

## **Poverty as a risk factor for HIV/AIDS: Evidence from a panel study in rural Malawi**

Simona Bignami-Van Assche, *Université de Montréal*

Ari Van Assche, *HEC Montréal*

### Background

The relationship between socioeconomic status and individual health is well documented. There is ample evidence that wealthier individuals do better on most measures of health status including malnutrition, morbidity, mortality, and health care utilization (Kuate-Defo 1997; Adler and Newman 2002; Fotso and Kuate-Defo 2005). Consistent with these findings, there is evidence of an inverse relationship between socioeconomic status and risk of sexually transmitted infections, such as herpes, chlamydia, gonorrhea, syphilis, and bacterial vaginosis (Ellen et al. 1995; Fleming et al. 1997; Lacey et al. 1997; Holtgrave and Crosby 2003; Kyriakis et al. 2003; Miller et al. 2003; Wald 2004; Chawla et al. 2004; Uuskula et al. 2004; Bukusi et al. 2006). It might therefore be expected that poverty increases individual vulnerability to HIV/AIDS in the same manner.

At the global level, there is indeed evidence of a positive correlation between HIV prevalence and poverty, as measured by per capita income, income inequality, or absolute poverty (Bloom et al. 2002). The HIV/AIDS epidemic in sub-Saharan Africa represents a notable exception to this general pattern. On the one hand, at the macro level African nations with high HIV prevalence, such as South Africa and Botswana, tend to be the wealthier countries in the region (Whiteside 2002; UNAIDS 2006). On the other hand, evidence from recent Demographic and Health Surveys that include HIV testing as well as earlier studies indicates that at the individual level wealth, and not poverty, is positively associated with HIV infection (Menon et al. 1996; Kirunga and Ntozi 1997; Shelton et al. 2005; Mishra et al. 2006).<sup>1</sup>

Several hypotheses have been put forward to account for this apparently anomalous finding. It has been argued that greater prevalence of risky sexual behaviors, better nutritional status, greater access to health care, and greater use of antiretroviral drugs (ARVs) among the wealthier increase their vulnerability to HIV infection (Shelton et al. 2005). Yet it is often

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<sup>1</sup> Reviews of the existing literature about the association between socioeconomic status and HIV infection indicate that only few studies have found a negative association, whereas most have found a positive or no association (e.g., Ainsworth et al. 1998; Wojcicki 2005).

overlooked that this latter group studies mostly rely on cross-sectional data, which only allow identifying associations, and not causal linkages, between wealth and HIV infection. Moreover, for many HIV-positive adults, these associations might be biased if the infection preceded the behaviors reported in the survey. Finally, the strength and direction of the relationship between poverty and HIV as well as the roles of risk behaviors and protective factors are likely to change over time, depending on the stage and spread of the epidemic. In this paper, we take advantage of behavioral and biomarker data from a large-scale panel survey to properly evaluate the causal linkages between poverty and HIV infection in rural Malawi.

### Data and Methods

Since 1998, the Malawi Diffusion and Ideational Change Project (MDICP) has collected longitudinal data for a population-based sample of approximately 3000 respondents age 15 or older to examine the role of social networks in changing attitudes and behavior regarding HIV/AIDS, family size, and family planning in rural Malawi. The MDICP is conducted in rural areas of three Malawian districts, one in each of the three regions of the country (North, Center, and South). A comparison of the characteristics of the 1998 MDICP sample with those of the rural population surveyed in the 2000 Malawi Demographic and Health Survey indicates that, at the baseline, the MDICP sample was representative of the national rural population (more details on sampling and fieldwork procedures, as well as the survey data, are available from the project's website: <http://malawi.pop.upenn.edu>).

The MDICP has completed four survey waves in 1998, 2001, 2004 and 2006. In this paper we use longitudinal data from the two most recent waves (2004 and 2006), since they included testing for HIV antibodies. In both cases interviewers administered to respondents the survey questionnaire and trained nurses were responsible for biomarker data collection. Participation in either the survey or the HIV testing was voluntary, and separate consents were obtained from respondents. A specimen of oral transudate fluid (hereafter 'saliva') was used for testing for HIV antibodies. Oral fluid specimens were tested at the laboratory of the University of North Carolina Project in the capital, Lilongwe. HIV antibody status was assessed using enzyme-linked immunosorbent assays (ELISA) kits for initial screening, with positive results confirmed by a Western Blot test. The assay sensitivity and specificity exceeded 99% (manufacturer's

data).<sup>2</sup> The survey and biomarker collection protocols were approved by both the Institutional Review Board of the University of Pennsylvania in the United States and the Research and Ethics Committee of the College of Medicine in Malawi. In order to ensure confidentiality, individual questionnaires and test results were linked only after the completion of fieldwork in all sites.

In 2001 as well as 2004, refusal rates in the MDICP for either the survey interview or HIV testing were relatively low (approximately 10%) and within the range of other population-based surveys. Attrition in the MDICP has also been shown to be quite low (Bignami-Van Assche et al. 2003), so we are confident that these sources of bias do not significantly affect our results.

As the well-known Demographic and Health Surveys (DHS), the MDICP does not include direct questions on income or expenditure, but collects information on several items that measure household ownership of consumer durables, (such as television and bicycle; materials used for housing construction; and availability of amenities such as electricity, source of drinking water, and type of toilet facility), which tend to be correlated with household wealth status. Using these survey items, Filmer and Pritchett (2001) developed a standard procedure to construct a “wealth index” to quantify differences in household economic status. The wealth index is generated using the principle components analysis. It is a composite measure of the cumulative living standard of a household, which places individual households on a continuous scale of relative wealth. The wealth index is divided into population quintiles, with the lowest quintile representing the poorest 20 percent and the highest quintile representing the wealthiest 20 percent households within each country. Using DHS data, it has been shown that household wealth (as measured by the wealth index) exhibits a strong monotonic relationship with the main indicators of health and well-being for children under five years of age and for women aged 15-49 (a full discussion about the wealth index can be found in Rutstein and Johnson 2004). Thus we can reasonably assume that, for our sample, the wealth index constructed using the MDICP survey items on household assets captures well relative economic status of households.

In order to evaluate the causal relationship between poverty and HIV for the MDICP longitudinal sample, we proceed in two steps. First, we evaluate the economic status of MDICP respondents infected with HIV in 2004 as compared to that of MDICP respondents who were

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<sup>2</sup> Although OraSure<sup>®</sup> has a sensitivity and specificity greater than 99% as reported by the manufacturer, the actual figures for Malawi are unknown. Since the test does not detect participants in the very early phase of HIV infection, the actual sensitivity in our setting is likely less than 99%. Our results should be interpreted taking this issue into account.

seronegative at the same point in time. Then, we assess the changes in their economic status and individual HIV serostatus between 2004 and 2006. We use multivariate analysis to assess whether changes in household wealth between the two survey waves are significantly related to changes in individual serostatus.

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