IBS

POPULATION PROGRAM ■
INSTITUTE OF BEHAVIORAL SCIENCE ■
UNIVERSITY OF COLORADO AT BOULDER ■

WORKING PAPER

The Socioeconomic Context of Prime-Age Adult Mortality: Evidence from the Agincourt Health and Demographic Surveillance Site

Laura Patterson
Lori M. Hunter
Wayne Twine

August 2009

Population Program POP2009-03

The Socioeconomic Context of Prime-Age Adult Mortality:

Evidence from the Agincourt Health and Demographic Surveillance Site

Laura Patterson
Institute of Behavioral Science, Program on Environment and Society
Department of Sociology
University of Colorado at Boulder

Lori M. Hunter
Institute of Behavioral Science, Program on Environment and Society
Department of Sociology and Environmental Studies Program
University of Colorado at Boulder

Wayne Twine
Centre for African Ecology, School of Animal, Plant and Environmental Sciences
University of Witwatersrand

Please direct correspondence to Dr. Lori Hunter, Institute of Behavioral Science, Program on Environment and Society, Campus Box 468, University of Colorado at Boulder, Boulder, CO 80309, USA; 303-492-5850; Lori.Hunter@colorado.edu.

Acknowledgements**:** This research has been supported by the Rockefeller Brothers Fund, Grant #05-245 entitled "HIV/AIDS, Elderly-Headed Households, Food Security, and the Natural Environment in Rural South Africa." We also thank the NICHD-funded University of Colorado Population Center (grant R21 HD51146) for administrative and computing support. The content is solely the responsibility of the authors and does not necessarily represent the official views of NIH or NICHD.

The Socioeconomic Context of Prime-Age Adult Mortality:
Evidence from the Agincourt Health and Demographic Surveillance Site

Abstract: There is little empirical research examining the relationship between household socioeconomic status (SES) and prime-age adult mortality in sub-Saharan Africa (Cogneau and Grimm 2006; Hallman 2005; Hargreaves et al. 2002). In the context of the ongoing HIV/AIDS pandemic, such work is important because SES may shape HIV/AIDS susceptibility (Bachmann and Booysen 2004; Dunkle et al. 2004; Goyer and Gow 2001; Hallman 2005; Santo and Etheredge 2004; Wojciki 2005), as well as the household's ability to recover from the death of a prime-age adult (Dorward 2006; Drimie 2003; Knodel et al. 2007; Yamano and Jayne 2004). This paper presents analyses of pre-mortality SES as well as pre- to post-mortality SES change in rural South Africa, using data from the Agincourt Health and Demographic Surveillance Site (AHDSS). Results do not support the contention that disadvantaged households are more vulnerable to HIV/AIDS. In addition, HIV/AIDS-related adult deaths appear associated with a decline in SES only for households experiencing death of an adult male *other* than the household head. At least in the AHDSS area, households across socioeconomic strata seem equally vulnerable to HIV/AIDS, and HIV/AIDS may not represent a unique form of household mortality shock. Both conclusions suggest that HIV/AIDS education programs, as well as efforts to reduce poverty, should be broadly promoted.

Keywords: HIV/AIDS, SES, adult mortality, South Africa

The Socioeconomic Context of Prime-Age Adult Mortality:

Evidence from the Agincourt Health and Demographic Surveillance Site

Unacceptably low life expectancies, due primarily to HIV/AIDS, continue to characterize many African populations (Cogneau and Grimm 2006; Kengni et al. 2004; Wojciki 2005; Yamano and Jayne 2004). HIV/AIDS remains the leading cause of death worldwide for people aged 15 to 49, with 38.6 million individuals (estimated range 33.4 - 46.0) infected with HIV as of 2005 (UNAIDS 2006). And Southern Africa, with 10% of the world's population, is home to 64% of all people living with HIV/AIDS (UNAIDS 2006). While new prevalence rates appear to have stabilized at 6.1% annually, the actual number of people infected continues to grow because of continued population growth, resulting in 2.7 million new cases in 2005 (UNAIDS 2006).

Yet there is little empirical research examining the relationship between household socioeconomic status (SES) and prime-age adult mortality in sub-Saharan Africa (Cogneau and Grimm 2006; Hallman 2005; Hargreaves et al. 2002). Such work is important because it has been contended that poverty may increase risky sexual behaviors and thereby HIV/AIDS (Dunkle et al. 2004; Hargreaves et al. 2002; Santo and Etheredge 2004). In addition, the loss of prime-age adult household members seems likely to reduce household income through lost wages (Hunter et al. 2007). Significant hurdles to research on these topics are posed by lack of cause-specific mortality data and of longitudinal data on household characteristics. We tap into the strength of the Agincourt Health and Demographic Surveillance data to shed light on the association between HIV/AIDS and social and economic disadvantage.

Background

Most researchers have speculated that deaths from HIV/AIDS lower household socioeconomic status, and also that impoverished households are more vulnerable to HIV infection (Bachmann and Booysen 2004; Knodel et al. 2007; Mather et al. 2005; Tekola et al. 2008; Wojciki 2005). Indeed, HIV/AIDS has been bluntly called "a disease of poverty" (Fenton 2004; Hargreaves et al. 2002). But empirical evidence for these claims remains mixed (Jayne et al. 2005; Jayne et al. 2006; Mather et al. 2005; Yamano and Jayne 2004), while methodological critiques abound, often calling for refinements in the measurement of both HIV/AIDS mortality and its impacts (e.g., Booysen and Arntz 2003; Jayne et al. 2006; Mather et al. 2005; Yamano and Jayne 2004).

Many authors have asserted that HIV/AIDS mortality may decrease household socioeconomic status by reducing the potential to generate income (Bachmann and Booysen 2004; Knodel et al. 2007; Mather et al. 2005; Tekola et al. 2008). This may be the case especially if the deceased had been a wage-earner (Hunter et al. 2007). Indeed, AIDS-related mortality in Ethiopia cost households substantially more in lost future earnings than did non-AIDS-related mortality, due largely to the young age of AIDS victims (Tekola et al. 2008). SES may also be affected by the sale of assets to compensate for lessened productivity and/or to pay for medical expenses and funeral costs (Dorward 2006; Knodel et al. 2007; Tekola 2008; Yamano and Jayne 2004). On the other hand, Bachman and Booysen (2004) reported that, although HIV/AIDS-affected households in South Africa were prone to decreases in both income and expenditure in the six months following the identification of HIV/AIDS morbidity within the household, these decreases did not reach statistical significance; and an 18-month follow-up study found that unaffected households experienced even greater income declines.

The nonsignificant differences observed in many studies may be due to the lack of a truly unaffected baseline population in areas where HIV prevalence rates often exceed 20 percent (Booysen and Arntz 2003; Jayne et al. 2006). Within these areas, households classified as "unaffected" are nevertheless likely providing assistance to disease-afflicted households by, for example, giving money or food, and/or taking in children or other family members (Jayne et al. 2006). Additionally, "unaffected" households may lose access to shared resources owned by neighboring or kin-related households that experience a death (Jayne et al. 2006). Research at the community level has attempted to overcome these difficulties by considering aggregate associations between HIV/AIDS mortality and well-being. Jayne et al. (2006) investigated whether communities with higher rates of HIV/AIDS-related mortality had lower incomes than those with relatively lower rates. Although little association was found, results did suggest that mortality impacts were slightly higher in more educated communities.

Research also remains inconclusive on the association between socioeconomic well-being and vulnerability to HIV infection. In a review of articles addressing this topic between 1980 and 2002, Wojciki (2005) identified 12 studies reporting positive associations between SES and HIV infection, 8 finding negative associations, 15 finding none, and one with mixed results. Clearly, the jury is still out. As Hargreaves et al. (2002:801) note, mixed findings are at odds with the "simplistic notion" that HIV/AIDS most seriously affects the poorest sectors of society.

On the other hand, some findings lend support to the hypothesis that HIV/AIDS is more prevalent in more disadvantaged households (Bachmann and Booysen 2004; Dunkle et al. 2004; Goyer and Gow 2001; Hallman 2005; Mather et al. 2005; Santo and Etheredge 2004; Wojciki 2005). In Kenya, both men and women from disadvantaged households are more likely to engage in risky sexual behaviors, and disadvantaged young women, in particular, are more likely

to become newly infected with HIV (Hargreaves et al. 2002). Research with women visiting antenatal clinics in Soweto, South Africa, found that 21% reported having engaged in transactional sex with a man other than their primary partner, and that these women were significantly more likely to test positive for HIV than those who had not (Dunkle et al. 2004). Such findings suggest that risky sexual encounters may be, in part, motivated by material or financial considerations, so that disadvantaged people are at particular risk (Dunkle et al. 2004). Santo and Etheredge (2004) examined prostitution in Senegal and came to the same conclusion – for women of lower SES, sexual relations were an important way to achieve social and economic status, and for some women prostitution was necessary for survival.

There are other routes through which disadvantage may shape susceptibility to HIV infection. First, poverty is associated with malnutrition and stress, which impair the immune system's ability to withstand infection (Fenton 2004). Second, poverty is also associated with both low educational status and illiteracy, which may hamstring HIV prevention education. In addition, poverty may lessen individuals' ability to purchase condoms and increase their likelihood of being raped (Hallman 2005). More generally, impoverishment may foster a short-term perspective resulting in high-risk behaviors (e.g., transactional sex) even if these are likely to compromise long-term well-being (Fenton 2004; Hallman 2005).

These associations, however, do not appear universal. Wojciki (2005) asserts that more advantaged individuals, including those with more education, may have more access to resources, be more mobile, and have access to more mobile partners, and evidence for this has been found in Cote d'Ivoire (Cogneau and Grimm 2006). The inconsistencies in the findings may be due to the timing of the studies as related to the stages of the HIV/AIDS pandemic (Fenton 2004; Hallman 2005; Hargreaves et al. 2003; Wojciki 2005). In the pandemic's early

years, HIV may have disproportionately affected those with higher SES because of their greater mobility. However, as infection became more common, lack of resources, lower levels of education, and possible propensity for risk-taking behaviors may have increased the vulnerability of the disadvantaged (Fenton 2004; Hargreaves et al. 2003).

Methodological Considerations

Methodological issues further complicate examination of HIV/AIDS impacts. Some researchers have questioned the appropriateness of labeling households as "HIV/AIDS-affected" versus "unaffected" given the difficulties in obtaining a truly unaffected baseline population (Booysen 2003; Jayne et al. 2006). In addition, problems arise in disentangling effects of the HIV/AIDS epidemic from other social phenomena. For example, many authors have argued that labor shortages caused by the HIV/AIDS epidemic have caused a shift toward less labor-intensive crops, such as cassava; however, Jayne et al. (2005) assert that this shift may actually be due to changes in agricultural legislation. Further, as Wojciki (2005) notes, the myriad ways in which SES has been measured and the variety of sociocultural practices in different African contexts also complicate the relationship between socioeconomic status and HIV/AIDS.

Of course, there are also methodological concerns inherent in cross-sectional approaches (Jayne et al. 2005; Mather et al. 2005; White and Robinson 2000). For example, research undertaken in rural Kenya suggested that AIDS mortality-affected households were, on average, poorer than their unaffected counterparts; but those households also had lower pre-mortality incomes than did unaffected households (Mather et al. 2004). Piot et al. (2002) speculate that the relationship between HIV/AIDS mortality and SES is reciprocal – that is, financial strain may

increase susceptibility to HIV/AIDS, while HIV/AIDS may also reduce household SES. Disentangling vulnerability from impacts requires longitudinal data such as that used here.

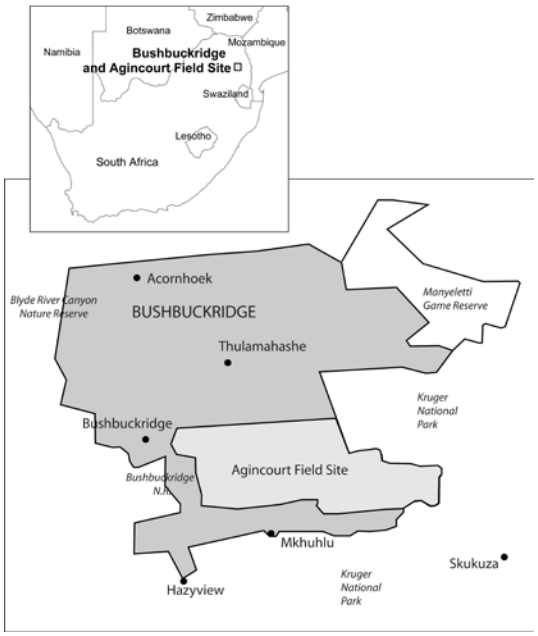
Beyond methodological contributions, we aim to provide additional insight on the association between adult mortality – both AIDS-related and non-AIDS-related – and household socioeconomic status. Specifically, we address the following substantive questions:

1) Do households where a prime-age adult has died have significantly different *pre-mortality* SES from other households?
2) Do households with prime-age adult mortality undergo more *pre- to post-mortality change* in SES than households without such mortality?
3) Are there significant *post-mortality* differences in household SES between households affected by prime-age adult mortality and their unaffected counterparts?

Research Setting, Data, and Methods

Our research setting is rural South Africa, at the Agincourt Health and Demographic Surveillance Site (AHDSS) operated by the University of the Witwatersrand School of Public Health (Wits) and South Africa's Medical Research Council (MRC) (Wits/MRC). Located in an impoverished rural area in the country's northeast (see Figure 1), the Wits/MRC AHPU (Agincourt Health and Population Unit) project has collected census data at 12-18 month intervals since 1992 from over 12,000 households in 21 villages.

Figure 1: Study Site



Data

Data for this project are drawn from the AHDSS censuses 2000-2003. A total of 12,145 households are examined for the presence of prime-age adult mortality during this period. Of those, 10,025 households have data reflecting socioeconomic status for both 2001 and 2003, a necessity for our research objectives. Many households missing data were not in tact at one of those time points. In other cases, no one was home at the time of data collection. Sample sizes for our final analyses range from 9,734 to 11,023, depending on the variables included.

Socioeconomic Status: We develop three indicators of socioeconomic status (SES) using data collected on specific household assets in the years 2001 and 2003. These data were obtained from an "Asset Module" fielded with the AHPU censuses that measured, for example, consumer goods such as wheelbarrows, televisions, and cellular phones, as well as livestock such

as pigs, chickens, and goats. All assets measured reflect socioeconomic standing within this setting. For purposes of these analyses, the "possessions index" was broken into three categories: consumer goods, agricultural goods (including livestock), and possessions that are uncommon in this context (e.g., cellular phones).

A cross-sectional SES measure for 2001 is used as a baseline, pre-mortality measure of SES, while a cross-sectional measure for 2003 reflects post-mortality household SES. In addition, a change variable reflects the difference between SES in 2003 and 2001.

Prime-age adult mortality: Households are categorized by whether they experienced the death of a person aged 15-49 between November 2001 and July 2003. Within some analyses, mortality experience is disaggregated by the deceased's gender, position in the household, and cause of death (HIV/AIDS related or non-HIV/AIDS related). On the basis of preliminary analyses, we categorize gender and position within the household as follows: female household head, male household head, wife of male household head, female "other," and male "other." Gender of the deceased may be expected to influence the impact of mortality on SES, as women and men in sub-Saharan Africa may have differential access to household resources (e.g. livestock) and often engage in different tasks (Gawaya 2008). Previous research also indicates that the death of a household head or spouse of a head may have differential impacts, both relative to each other as well as to the death of another household member (Hunter et al. 2008; Yamano and Jayne 2004).

Given the public health origins of the AHDSS, substantial effort has gone into understanding social processes related to, and implications of, mortality. Each recorded death has been subject to a verbal autopsy (VA) in which specially trained fieldworkers interview (in his or her mother tongue) the closest caregiver of the deceased. Two medical doctors, blind to

each other's findings, review the VA transcripts and independently assign probable cause of death. Where these correspond, the diagnosis is accepted. Where they differ, the practitioners discuss the case, and, if they achieve consensus, attribute a cause of death. If not, a further blind assessment is made by a third independent practitioner. If two of three diagnoses now correspond, the majority diagnosis is accepted; if not, the cause of death is described as "undetermined" (Kahn et al. 1999, Kahn et al. 2007). For the study presented here, cause of death for prime-age adult mortality is categorized as AIDS-related and non-AIDS-related (noncommunicable, infectious and parasitic, accidental, or "other").

Control Variables: In order to accurately estimate the association between prime-age adult mortality and household SES, we include data reflecting other household characteristics likely associated with our variables of central interest. *Household size* is measured by two variables reflecting the number of individuals reported to be members of the household on August 1, 2001 and July 1, 2003. *Age composition* is represented by two dummy variables reflecting young and old age structures; again, these two variables are created both for August 1, 2001 and July 1, 2003. "Young" households are those in which at least one-third of members were aged less than 15 years, while "old" households are those with at least one-third of their members of pensionable age (60 years for women and 65 years for men). *Sex ratio* is measured by two variables reflecting the ratio of working age (aged 15-49) men to women who were members of the household on August 1, 2001 and July 1, 2003. *Labor market participation* is reflected by a variable indicating the proportion of adult household members (aged 15-49) employed in either the primary or the secondary labor market. These data were obtained from a module in the AHPU census fielded between August and November 2000. *Receipt of pensions and grants* is measured in two ways: (1) the number of student grants and old-age pensions

received by members of each household, and (2) a dummy variable reflecting whether an adult within the household was receiving a child grant. All of these variables were calculated from the AHPU labor module fielded between August and November 2000. *Household head characteristics* is measured by two sets of variables reflecting the age, gender, and ethnicity of the head of the household in August 2001 and July 2003. Ethnicity is coded "1" for South African and "0" for all other. In most cases, a "0" represents Mozambican ethnicity, but this category also includes individuals with an ethnicity categorized as "other" or indeterminable.

Research Methods

Prime-age adult mortality and pre-mortality SES: We use logistic regression to predict the probability of prime-age adult mortality within a household (2001-2003) as a function of the cross-sectional baseline measure of SES (2001). An aggregated measure of adult mortality is used in this analysis. Control variables include those described above.

Prime-age adult mortality and pre- to post-mortality change in SES: We use OLS regression to predict SES change as a function of prime-age adult mortality experience in the years 2001 to 2003. Control variables include those above in addition to the cross-sectional baseline measure of SES (2001).

Methodological Query: Finally, we conduct analyses to determine whether simply using post-mortality cross-sectional SES measures, without controls for pre-mortality SES, would lead one to erroneously infer the presence of a significant mortality effect on household SES. Again, the same suite of control variables is included.

Results

Adult mortality and pre-mortality SES

No significant relationships were found between prime-age adult deaths and any of our three measures of pre-mortality household SES. Households reporting a higher score on the agricultural goods SES index did show a decreased likelihood of experiencing an adult death (OR = 0.90; $p < 0.10$) until controls for household head characteristics were included; however, the appearance of a significant relationship between female headedness and mortality experience (OR = 1.25, $p < 0.10$) coincided with the disappearance of a significant relationship between such experience and agricultural SES.

With regard to additional controls, larger households showed a greater likelihood of experiencing a prime-age adult death (OR = 1.07, $p < 0.01$), while those with either an old or a young age composition showed a lesser likelihood (OR = 0.41, $p < 0.01$; and OR = 0.46, $p < 0.01$, respectively). This is expected, as having fewer household members, or a high proportion of either young or old household members, means less prime-age adults are present within the household.

Adult mortality and change in SES

For the common goods measure of SES, we found no significant relationship between adult mortality and a household's change in SES over the period studied. Interestingly, however, when pre-mortality SES, labor market participation, and grant and pension receipt were not simultaneously controlled in the same analyses, the non-AIDS-related death of the wife of a household head showed a negative, and relatively substantial, association with the pre- to post-

mortality change in household SES ($b = -0.51$, $p < 0.10$). This may be a result of these households' slightly higher pre-mortality SES compared to other study households, which, as upcoming results indicate, may have rendered them more prone to experience a loss in assets over the two year period.

For the agricultural goods SES index, a significant relationship was found between change in SES and the AIDS-related death of a female "other" ($b = 0.16$, $p < 0.10$). Interestingly, this coefficient is positive, indicating that households experiencing such a death were actually likely to gain agricultural goods after the death. This result may indicate these households are shifting their subsistence patterns to rely more heavily on agricultural products or that they are receiving aid from other households in the way of agricultural supplies. Of course, given the high number of analyses run in this study, we must also entertain the possibility that a portion of those findings significant at the ten percent level may be labeled so erroneously.

For the uncommon goods SES index, the AIDS-related death of a male "other" was the only type of mortality experience that showed a significant relationship with change in SES. Households experiencing such mortality were likely to show a slight decrease in uncommon goods after the death ($b = -0.04$, $p < 0.10$).

In general, these results suggest AIDS-related mortality is more likely to be associated with a change in household SES over the pre- to post-mortality period than is non-AIDS-related mortality; interestingly, however, this relationship is not always negative. Additionally, the death of a household member other than the head or wife of the head can substantially impact household SES, potentially more than that of a household member of higher status.

For all three SES measures, a greater SES in 2001 was associated with a decrease of approximately half an SES point between 2001 and 2003 (in all cases $p < 0.01$). This indicates

that those households with a higher SES are more prone to lose assets than are their less wealthy counterparts; perhaps they have expendable assets that they are able to use to cope with the household shock.

With regard to other controls, greater labor market participation in 2000 was associated with an increase in both consumer goods and, to a lesser extent, uncommon goods between 2001 and 2003 ($b = 0.25$, $p < 0.01$ and $b = 0.02$, $p < 0.01$, respectively). Receipt of a child grant in 2000 was associated with a very slight increase in the agricultural SES index and a very slight decrease in the uncommon goods index between 2001 and 2003 ($b = 0.04$, $p < 0.01$ and $b = -0.01$, $p < 0.01$, respectively). A higher sex ratio was associated with a decrease in SES over this time period for all indices ($b = -0.00$, $p < 0.01$; $b = -0.00$, $p < 0.01$; $b = -0.00$, $p < 0.10$), while a greater household size was associated with an increase in consumer goods and agricultural goods ($b = 0.03$, $p < 0.01$ and $b = 0.02$, $p < 0.01$, respectively). Female headedness was associated with a relatively substantial decrease in consumer goods and agricultural goods ($b = -0.26$, $p < 0.01$ and $b = -0.12$, $p < 0.01$, respectively), while South African headedness was associated with an increase in SES for all three indices ($b = 0.54$, $p < 0.01$; $b = 0.08$, $p < 0.01$, and $b = 0.01$, $p < 0.01$ for the consumer goods, agricultural, and uncommon goods indices, respectively).

Adult mortality and post-mortality SES

In all cases where a significant association appeared between post-mortality SES and adult deaths, these associations were positive. For the consumer goods SES index, a significant association was found between the death of the wife of a household head (whether AIDS related or not) and household SES ($b = 1.06$, $p < 0.05$; $b = 0.57$, $p < 0.10$). For the agricultural SES index, a significant association was found between the AIDS-related death of a female “other”

and household SES ($b = 0.20$, $p < 0.10$). Interestingly, the AIDS-related death of either a male or a female household head, as well as the non-AIDS-related death of a male household head, showed a significant negative relationship with household agricultural SES until the control variables for household characteristics (household size, sex ratio, and age composition) and characteristics of the household head (age, ethnicity, and gender) were added into the analysis. At that point, these effects became insignificant. For the uncommon goods SES index, there was a significant association between non-AIDS-related mortality of the wife of a household head and household SES ($b = 0.08$, $p < 0.05$).

With regard to control variables, greater labor market participation in 2000 was associated with more consumer goods and, to a lesser extent, more uncommon goods in 2003 ($b = 0.93$, $p < 0.01$ and $b = 0.03$, $p < 0.01$, respectively). Receipt of a greater number of student grants in 2000 was associated with a greater value for all three SES indices in 2003 ($b = 0.12$, $p < 0.01$; $b = 0.04$, $p < 0.01$, and $b = 0.01$, $p < 0.01$, for the consumer goods, agricultural, and uncommon goods indices, respectively), while receipt of a greater number of pensions was associated only with a greater value for agricultural goods in these same years ($b = 0.14$, $p < 0.01$). Receipt of a child grant in 2000 was associated with fewer consumer goods and uncommon goods and more agricultural goods (($b = -0.19$, $p < 0.01$; $b = -0.02$, $p < 0.01$, and $b = 0.06$, $p < 0.01$, respectively). A greater sex ratio in 2003 was associated with a lower SES in this same year for all three SES indices ($b = -0.00$, $p < 0.01$ for all three indices), while a greater household size was associated with a greater SES only for the consumer and agricultural goods indices ($b = 0.06$, $p < 0.01$ and $b = 0.04$, $p < 0.01$, respectively). Households with either an old or a young age composition in 2003 had fewer common goods ($b = -0.19$, $p < 0.01$ and $b = -0.15$, $p < 0.05$, respectively). Female headedness was associated with a lesser SES value for all three

indices in 2003, while South African headedness was associated with the opposite ($b = -0.70$, $p < 0.01$; $b = -0.26$, $p < 0.01$, and $b = -0.01$, $p < 0.01$ for female headedness; and $b = 1.23$, $p < 0.01$; $b = 0.19$, $p < 0.01$, and $b = 0.03$, $p < 0.01$ for South African headedness, for the consumer goods, agricultural, and uncommon goods indices, respectively). Elder headedness in 2003 was associated with a slightly higher SES for the agricultural and uncommon goods indices in that same year and the opposite for the consumer goods index ($b = 0.01$, $p < 0.01$; $b = 0.00$, $p < 0.05$, and $b = -0.00$, $p < 0.05$).

Discussion

As many authors have noted, most of the policy recommendations put forth to deal with the impacts of HIV/AIDS on rural communities have been grounded in uncertain knowledge – a situation that has endangered households attempting to cope with the disease (Jayne et al. 2006; Mather et al. 2005). For example, most publications to date have focused on labor shortages as the primary negative effect of HIV/AIDS mortality on rural households, and therefore proposed solutions have largely focused on labor-saving interventions such as the production of less labor-intensive crops, the development of technological adaptations such as lighter ploughs, and community-wide improvements to water and energy access (Gillespie and Haddad 2002; Haddad and Gillespie 2001; Piot et al. 2002). However, many studies have suggested that these policy decisions may be misguided, as mortality-affected rural households likely do not face the labor constraints it was long assumed they would (Dorward 2006; Jayne et al. 2005; Mather et al. 2005; Yamano and Jayne 2004). These studies reaffirm the need for more thorough research into the impacts of HIV/AIDS morbidity and mortality on rural households. Like the studies cited

above, our findings indicate that the association between mortality and SES in rural Africa is more nuanced than is often assumed.

Apparently, household SES is not a significant risk factor for prime-age adult death at the Agincourt Health and Demographic Surveillance Site, at least not when mortality for all household members, and from all causes, is aggregated. This finding is in line with many empirical studies finding weak or inconclusive relationships between SES and infection risk (Hargreaves et al. 2002; Wojciki 2005), even though it contradicts much of the current orthodoxy surrounding the association between SES and the disease (Fenton 2004; Hargreaves et al. 2002). Our results do not suggest that households in the rural South African context would not benefit from improved socioeconomic standing; rather, they indicate that SES may not be one of the factors on which selection into HIV/AIDS prevention programs should be based.

The impacts of adult mortality on the socioeconomic standing of households, as uncovered in this study, are similarly nuanced. Generally speaking, those households experiencing prime-age adult deaths did not experience a significant change in SES after the death, compared to other households. However, with regard to two household positions – both the male and the female "other" – AIDS-related mortality was found to affect SES. Interestingly, these impacts were in different directions, with male deaths generating a slight decrease in SES and female deaths an increase. In addition, the SES impacts of the mortality were relevant for different indices: uncommon goods for male "other" mortality and agricultural goods for the death of a female "other". Because both effects were relatively small and were only marginally significant, we must refrain from exaggerating the impact of these types of deaths; indeed, with the number of analyses run in this study, we would expect a portion to be mistakenly labeled significant at this level just by chance. Nonetheless, these findings indicate

that the effects of adult mortality on household socioeconomic status may vary by household position of the deceased, with those members other than the head or spouse of head potentially having a significant impact on household wellbeing. This is noteworthy as research often indicates the contrary, with mortality most greatly affecting household wellbeing when the individual is a household head or spouse of the head (Hunter et al. 2008; Yamano and Jayne 2004). Additionally, mortality of different household positions may affect households in different ways, as evidenced by the fact that the significant mortality effects uncovered in this study were relevant for different SES indices. These findings suggest we should avoid sweeping generalizations about the effects of mortality on SES.

A finding with particular importance for the methodology of studies examining change in SES following adult mortality is that failing to control for pre-mortality SES may produce faulty results. We found this to be the case for the non-AIDS-related death of the wife of a household head, which appeared to decrease households' consumer goods SES by approximately half a point until pre-mortality SES was taken into account. This supports Booysen and Arntz's (2003) argument and evidences the need to control for baseline levels in these types of analyses. In addition, analyses solely examining post-mortality SES suggest the inadequacy of this measure in characterizing the effects of mortality, as their results were incongruous with the more sophisticated analyses examining change in SES over the pre- to post-mortality period.

Baseline SES in 2001 showed a significant association with change in SES between 2001 and 2003 for all three SES measures; indeed, in each case, a higher baseline SES was associated with a significant decrease of approximately half a point between 2001 and 2003. This suggests that higher SES households are more likely to lose assets, perhaps for the simple reason that they have more assets to lose. Lower SES households, having fewer assets to spare, may absorb

shocks in other ways. Importantly, this may suggest the inadequacy of SES measures alone in measuring the impact of adult mortality on households, especially for those households with less wealth.

In general, our research suggests that, in rural South Africa, SES may not be a significant risk factor for prime-age adult mortality, and that an adult death may increase household SES, decrease household SES, or leave SES unchanged, depending on the household position and cause of death of the deceased, as well as the type of SES examined. With regard to methodology, this study reaches two important conclusions. First, when examining change in SES as an outcome of mortality experience, one must control for baseline SES, lest households with more assets be inappropriately targeted as most severely affected by such experience. Second, post-mortality SES is an inadequate outcome for capturing the impact of mortality on household standard of living. Only very slight changes in SES were observed in the current analyses. It is important to stress that the differences between mortality-affected households and their unaffected counterparts may be underestimated in this study because of the difficulties inherent in obtaining a truly unaffected, baseline population in an area where HIV infection rates exceed twenty percent (Booysen 2003; Jayne et al. 2006); indeed, households classified as "unaffected" may be assisting "affected" ones. Also, if higher SES households may be more prone to absorb mortality shocks by selling off assets, future research should ask what coping strategies lower SES households may resort to, and how we might capture these other effects.

References

Bachman, M. O., & Booysen, F. M. R. (2004). Relationships between HIV/AIDS, income and expenditure over time in deprived South African households. *AIDS Care*, *16*(7), 817-826.

Booysen, F. R., & Arntz, T. (2003). The methodology of HIV/AIDS impact studies: A review of current practices. *Social Science & Medicine*, *56*, 2391-2405.

Cogneau, D., & Grimm, M. (2006). Socioeconomic status, sexual behavior, and differential AIDS mortality: Evidence from Cote d'Ivoire. *Population Research Policy Review*, *25*, 393-407.

de Waal, A., & Tumushabe, J. (2003, February). HIV/AIDS and food security in Africa. *Report for DFID*.

de Waal, A., & Whiteside, A. (2003). New variant famine: AIDS and food crisis in southern Africa. *The Lancet*, *362*, 1234-1237.

Dorward, A. R., Mwale, I., & Tuseo, R. (2006). Labor market and wage impacts of HIV/AIDS in rural Malawi. *Review of Agricultural Economics*, *28*(3), 429-439.

Drimie, S. (2003). HIV/AIDS and land: Case studies from Kenya, Lesotho, and South Africa. *Development Southern Africa*, *20*(5), 647-658.

Dunkle, K. L., Jewkes, R. K., Brown, H. C., Gray, G. E., McIntryre, J. A., & Harlow, S. D. (2004). Transactional sex among women in Soweto, South Africa: Prevalence, risk factors and association with HIV infection. *Social Science & Medicine*, *59*, 1581-1592.

Fenton, L. (2004). Preventing HIV/AIDS through poverty reduction: The only sustainable solution? *The Lancet*, *364*, 1186-1187.

Gawaya, R. 2008. Investing in women farmers to eliminate food insecurity in southern Africa: policy-related research from Mozambique. *Gender and Development*, 16(1), 147-159.

Gillespie, S., & Haddad, L. (2002). AIDS and food security. *IFPRI 2001-2002 Annual Report*: Washington, D.C.

Goyer, K. C., & Gow, J. (2001). Transmission of HIV in South African prisoners: Risk variables. *Society in Transition*, *32*(1), 128-132.

Haddad, L., & Gillespie, S. (2001). Effective food and nutrition policy responses to HIV/AIDS: What we know and what we need to know. *Journal of International Development*, *13*, 487-511.

Hallman, K. (2005). Gendered socioeconomic conditions: HIV and risk behaviours among young people in South Africa. *African Journal of AIDS Research*, *4*(1), 37-50.

Hargreaves, J. R., Morison, L. A., Chenge, J., Rutenburg, N., Kahindo, M., Weiss, H. A., Hayes, R., & Buve, A. (2002). Socioeconomic status and risk of HIV infection in an urban population in Kenya. *Tropical Medicine and International Health*, *7*(9), 793-802.

Hunter, L.M., Patterson, L., & Twine, W. 2008. HIV/AIDS, food security and the role of the natural environment: Evidence from the Agincourt Health and Demographic Surveillance Site in rural South Africa. Working paper.

Jayne, T. S., Chapoto, A., Byron, E., Ndiyoi, M., Hamazakaza, P., Kadiyala, S., & Gillespie, S. (2006). Community-level impacts of AIDS-related mortality: Panel survey evidence from Zambia. *Review of Agricultural Economics*, *28*(3), 440-457.

Jayne, T. S., Villarreal, M., Pingali, P., & Hemrich, G. (2005). HIV/AIDS and the agricultural sector: Implications for policy in Eastern and Southern Africa. *Journal of Agricultural and Development Economics*, *2*(2), 158-181.

Kahn, K., Tollman, S. M., Collinson, M. A., Clark, S. J., Twine, R., Clark, B. D., Shabangu, M., Gomez-Olive, F. X., Mokoena, O., & Garenne, M. L. (2007). Research into health, population and social transitions in rural South Africa: Data and methods of the Agincourt Health and Demographic Surveillance System. *Scandinavian Journal of Public Health*, *69*(35), 8-20.

Kahn, K., Tollman, S. M., Garenne, M., & Gear, J. S. S. (1999). Who dies from what? Determining cause of death in South Africa's rural north-east. *Tropical Medicine and International Health*, *4*(6), 433-441.

Kengni, E., Mbofung, C. M. F., Tchouanguep, M. F., & Tchoundjeu, 2004. The nutritional role of indigenous foods in mitigating the HIV/AIDS crisis in West and Central Africa. *International Forestry Review*, *6*(2), 149-160.

Knodel, J., Zimmer, Z., Kim, K. S., & Puch, S. (2007). The effects on elderly parents in Cambodia of losing an adult child to AIDS. *Population and Development Review*, *33*(3), 479-500.

Mather, D., Donovan, C., Jayne, T., & Weber, M. (2005). Using empirical information in the era of HIV/AIDS to inform mitigation and rural development strategies: Selected results from African country studies. *American Journal of Agricultural Economics*, *87*(5), 1289-1297.

Mather, D., Marrule, H., Donovan, C., Weber, M., & Alage, A. (2004). *Household responses to prime age adult mortality in rural Mozambique: Implications for HIV/AIDS mitigation efforts and rural economic development policies*. Maputo: MADER Directorate of Economics, Department of Policy Analysis (MADER/DE/DAP).

Ngalula, J., Urassa, M., Mwaluko, G., Isingo, R., & Boerma, J. T. (2002). Health service use and household expenditure during terminal illness due to AIDS in rural Tanzania. *Tropical Medicine and International Health*, *7*(10), 873-877.

Piot, P., & Andersen, P. (2002). AIDS and food security. *IFPRI 2001-2002 Annual Report:* Washington, D.C.

Santo, M. E. G. D., & Etheredge, G. D. (2004). And then I became a prostitute... Some aspects of prostitution and brothel prostitutes in Dakar, Senegal. *Social Science Journal*, *41*, 137-146.

Tekola, F., Reniers, G., Mariam, H., Araya, T., & Davey, G. 2008. The economic impact of HIV/AIDS morbidity and mortality on households in Addis Ababa, Ethiopia. *AIDS Care*, 20(8), 995-1001.

UNAIDS. 2006. UNAIDS/WHO AIDS Epidemic Update: December 2006. UNAIDS: Geneva, Switzerland.

White, J., & Robinson, E. (2000). *HIV/AIDS and rural livelihoods in sub-Saharan Africa (*Policy Series No. 6). Natural Resource Institute, University of Greenwich.

Wojcicki, J. M. (2005). Socioeconomic status as a risk factor for HIV infection in women in east, central and southern Africa: A systematic review. *Journal of Biosocial Science*, *37*, 1-36.

Yamano, T., & Jayne, T. S. (2004). Measuring the impacts of working age adult mortality among small-scale farm households in Kenya. *World Development*, *32*(1), 91-119.

Table 1. Descriptive Profiles of Selected Dependent and Independent Variables

Variable	Mean	Min	Max	N
Mortality				
Male head - AIDS	0.002	0	1	12,145
Female head - AIDS	0.002	0	1	12,145
Male "other" - AIDS	0.005	0	1	12,145
Female "other" - AIDS	0.007	0	1	12,145
Wife - AIDS	0.001	0	1	12,145
Male head - non-AIDS	0.005	0	1	12,145
Female head - non-AIDS	0.001	0	1	12,145
Male "other" - non-AIDS	0.008	0	1	12,145
Female "other" - non-AIDS	0.006	0	1	12,145
Wife - non-AIDS	0.002	0	1	12,145
SES				
Common goods index 2001	2.57	0	8	10,046
Agricultural goods index 2001	1.03	0	5	10,046
Uncommon goods index 2001	0.05	0	2	10,046
Common goods index 2003	2.54	0	8	11,255
Agricultural goods index 2003	0.84	0	5	11,255
Uncommon goods index 2003	0.03	0	3	11,255
Change in common goods index 01-03	0.07	-7	5	10,025
Change in agricultural goods index 01-03	-0.14	-4	4	10,025
Change in uncommon goods index 01-03	-0.02	-2	2	10,025
Employment and grant and pension receipt				
Labor market participation	0.29	0	1	12,145
Number of student grants	1.4	0	19	12,145
Number of pensions	0.21	0	4	12,145
Receipt of child grant	0.51	0	1	12,000
Household characteristics				
Sex ratio	162.62	0	1,000	12,145
Household size	7.4	1	48	12,145
Old age composition	0.1	0	1	12,145
Young age composition	0.1	0	1	12,145
Head characteristics				
Head age	49.95	8.4	101.32	10,194
Female head	0.33	0	1	10,194
South African head	0.72	0	1	10,189

Table 2. Logistic Regressions for the Effects of SES on Adult Mortality Experience

Adult mortality experience	OR	OR	OR	OR
SES				
Common goods index 2001	1.05	1.03	1.01	1.03
Agricultural goods index 2001	1.02	0.94	0.90*	0.92
Uncommon goods index 2001	0.68	0.70	0.75	0.76
Employment and grant and pension receipt				
Labor market participation		0.73	0.80	0.80
Number of student grants		1.14***	0.99	0.99
Number of pensions		1.15	1.19*	1.18
Receipt of child grant		1.20*	0.99	0.99
Household characteristics				
Sex ratio			1.00	1.00
Household size			1.07***	1.07***
Old age composition			0.42***	0.41***
Young age composition			0.46***	0.46***
Head characteristics				
Head age				1.00
Female head				1.25*
South African head				0.88
N	9,734	9,734	9,734	9,734
r-squared	0.001	0.01	0.03	0.03

** p < 0.10; ** p < 0.05; *** p < 0.01*

Table 3. Linear Regressions for the Effects of Adult Mortality Experience on Change in SES over Pre- to Post- Mortality Period

	Common goods				Agricultural goods				Uncommon goods			
Change in SES	b	b	b	b	b	b	b	b	b	b	b	b
Mortality												
Male head - AIDS	-0.12	-0.12	-0.11	-0.07	-0.03	-0.23	-0.17	-0.02	0.08	0.03	0.03	0.03
Female head - AIDS	-0.16	-0.29	-0.28	-0.32	-0.11	-0.29*	-0.25	-0.15	-0.07	-0.04	-0.04	-0.03
Male "other" - AIDS	-0.12	-0.15	-0.17	-0.09	-0.10	0.05	0.02	0.00	-0.06*	-0.04*	-0.04*	-0.04*
Female "other" - AIDS	-0.05	-0.05	-0.06	-0.02	0.12	0.16*	0.16*	0.16*	0.04	0.01	0.01	0.01
Wife - AIDS	-0.51	-0.11	-0.03	0.09	-0.01	-0.11	-0.12	-0.08	-0.02	-0.01	-0.01	-0.01
Male head - non-AIDS	0.04	-0.08	-0.08	0.04	-0.05	-0.16	-0.14	-0.03	0.02	-0.01	-0.01	-0.01
Female head - non-AIDS	0.36	0.01	0.01	0.09	-0.21	-0.28	-0.24	-0.07	0.02	-0.01	-0.01	0.00
Male "other" - non-AIDS	-0.17	-0.13	-0.13	-0.12	0.04	0.02	0.01	-0.01	0.01	0.00	0.00	0.00
Female "other" - non-AIDS	-0.11	-0.08	-0.06	-0.02	0.13	0.13	0.13	0.13	0.00	-0.02	-0.02	-0.02
Wife - non-AIDS	-0.51*	-0.14	-0.14	-0.09	0.22	0.20	0.18	0.16	-0.02	0.05	0.05	0.05
Employment and grant and pension receipt												
SES 2001		-0.31***	-0.32***	-0.36***		-0.41***	-0.42***	-0.45***		-0.62***	-0.62***	-0.63***
Labor market participation		0.13***	0.19***	0.25***		0.00	0.01	0.00		0.02***	0.02***	0.02***
Number of student grants		0.06***	0.03***	0.01		0.04***	0.01	0.00		0.00***	0.00***	0.00**
Number of pensions		-0.02	0.03	0.02		0.10***	0.09***	0.02		0.00	0.00	0.00
Receipt of child grant		0.07***	-0.04	-0.05		0.09***	0.03**	0.04***		-0.01***	-0.01***	-0.01***
Household characteristics												
Sex ratio			0.00***	0.00***			0.00*	0.00***			0.00	0.00*
Household size			0.01***	0.03***			0.02***	0.02***			0.00	0.00
Old age composition			-0.17***	-0.06			0.11***	0.03			-0.01	-0.01
Young age composition			-0.08	-0.09*			-0.03	0.00			0.00	0.00
Head characteristics												
Head age				0.00**				0.01***				0.00
Female head				-0.26***				-0.12***				0.00
South African head				0.54***				0.08***				0.01***
Constant	0.07***	0.70***	0.82***	0.65***	-0.14***	0.15***	0.07***	-0.19***	-0.02***	0.00	0.01	0.00
N	9,944	9,944	9,944	9,944	9,944	9,944	9,944	9,944	9,944	9,944	9,944	9,944
r-squared	0.001	0.16	0.17	0.20	0.001	0.24	0.25	0.26	0.001	0.44	0.44	0.44

** p < 0.10; ** p < 0.05; *** p < 0.01*

Table 4. Linear Regressions for the Effects of Adult Mortality Experience on Post-Mortality SES

	Common goods				Agricultural goods				Uncommon goods			
Post-Mortality SES	b	b	b	b	b	b	b	b	b	b	b	b
Mortality												
Male head - AIDS	-0.08	-0.11	-0.16	0.07	-0.59**	-0.48**	-0.35	0.01	0.00	0.00	0.00	0.01
Female head - AIDS	-0.58	-0.61	-0.56	-0.60	-0.62***	-0.52**	-0.44**	-0.21	-0.02	-0.02	-0.02	-0.01
Male "other" - AIDS	-0.07	-0.26	-0.26	-0.07	0.36**	0.22	0.15	0.11	-0.03	-0.03	-0.03	-0.03
Female "other" - AIDS	0.12	-0.02	-0.06	0.02	0.37***	0.21*	0.21*	0.20*	-0.01	-0.01	-0.01	-0.01
Wife - AIDS	0.60	0.81*	0.95**	1.06**	-0.40	-0.20	-0.24	-0.14	-0.01	-0.01	0.00	0.00
Male head - non-AIDS	-0.16	-0.27	-0.26	0.15	-0.28**	-0.30***	-0.26**	-0.02	-0.03	-0.03	-0.03	-0.02
Female head - non-AIDS	-0.72	-0.75	-0.70	-0.36	-0.43*	-0.37	-0.28	0.07	-0.02	-0.02	-0.02	-0.01
Male "other" - non-AIDS	0.10	-0.07	-0.08	-0.03	0.14	-0.02	-0.04	-0.07	0.00	0.00	0.00	0.00
Female "other" - non-AIDS	0.07	-0.03	0.01	0.10	0.26**	0.14	0.13	0.13	-0.03	-0.03	-0.03	-0.03
Wife - non-AIDS	0.54	0.59*	0.57*	0.57*	0.08	0.16	0.12	0.11	0.07**	0.07**	0.07**	0.08**
Employment and grant and pension receipt												
Labor market participation		0.81***	0.92***	0.93***		0.05*	0.06**	0.01		0.03***	0.03***	0.03***
Number of student grants		0.25***	0.17***	0.12***		0.12***	0.05***	0.04***		0.01***	0.01***	0.01***
Number of pensions		-0.03	0.09**	0.03		0.36***	0.30***	0.14***		0.00	0.01**	0.00
Receipt of child grant		0.05	-0.20***	-0.19***		0.15***	0.03*	0.06***		-0.01***	-0.02***	-0.02***
Household characteristics												
Sex ratio			0.00***	0.00***			0.00*	0.00***			0.00***	0.00***
Household size			0.03***	0.06***			0.05***	0.04***			0.00	0.00
Old age composition			-0.47***	-0.19***			0.22***	0.04			-0.01	-0.01
Young age composition			-0.16**	-0.15**			-0.03	0.03			0.00	0.00
Head characteristics												
Head age				0.00**				0.01***				0.00**
Female head				-0.70***				-0.26***				-0.01***
South African head				1.23***				0.19***				0.03***
Constant	2.55***	1.91***	2.10***	1.53***	0.85***	0.51***	0.31***	-0.29***	0.03***	0.01***	0.02***	-0.01
N	11,023	11,023	11,023	11,023	11,023	11,023	11,023	11,023	11,023	11,023	11,023	11,023
r-squared	0.001	0.07	0.10	0.21	0.003	0.11	0.14	0.19	0.001	0.01	0.01	0.02

** p < 0.10; ** p < 0.05; *** p < 0.01*