (2004), and Zaba et al. (2004). Therefore I will confine myself here to a few comments relevant for policy and further research.

The literature on the impact of HIV/AIDS on household has suggested that the main adverse impact is labor scarcity. Helping the affected households overcome labor bottlenecks was seen as the critical issue for agricultural policy makers and researchers. The labor scarcity hypothesis arose from case studies, and from an implicit assumption that the loss of labor power associated with an adult death was more significant than losses in physical and human capital, or the pre-existing scarcity of land in poor households. However, impacted populations react in a dynamic way to their misfortune, and therefore all the issues of endogeneity, omitted variables, and disappearing individuals and households have plagued the investigators. The conclusion about the predominance of labor scarcity rested on a static view of the household, which under-estimated the capacity of households experiencing an adult death to recruit new adult members. And when looking at the labor market effects such as the rural wage, it implicitly assumed that labor demand was going to be unaffected by the death of adults, and or that there were few unemployed or under-employed workers who could replace the ones who died.

Mahter et al. (2005) used the broad survey data emerging from the Michigan state effort to analyze the hardest hit countries in seven Eastern and Southern Africa. They conclude that AIDS is projected to erode population growth roughly to zero, resulting in a roughly constant number of working age adults. Many affected agricultural households quickly recruit new adults, and the agricultural labor shortages are likely to induce urban-rural labor migration. Therefore for poorer smallholder households, land is likely to remain the primary constraint on income growth. HIV/AIDS is likely to progressively decapitalize highly affected rural communities, and increasing scarcity of capital (savings, cattle, draft animals) may come to pose the greatest limit on rural productivity and livelihoods in these communities.

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example of this neglect is the use of per capita income of the survivors as the yardstick of the economic impact of HIV/AIDS. This yardstick totally ignores the lifetime income loss of the deceased.

Dorard and Mwale (2005) show that in rural Malawi communities with high HIV/AIDS impact, widespread reduction in household incomes and increased cash constraints also tend to depress agricultural demand and the demand for rural non-tradables. This reduction in aggregate demand would reduce labor demand, and induce a fall in rural wages, posing problems for poor households who are net suppliers of labor.

Differential adjustment in household composition also affects the welfare consequences for orphans. Of course orphans usually face serious psycho-social consequences of the loss of one or both of their parents. The consequences for their food intake and nutrition, their growth, and their school attendance depend on the households within which they are placed. Extended families are most likely to choose better-off members as the fostering parents. As a consequence studies have shown that orphan-fostering households are not necessarily the poorest and most vulnerable households (Seaman and Petty 2005, and Polsky 2005). But all extended families do not have enough well-off members relative to the number of orphans they need to take care of. In a meta-analysis of national nutrition and health surveys in Sub-Saharan Africa, Rivers et al. (2005) show that orphaned children, regardless of the way they were defined, were not consistently more malnourished than non-orphaned children. On the other hand, households with more than one orphan reported significantly more food insecurity and hunger than households with no or only one orphan.

In terms of impact on agriculture, the review of the large representative rural household studies fostered by Michigan State University by Mather et al (2004) shows that the average affected rural household has similar ex-post land cultivated, total land area, cultivation rates and total income. As discussed in the methodology section, the ex-post comparisons suffer from the fact that the affected households may have been better off to start with. The longitudinal data set in Kenya (Yamano and Jayne, 2002) shows that the death of an adult male household head is associated with a larger negative impact on household crop production, non-farmer income and crop production than any other kind of adult death. In addition the Kenya data show that the impact of adult mortality on household welfare is more severe for households in the lower half of the per capita income distribution.

The cross section comparisons in these data sets do not support the conventional wisdom that affected households shift their cropping patterns away from high value crops towards roots and tubers. Nevertheless the longitudinal data sets for Rwanda and Kenya do show such effect for some household classes, and these effects are strongly conditioned by the gender and household position of the deceased, and the initial asset level of the affected household.

Nevertheless the ex-post comparisons do inform on which households are likely to suffer more lasting consequences: Households with a head or spouse death have fewer ex-post prime age adults and higher dependency ratios than non-affected ones, or those where another adult died.

Few data sets adequately capture the usually prolonged period of morbidity which recedes an AIDS death. Most of the impact studies therefore concentrate on the impact of mortality. The impacts of morbidity on economic welfare, especially of women, asset depletion, agriculture and nutrition deserve much more emphasis. So does research on strengthening community mechanisms to provide support to families who take care of the chronically ill.

Interventions

There are many possible interventions to combat the spread and impact of HIV/AIDS. UNAIDS, WHO, UNICEF and others provide guidelines and best practice papers on which interventions are important and how to implement them that are available on their websites. They typically advocate broad based and holistic interventions of a high degree of complexity. Little rigorous impact research is available which evaluates the plethora of possible individual interventions, or the recommended combinations. This section summarizes some available conclusions on the economic efficiency of possible intervention. It then focuses on the difficulties of implementing a broad set of interventions in widely dispersed rural areas, and then discusses decentralized and community-driven approaches to overcome some of these difficulties. These insights are then used to draw some consequences for the design of impact evaluation studies.

Which types of interventions are efficient?

Harling et al., (2005) summarize the peer-reviewed literature on the efficiency of prevention, treatment and care interventions published between 1994 and 2003. They cover both the developed and the developing world, using three yardsticks of economic efficiency: cost-effectiveness, cost-utility, and cost-benefit analysis.[9] They used 19 criteria to screen over a thousand articles, and to ensure consistency between the 175 they eventually included in their review.

In each of the following areas they included between 27 and 44 articles: Prevention, Screening and testing, Prevention of Mother to Child Transmission of HIV/AIDS (MTCT), Anti-retroviral therapy (ART) and treatment of opportunistic infections (OI treatment). Of the 176 articles 108, or nearly 2/3 were from the US, 39 were from Africa, and only 2 were from Asia or Latin America. Only 40 evaluated community –based prevention interventions. Unfortunately the review does not address whether studies were carried out in rural or urban settings, but one would assume that very few were focusing on rural areas.

The results varied by geographic setting and population studied. The following interventions were generally found to be economically efficient:

[9] Cost-effectiveness analyzes the financial resources needed to achieve a specific outcome, such as prevention of an HIV infection, or the cost of prolonging life by a year. In cost-utility analysis different outcomes are given utility weights. In benefit-cost analysis not just the costs, but also the outcome is expressed in monetary terms.

(1) prevention efforts and testing programs among vulnerable populations, especially if the lifetime treatment costs saved were included (prevention studies considering general populations reported contradictory results);
(2) blood screening in high income nations and in sub-Saharan Africa;
(3) providing anti-retroviral drugs and other interventions to expectant mothers and infants;
(4) treating some opportunistic infections; and
(5) providing combination anti-retroviral therapy (ART) in high income countries, and, with the recent price reductions, increasingly in low and middle income countries.

Because of the paucity of primary data, outcomes and costs were frequently modeled, using data from multiple sources. Another limitation is that interventions, especially in the treatment area, keep changing and therefore studies can be quickly outdated. To take account of both of these difficulties, the authors recommend *the establishment of multi-center prospective monitoring systems on the use, cost and outcomes of HIV service provision in middle and lower income countries.*

The review does not include studies of the cost-effectiveness of intervention involving livelihood-based approaches or food and nutrition interventions to reduce the spread of HIV, prolong life of those infected, or mitigate the impact on those left behind. I am also not aware of such studies in the literature. Such research therefore is an urgent research priority.

Rural intervention strategies: Decentralized, community-driven implementation mechanisms

One main conclusion of review work of best practices that I did jointly with Stewart Gillespie and Suneetha Kadiyala (2006) is that, in *each and every one of the areas of prevention, care and treatment, and mitigation of the impacts, a number of activities are required*. This means that future intervention programs will be fairly complex, and involve several sectors and actors in their implementation. In places where the epidemic is generalized and interventions must become to all populations, a service delivery approaches relying on specialized government implementing agencies or NGOs, who each focus on a one or a small subset of components of the required interventions will not be scalable in rural areas. The main reasons for this are that (1) delivering a multiplicity of services via specialized providers in separate programs would lead to very high overhead and transport costs, because such costs would arise for each intervention, and that such a service delivery and therefore be prohibitively costly, and (2) in widely dispersed rural areas, holistic, multi-sector interventions can only be coordinated at local levels and implemented by communities themselves, supported by local actors.

These issues were debated at the Durban conference in footnote 3, and a consensus emerged that, where the epidemic is generalized, *decentralized and community-driven approaches are the most likely design for many HIV/AIDS interventions.*

Rural intervention strategies: Different types of epidemics, and likely consequences for implementation mechanisms

Depending on the rate of prevalence of HIV infection, the literature distinguishes between nascent, focused and generalized epidemics. So far, much of the research on rural HIV/AIDS has focused on countries where the epidemic is already generalized, partly because it is only there that impacts of the epidemic are sufficiently large so that they can be measured. However, as we have seen in the section on the determinants of prevalence rates, focused epidemics have not progressed to generalized epidemics in a number of countries.

One reason for giving more attention to nascent and focused epidemics is that prevention, care and treatment interventions appropriate in them are likely to differ significantly from those appropriate in generalized epidemics. Where the epidemic is still focused, the most important intervention is targeted prevention, focusing on specific populations such as sex workers, inmates in correctional institutions, men having sex with men, or locations such as truck stops and market places.[10] Cost-effectiveness of generalized prevention campaigns is doubtful, broad –based care and support interventions are not yet needed, and treatment can also be targeted to the specific populations at risk. While even such targeted interventions involve strong participation by the targeted communities, they can be organized in a cost-effective way by using a more centralized service delivery approach.

Whether a service delivery approach or a decentralized community-driven approach is the most effective way to organize different components of the fight against HIV/AIDS also depends on other features of the environment, such as population density and transport costs, as well as the pre-existing institutions and service providers. For example, in rural Bangladesh, where population densities are high and there is a dense network of service NGOs, the optimal mode of producing HIV/AIDS services might be quite different than in most of rural Africa. A relevant research topic is to investigating which type of implementation mechanisms is more likely to work in what types of rural and urban areas and in which types of epidemics.

Prevention

In earlier sections we have seen that characteristics of the economic, bio-medial and cultural environment are much more powerful determinants than individual behavioral factors. However, few of these environmental factors are amenable to rapid and significant change. In addition, if people can be convinced to change their behaviors, and either abstain from sex, are faithful, or use condoms, they will be protected from

[10] See Annex one for further discussion of this issue.

infection. This is true regardless of the stage of the epidemic and the characteristics of the environment. Therefore bringing about behavior change remains the most important approach to reducing the spread of the epidemic. It is also clear that targeted prevention interventions are cost effective. Most of these studies on targeted prevention interventions have, however, been done in urban environments, and it is doubtful that for rural areas sharply targeted interventions would be feasible and economically efficient.

The desired outcomes of prevention programs include changes in sexual practices towards fewer partners, a single partner, delayed initiation of sex by youth, or abstinence, and adoption of safer sex techniques, in particular condoms. They also may include changes in community norms of male dominance and tolerance, violence and abuse. Parents and communities must accept that their children be provided with thorough sex and prevention education, enabling them to protect themselves as and when they start to have sex. For women prevention involves giving them the self confidence to demand condom use by their regular partners or husbands, and for men it involves accepting that sex with their regular partners or wives is not a right where they alone determine the practices.

Global experience suggests that AIDS education and awareness programs, while clearly necessary, rarely bring about behavior change without intensive participation by those whose behavior is to be changed. (UNAIDS 2004a, chapter 4). In rural areas of Africa, interventions not only required inter-personal communication, but participatory involvement of whole communities, such as the model of TANESA, which was scaled up to all villages in an entire district.[11] *A major research priority would be to evaluate such scaled up community-based prevention interventions.* Such evaluations would include process as well as impact evaluation, which would help in fine tuning the design of such interventions, enhance their scalability, and evaluate their economic efficiency.

Treatment

Previous sections have shown that, in the absence of Anti-Retroviral Therapy (ART), health and nutrition interventions are unlikely to prolong survival rates by more than a year or two. Therefore AIDS mortality in rural areas can only significantly be reduced by scaling up ART. The WHO guidelines for HIV/AIDS treatment, including ART (WHO, 2004) have been designed in such a way that a nurse in a rural health post, without laboratory equipment, can use syndromic management (i.e. diagnosis based solely on observable symptoms) to diagnose advanced HIV disease and prescribe a standard first line treatment to adults. The nurse is also trained to refer children with AIDS symptoms, patients with severe opportunistic infections, and patients who respond poorly to the first line treatment, or show significant side effects, to the next higher level health center.

The WHO guidelines view ART only as one component of successful treatment, and recommend the strong involvement of communities in the provision of the other

[11] For information on the TANESA program see http://www.kit.nl/projects/pr_sheets/pr_sheet17.asp, and www.kit.nl/projects/resource/pub/87.mht

components, such as training in healthy living and survival skills, provision of food and nutrition, and adherence support.

A most important research agenda, therefore is to closely follow the scaling up and impacts AIDS treatment in rural areas. This would include *how the lack of food undermines the adherence of patients to ART, and how the impact of ART is improved by good nutrition*, topics which are equally important for the rural and the urban poor. As in the case of prevention interventions, *socio-economic research should focus closely on the determinants, effectiveness and impacts of community participation in treatment programs.*

Care and support: Towards broad rural social protection programs

Care and support includes the care for the sick, the support for their families and caregivers, and mitigation of the impact on surviving families, and especially orphans. Care and support interventions are multi-sectoral and involve psycho-social support, health care, education, food and nutrition interventions, as well as livelihood support. The consensus of the literature is that care and support should take a holistic approach to the needs of affected families and individuals, rather than dealing with sector-specific interventions one at a time. In addition it is widely recognized that such holistic interventions are best implemented by communities, rather than by vertical service-delivery mechanisms. Of course communities will require technical and financial support to be able to implement these complex interventions, and NGOs and line agencies therefore need to act as co-producers of the services.

However, government and donor funding practices and the largely sector-based organization of government and donor programs, means that very few holistic and community-based care and support initiatives have been scaled up beyond the level of small boutiques.

An added difficulty of care and support programs is that the high prevalence of AIDS stigma means that it is rarely possible to provide care and support interventions only to families and individuals affected by HIV/AIDS. Not only may it be difficult and inefficient, it may also be unethical. For example, conclusive proof that an illness or a death has been caused by HIV/AIDS would require HIV testing, a precondition which is not only unrealistic, but would also force people to undergo tests, which should be voluntary. And why would one want to direct support only to families who have chronically ill HIV/AIDS patients, rather than all families with chronically ill patients; or only HIV/AIDS orphans, rather than just orphans?

Box 4: A Burkina Faso Proposal for Scaling Up Social Protection

When the Burkina Faso community-driven prevention program was first set up, communities were allowed to put in place social protection components. Few ever did, and it became clear that communities would not be able to do so on their own. Several barriers to community management of the social protection efforts need to be resolved. A learning by doing program to cover the entire province of Sanmatenga is currently in the design phase and trying to overcome these barriers.

1. Communities and individual families are already part of an informal, if inadequate, social protection system. But they do need additional resources and support to expand these informal mechanisms into a more systematic effort. These resources should be provided as matching grants to the communities, with the latter providing the matching resources in cash or in kind. Rural communities which are provided with cash to assist with health and education expenses will be asked to provide the food needed for their most vulnerable members, either in kind or in cash.
2. While communities all over Africa are able to identify vulnerable families, and classify them by degree of need, they are not able to carry out proper needs assessment for these families, a task which normally is done by a social worker. In Sanmatenga there are nearly 300 villages and urban neighborhoods, but only three trained social workers, and there is no way the Ministry of Social Welfare can hire enough social workers to assist communities to do this job. The learning by doing program will therefore ask communities to select one or several members to be trained in basic family needs assessment and supervision skills, and they will then be remunerated via daily allowances for their work out of the community grants. The ministry is currently developing a curriculum and training program for them.
3. Assisting the chronically ill, orphans and the families which take care of them will require significant additional training of enough community members to manage the tasks. These community members cannot work as volunteers for a long period of time, and need to be provided with modest remunerations, such as per diems for every day they work or home visit they make.
4. The community members will encounter situations which they and the community as a whole cannot handle, such as medical emergencies, or child abuse. To deal with these cases requires the putting in place of proper referral systems so that difficult cases can be handled by health professionals, social workers or educators with the required skills. These same specialists need to be involved in designing and delivering the training and be available for facilitation and training on demand.
5. The same committee structures that were used for prevention at the provincial, district, and community level, the same training teams, and the same financing mechanisms can be reinforced and used to coordinate, manage and monitor the social protection program. In particular the committees can coordinate and provide financial resources to the NGOs and local offices of the respective government services so that they can become the facilitators, trainers and referral system.

Hans Binswanger, personal observations

Finally, we have seen that HIV/AIDS impacts are highly differentiated according to who is sick or dies in a family, how well off the household was before experiencing and

HIV/AIDS impact, and how large and well off its extended family network is. Therefore only a fraction of the affected households and individuals need care and support interventions from the outside. A better way to provide care and support in a holistic and multi-sectoral way in rural areas would therefore be to design, and financially support, more general community-driven social safety nets that would focus on all highly vulnerable households and individuals, irrespective of the source of their vulnerability. Box 1 presents a proposal for such a program.

The only places where care and support can and should be provided just to those infected or affected are specialized HIV/AIDS treatment facilities or associations of people living with HIV/AIDS. However, treatment facilities are notoriously poor at providing care and support, unless they build up very strong partnerships with communities or PLWHA associations. And PLWHA associations are not widely available in rural areas.

Stigma

To understand the lack of truly scaled up action and success in curtailing the spread and impacts of HIV/AIDS, one must focus on the stigma associated with HIV/AIDS. Stigma is both external and leads to discrimination against the stigmatized, and internalized by stigmatized people, preventing them from taking action when they could help themselves to deal with the epidemic (Aggleton, 2000).

Nyablade et al. (2005) report the outcome of a research program in Ethiopia, Tanzania and Zambia on stigma which involved 650 individual interviews and 80 focus group discussion as well as quantitative analysis of 400 survey respondents. Their findings indicate the following:

1. The main causes of stigma relate to incomplete knowledge, fears of death and disease, sexual norms, and the lack of recognition of stigma
2. The poor are blamed less for their infection than the rich, yet suffer more from stigma, because they have few resources to hide an HIV-positive status. Youth and women are blamed more than men.
3. People living with HIV/AIDS face social isolation from family friends and community, gossip, name calling and voyeurism, and a loss of rights, decision-making power and access to resources and livelihoods. Those associated with them face secondary stigma.
4. Stigma impedes efforts at prevention, care and support (and more recently also treatment). [12]

[12] ACT-UP, the coalition of AIDS activists which over the past 20 years has put enormous pressure on governments to fight AIDS, has often used the slogan "Stigma=Death" and rightfully so. The most dramatic illustration of internalized stigma is well known by treatment practitioners in the field: A significant number of AIDS patients refuse to acknowledge their status, and as a consequence fail to seek treatment for AIDS. Stigma paralizes its victims. I have personally witnessed the death of seven people, of which three were employees of the World Bank, who knew perfectly well that they could be treated, but failed to seek it, or even refused it.

Even after 25 years of the onset of the epidemic, stigma is still rampant and exercises its influence at the global, national, community and individual levels, in the hearts of those infected and affected. It sharply aggravates the pain and suffering of those infected and affected.

Even though the list above clearly shows that it has major economic implications, I have been unable to find any literature on the economic impacts of stigma in general, or AIDS stigma in particular. Some of the models and research methods in the literature on the economics of discrimination may well have application in HIV area. While the causes and non-economic impacts of stigma are fairly well researched, few anti-stigma interventions have been subject to rigorous impact evaluation in OECD countries, and even less so in the developing world, and least of all in rural areas. It would therefore be useful to include the program and economic impacts of stigma as well as the evaluation of interventions to reduce stigma in any future research on rural HIV/AIDS. It would require the addition of stigma-related questionnaires to multi-disciplinary data panel data sets, as well as impact evaluation studies.

Conclusions

This paper has discussed the status of research on the relationships between HIV/AIDS, agricultural and rural development, and food and nutrition security under three major headings:

(1) **Determinants** of incidence and prevalence of HIV/AIDS as well as survival rates once infected
(2) **Impacts** of HIV/AIDS on morbidity, death, the welfare of the survivors, and on agricultural production and farming systems
(3) **Interventions** for prevention, care and treatment, and mitigation of HI/AIDS impact impact

The review also shows that very little of this literature comes from Asia or Lantin America, and that the literature on determinants and impacts is much more developed than the evaluation of interventions.

Determinants

On determinants of incidence and prevalence, major revisions of conventional wisdom have occurred as a consequence of large scale representative and multi-disciplinary surveys across four cities in Africa, and across different rural environments in Kenya. These studies show that it is differences in environmental factors, not differences in behavior which account for the major observed differences in prevalence rates across environments. The major environmental factors include circumcision, the prevalence of SIV-1 (herpes simplex), and the level of economic activity and proximity to cities of the rural communities. The two major studies on which these conclusions are based, did not

explicitly include food intake and nutrition status. But the fact that individual income did not figure as a major determinants suggests that, all the bio-medical literature on the relationship between nutrition and susceptibility notwithstanding, food intake and nutrition do not appear to be a major determinant of differences in prevalence rates. (An exception may be the impact of vitamin supplementation in reducing MTCT).

The data on survival rates after infection in Africa which have recently become available suggest that these are only about 20 percent lower than the survival rates in OECD countries before the advent of powerful anti-retroviral therapy ART. Just the differences in background mortality and in the prevalence of infectious diseases and parasites are likely to account for a significant share of the measured difference in survival rates. The bio-medical literature on the role of nutrition factors in disease progression notwithstanding, that would leave little room for improvements in food intake and nutrition to make a significant contribution to length of survival after HIV infection.

Clearly ART is the only way in which survival rates can be significantly increased. That has several implications: It will be difficult to do further research on the impact of food intake and nutrition for survival rates after infection, as more and more people will have access to ART; it would also be morally indefensible in a research study to deny access to ART to some just to further research the determinants of survival rates in the absence of ART. On the other hand the existing literature suggests that lack of food is a major bottleneck to adherence to ART, and that better nutrition can enhance the effectiveness of ART. Research therefore should shift its emphasis to the impact of food and nutrition interventions on adherence to and survival rates with ART. The other major research topic related to ART is how to scale up ART in widely dispersed rural areas.

Impacts

Demographers have had access to richer and more representative data than economists and food and nutrition researchers, and therefore the direct impact of the epidemic on death and demographic composition of the population is the best developed. Not only has the literature on economic, agricultural and food and nutrition impacts suffered from poorer data, few data sets were sufficiently representative or had the required over time dimension to evaluate impact. Nevertheless richer data which combine morbidity and mortality information with socio-economic data have already thrown out some of the conventional wisdom about impacts on individuals and household left behind, and on the adjustments to their agricultural and other livelihood strategies. Firming up these conclusions will require continuation of the data collection strategies pursued by the Michigan state group, as well as expansion of the data collection to include data on health and morbidity, tests for HIV infection, and food and nutrition.

Most of the new insights deal with the impact of mortality, rather than the impact of prolonged morbidity prior to death, and more work on the impacts of morbidity is clearly required. In addition, few data sets have yet been able to trace the path to recovery from

the loss of life of households and communities. Both of the above topics deserve additional research. Such research requires representative panel data with high frequency of data collection along the lines of the ICRISAT village studies of the 1970s and early 1980s.

The type of multi-disciplinary data sets required to evaluate the impact of HIV/AIDS – both large scale representative panels as well as intensive continuous village studies – can of course serve to study not only the impacts, but also the determinants of HIV/AIDS. In addition they can be used for a large number of research areas other than HIV/AIDS. An alternative way of looking at the question would be to say that multi-disciplinary HIV/AIDS data collection needs to be mainstreamed into any major rural panel data collection effort.

Interventions

Research on improving the design of interventions and measuring their impact is the most neglected area in HIV/AIDS research. Of course interventions do not await such explicit research, and should not do so either. In many cases what needs to be done and how to do it is well known. One example is the area of prevention. Notwithstanding the fact that behavioral factors are not what drives the major differences in incidence and prevalence across environments, changing behavior, including the use of condoms, is one of the few ways by which the epidemic can be rapidly reduced from what it would be without behavior change. And this is so regardless of the factors determining prevalence in any given environment. The finding of the impact evaluation literature that focused behavior change interventions are economically efficient only adds to the imperative to proceed with them. Similarly, only ART, not any other intervention, can prolong survival rates after infection by more than one or two years, and scaling up ART is the only way to save the millions already infected. Furthermore, best practices in many of the intervention areas are relatively well defined. The best practices may not have been the result of rigorous monitoring and evaluation studies, but rather have emerged from a combination of knowledge accumulated in the scientific literature and the program experience of practitioners. The purpose of research on interventions therefore is to build on what is already known further improve the design of the interventions, and evaluate their impacts, including their economic efficiency.

The best practice literature emphasizes two general directions in which interventions are evolving. In all three areas of prevention, care and treatment, and support, the interventions are becoming more complex and holistic, and almost all require deep involvement of communities in the local adaptation, the execution, and the monitoring and evaluation of the interventions.

Another difficulty for research on interventions is the fact that interventions are rapidly changing, especially in the area of care and treatment. The development of effective microbicides, for example, would also lead to major changes in prevention interventions.

Research strategies need to take prepare for possible changes in interventions during the course of impact evaluation.

Implications for data collection

The methodological considerations discussed in the introduction, as well as further illustrations provided in body of the paper suggest that the best approach to data collection is *to develop multi-purpouse panal data sets on households and communities that can be used the address a broad range of HIV/AIDS questions, as well as serve other rural and agricultural research interests.* Such data sets need to cover widely different environments. In addition to demographic, socio-economic and agricultural variables, they would include data on the environmental, behavioral, biological, medical, and nutrition factors which are hypothesized or known to facilitate the spread of HIV/AIDS, accelerate its progression, co-determine the household responses to and impacts of HIV/AIDS, and govern the receptiveness and impact of prevention, care, treatment, and support intervention. Data on ongoing interventions should also be included. Such data sets would also provide opportunities for carefully introducing new interventions into the communities and households covered by these data, and rigorously evaluate their impacts.

Research and data collection strategies to evaluate interventions can in principle also be carried out within broad based and in depth multi-disciplinary data sets. First, they can also be used to evaluate a number of interventions which are found to be ongoing in the areas where surveys are being carried out. Second, it is possible to design interventions to be carried out within these data sets, using either experimental designs or propensity score matching. The interventions which could be evaluated are not only those dealing with food and nutrition, or agricultural production, but also prevention, care and treatment, and social safety nets. To the extent that the interventions involve treatment, the data would most usefully be developed in collaboration with multi-center evaluation of ART, and focus on the role of communities and food and nutrition intervention in making ART more effective, especially by improving adherence of the patients to the drugs.

Specific Research Priorities

The above sections have dealt with broad strategies of research priorities and data collection efforts. Below are some specific topics where more work appears to be needed.

1. The economic determinants and impacts of stigma; methods to overcome stigma in rural communities and among rural programs and service providers.
2. The impact of morbidity on household welfare and agriculture and food systems.
3. The speed of recovery, or lack thereof, on households and communities impacted by HIV/AIDS.

4. The best way to design interventions for rural areas in low prevalence countries and/or very high population density countries where more targeted approaches, rather than broad based community-driven approaches, may be cost-effective.
5. The best way to design and scale up decentralized and community-driven prevention, treatment, care and support interventions, and their impacts on
    a. Stigma
    b. Behavior change
    c. Incidence and prevalence of HIV/AIDS
    d. Survival rates after infection
    e. Effectiveness of ART
    f. Welfare of the communities involved and their members
    g. Economic efficiency of the interventions
6. The best way to design and scale up holistic, decentralized and community driven social safety nets. These would build on and strengthen existing community safety nets, and would not be targeted just to families affected by HIV/AIDS. Multiple impacts would be evaluated, including on
    a. Attendance in schools, vaccination programs and use of health care infrastructure
    b. Morbidity and mortality of those assisted, and spillover effects on the community as a whole
    c. Production, income and welfare of those assisted, as well as spillover effects
    d. Economic efficiency of the intervention in terms of investment and growth, and poverty reduction
    e. Impact on HIV/AIDS incidence, prevalence, mortality, survival, and orphan welfare.

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