
FOOD SECURITY RESEARCH PROJECT

**SECURITY OF WIDOWS' ACCESS TO LAND IN
THE ERA OF HIV/AIDS: PANEL SURVEY
EVIDENCE FROM ZAMBIA (REVISED VERSION)**

By

Antony Chapoto, T.S. Jayne, N. Mason

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EXECUTIVE SUMMARY

Beyond the obvious catastrophic effects of the HIV/AIDS pandemic on mortality, demographic changes, and the suffering of individuals and their families, we are still only learning about the complex longer-term effects of the pandemic on poverty and vulnerability. For example, the HIV/AIDS pandemic has substantially increased the number of widow-headed households in Africa. Many narratives and qualitative studies highlight gender inequalities in property rights and the difficulties that widows face in retaining access to land after the death of their husbands. HIV/AIDS has undoubtedly exacerbated such problems. However, to date, there is virtually no quantitative evidence on the proportion of widows who lose their land after the death of their husbands, whether they lose all or part of that land, and whether certain characteristics of the widow, her deceased husband, and/or her household influence the likelihood of her losing land rights. Because the number of widows is growing rapidly in areas hard hit by HIV/AIDS, there is an urgent need to understand the magnitude of the problem and the degree to which it is exacerbating rural poverty.

Using nationally-representative panel data of 5,342 rural households in Zambia, surveyed in 2001 and 2004 we measure changes in landholding size among households becoming widow-headed after 2001. We estimate difference-in-difference models using male-headed households not experiencing any prime-age mortality during the survey interval as the control group. The difference-in-difference approach and the use of time/village dummy variables control for unobserved household characteristics and exogenous community shocks. This longitudinal data is particularly well suited to understand the factors associated with changes in widow-headed households' conditions, first because of its nationally-representative nature and also because the surveys include a rich set of information on individual kinship ties, the length of settlement of the household in the village, and other retrospective information not commonly collected in economic surveys. This social information provides an ability to examine whether changes in land access over time differ by initial household characteristics, attributes of the widow, social capital, and community characteristics such as matrilineal versus patrilineal inheritance institutions.

The analysis yields a number of noteworthy findings that may help guide efforts to safeguard widows' rights to land through land tenure innovations and social protection:

First, more than 66 percent of the households that suffered the death of the male household head and became headed by a widow after the 2001 survey did indeed have less land (defined by the sum of cultivated and fallow land) in 2004 than in 2001. Over 30 percent of the widow-headed households controlled less than half of land they had before the death of the male head. Other factors constant, landholdings declined by 3.6 percent among non-afflicted households, by 8.5 percent among households experiencing the death of a prime-age adult other than the male head, and by 34.6 percent among households experiencing male head-of-household death and becoming widow-headed. Of the three groups, widow-headed households were the least likely to increase the size of their landholdings and the most likely to suffer a greater than 50 percent decline in cropped area. However, it is worth noting that 37.5 percent of widow-headed households were able to retain or increase the amount of their landholding size, indicating that the loss of land by widows and their dependents is far from universal.

Second, the econometric results show that older widows are to some extent protected against the loss of land compared to younger widows. Landholding size declined by 29.9 percent among households headed by a widow aged 50 or above compared to a 54.8 percent decline

among households headed by a widow age below the age of 38, holding all other variables at their mean levels. This could reflect assumptions implicit in traditional land inheritance laws that younger women are more likely to remarry and gain access to a new husband's land, thereby obviating the need for her to retain the deceased husband's land. However, this does not appear to be the case in this nationally representative sample from Zambia, at least in the short run. Because the surveys recorded the name of the individuals in the family in both surveys, we were able to determine whether widows left their homes after the death of their husbands. We found that 100 percent of the wives of the household head in the initial 2001 survey were still resident at the household in 2004 after having become widowed in the interim. Additional longitudinal surveys will be necessary to track these individuals and determine how many continue to reside on their farms in subsequent years. Notwithstanding the potential for widows to acquire use rights to land through remarriage, it appears that widow-headed households suffer a non-marginal decline in landholdings regardless of the age of the widow, at least within a 1-3 year period after the death of their husbands.

Third, the results do not suggest any differential impact on land loss according to the education level of the widow. All of the education level variables are statistically insignificant even at a 20 percent level of significance.

Fourth, if we use the initial number of prime-age adults as an indicator of available household labor, our results show that in contrast to the conventional wisdom, having more prime-age males, females and/or children in the household does not protect the widow from losing land access after the death of her husband. These findings indicate that labor shortages due to mortality are not a cause of the reduction in landholding size among widow-headed households.

Fifth, the greatest decline in landholding size is among widow-headed households that were relatively wealthy prior to the death of the husband. The initial mean 2000/01 value of assets, value of livestock, off-farm income, and income is substantially higher among widow-headed households experiencing a greater than 50 percent decline in landholding size compared to other widow-headed households. Widows whose households were relatively well off compared to other households in the community prior to the husband's death appear to have the most property to lose. However, the programmatic implications of this result are unclear; one might argue that special assistance should be targeted to widow-headed households, or any other kind of household, that are currently the poorest.

Sixth, widows whose family has kinship ties to the village authorities are less likely to lose land. Other factors held constant, landholdings declined by 24.3 percent when the widow was related to the headman and by 66.4 percent if not. This finding suggests that widows with kinship ties to the headman have some protection of their rights to property and assets including land. This finding underscores the importance of social relations within the community in influencing land tenure and allocation decisions.

Seventh, the duration of a household's settlement in the locality tends to exacerbate widow's ability to retain land. Although, the result is weakly statistically significant, the greater the number of years settled in the village, the greater the percentage decline in landholding size. This finding may indicate that the longer an extended family has settled in an area, the greater the number of relatives who are likely to lay claim on the deceased husband's estate. Finally, contrary to the *a priori* expectation that widows living in matrilineal villages have some protection against loss of land, our results show that there appears to be no difference

between widows living in matrilineal versus patrilineal villages; both are equally at risk of losing their rights to productive assets including land to their husbands' brothers and/or uncles.

The view that widows and their dependents face greater livelihood risks in the era of HIV/AIDS is indeed supported by nationally-representative survey results from Zambia. Efforts to safeguard widows' rights to land through land tenure innovations involving community authorities may be an important component of social protection, poverty alleviation, and HIV/AIDS mitigation strategies. Several of the findings reported above show the influence of local traditional authorities in affecting the extent to which widows are able to retain land. Increased government commitment to ensure security of widows' access to land is another approach, but initial evaluations of government efforts provide mixed evidence (see Izumi, 2006). Government decrees appear to have little impact if local community authorities are not part of the agreement. But certainly, national governments, donors, and NGOs have an important role to play in developing programs to work with local authorities to protect widows and children against property grabbing by relatives of the deceased as well as to institute property rights that are more compatible with social protection and anti-poverty objectives in the era of AIDS.

1.0 INTRODUCTION

Beyond the obvious catastrophic effects of the HIV/AIDS pandemic on mortality, demographic changes, and the suffering of individuals and their families, we are still only learning about the complex longer-term effects of the pandemic on poverty and vulnerability. For example, the HIV/AIDS pandemic has substantially increased the number of widow-headed households in Africa. Many narratives and qualitative studies highlight gender inequalities in property rights and the difficulties that widows face in retaining access to land after the death of their husbands. HIV/AIDS has undoubtedly exacerbated such problems. However, to date, there is virtually no quantitative evidence on the proportion of widows who lose their land after the death of their husbands, whether they lose all or part of that land, and whether certain characteristics of the widow, her deceased husband, and/or her household influence the likelihood of her losing land rights. Because the number of widows is growing rapidly in areas hard hit by HIV/AIDS, there is an urgent need to understand the magnitude of the problem and the degree to which it is exacerbating rural poverty.¹ Such information may have important implications for poverty alleviation programs. For example, if widow-headed households constitute a relatively large group whose ability to retain and cultivate land is imperiled, then this would suggest the need for much greater attention to gender issues underlying local institutions and property rights as part of comprehensive rural poverty reduction programs.

This study uses nationally-representative panel data of 5,342 rural households in Zambia, surveyed in 2001 and 2004, to measure changes in landholding size among households becoming widow-headed after 2001. We estimate difference-in-difference models using male-headed households not experiencing any prime-age mortality during the survey interval as the control group. The difference-in-difference approach and the use of time/village dummy variables control for unobserved household characteristics and exogenous community shocks. This longitudinal data is particularly well suited to understand the factors associated with changes in widow-headed households' conditions, first because of its nationally-representative nature and also because the surveys include a rich set of information on individual kinship ties, the length of settlement of the household in the village, and other retrospective information not commonly collected in economic surveys. This social information provides an ability to examine whether changes in land access over time differ by initial household characteristics, attributes of the widow, social capital, and community characteristics such as matrilineal versus patrilineal inheritance institutions.

Section 2 briefly describes land inheritance patterns in Zambia and perceptions of pressures for change. This is followed by a description of the data, sample attrition issues, and estimation methods in Section 3. Section 4 presents estimation results and their interpretation. Section 5 discusses the conclusions and implications for donor and government policy.

¹ The few qualitative studies give somewhat conflicting evidence. Izumi (2006) find that widows experiencing land and property disputes with their in-laws is common throughout eastern and southern Africa. Von Struensee (2004) reviews available literature on the topic and the massive hardships that many widows have faced in east Africa, but there is little information reported on the proportion of widows who actually lose access to land. By contrast, a study of the relationship between land tenure insecurity and HIV/AIDS in three villages in Kenya in 2002 found little evidence that HIV/AIDS is a major cause of land tenure loss by widows in AIDS-afflicted households (Aliber and Walker, 2006). Although HIV/AIDS may make widow-headed households more vulnerable to land tenure loss, other factors such as poverty, population growth, and disempowerment of women were more important drivers of land tenure insecurity, at least in this particular study. The Aliber and Walker study, however, was based on only three villages and the small number of AIDS-affected widows interviewed (n=15) limits the extent to which the findings can be generalized to Kenya or the region.

2.0 LAND INHERITANCE PATTERNS IN ZAMBIA

Access to land is an important indicator of welfare among rural farm households (Jayne et al., 2003). It is an especially critical source of livelihood for women. In Southern Africa, 60 percent of small farmers are women and women make up about 75 percent of the food production and processing workforce (UNECA, 2003). But in Zambia, as in almost all of Sub-Saharan Africa, women rarely own or have control over land (WLSA, 1997; Shezongo-Macmillan, 2005; UNECA, 2003).

Two land tenure systems exist in Zambia: the customary system and the statutory system. Under the customary system, traditional authorities, such as the chief and/or village headman, allocate vacant land to families and individuals. Under the statutory system, individual land owners have title deeds to their land and can sell, rent, mortgage or transfer that land (Republic of Zambia, 2005). According to the Zambian Ministry of Lands, 94 percent of the land area in the country is controlled by the customary system whilst 6 percent is controlled by the statutory system (Ministry of Lands, 2002; Machina, 2002).

Under customary law, a wife cannot inherit land or other property from her husband and tribal authorities rarely allocate land directly to women (Mutangadura, 2004). Although in principle Zambian women can request land (under both the statutory and customary systems), in reality, women are disadvantaged in terms of access to, as well as ownership and control over, land (Machina, 2002). Land and other property and productive assets are normally inherited by the deceased man's male family members (WLSA, 1997; Armstrong, 1992; Milimo, 1990). "Family" in a patrilineal (matrilineal) society is defined by the blood line of the father (mother) to his (her) male children. Women entering the family through marriage acquire use rights to land through their husbands.

Focus group discussions of men from the region indicate a perception that they do not feel that the land is individually "theirs" (Opiyo, 2001; see also Shezongo-Macmillan, 2005). It is the family's land and the ancestors' of the family. If a man arranges to transfer his family's ancestral land out of the family to someone outside his family (e.g., to his wife), this would be a taboo, and he invites retribution by the ancestors (Opiyo, 2001). These traditions and perceptions introduce psychological, religious, and social constraints on transferring land to women.

Under statutory law, women have the right to own land but titles tend to be passed through male relatives in both matrilineal and patrilineal systems (Republic of Zambia, 2005). Socio-economic and cultural factors such as illiteracy, the high cost of land, lack of capital, and patriarchal attitudes among men and civil servants prevent women from applying to lease or own land (UNECA, 2003; Keller, 2000; Republic of Zambia, 2005).

Historically, customary law safeguarded women's access to land albeit with limited rights of control over it. Access was always only through a male relative, normally the husband, father, brother, and/or uncle (Shezongo-Macmillan, 2005). However, these safeguards may be at risk due to reports of increased property grabbing (von Stuenkel, 2004). For example, Kajoba (2002), in a study undertaken in a village community in Chibombo District in Central Province, found that women complained that they lost their land after their husbands' death and in some cases they were told to vacate the village and go back to their natal homes. Furthermore, according to Article 23 of the Republican Constitution of 1991, amended in 1996, discrimination on the basis of sex is forbidden by law; however, the Constitution explicitly excludes from this provision

customary laws related to property inheritance (Keller, 2000). Thus, women's access to and security to land is greatly limited despite the Intestate Succession Act (1989), which allows the surviving spouse to inherit 20 percent of the deceased's estate and, together with the children, the house (Milimo 1990). Recent changes to land policy in Zambia attempt to address the gender imbalance in land ownership. Specifically, the Ministry of Land now "requires that at least 30% of the plots which have been created be allocated to women" and also allows women to compete with men for the remaining 70% of allocated plots (Republic of Zambia, 2006). Civil society groups consulted about the new land policy insist that the 30% allocation is still too little to fully satisfy the demand for land by women (Zambia Land Alliance, 2005) – a claim that is supported by reports in the Times of Zambia of the demand for land by women outstripping supply (Times of Zambia, 2007).

Despite these recent policy changes, cultural norms and practices among most matrilineal and patrilineal ethnic groups tend to reinforce the lack of women's direct access to, control over, and ownership of land in Zambia, likely because most rural marriages in Zambia are virilocal (Republic of Zambia, 2005; Milimo, 1990; Mutangadura, 2004, ECA-SA, 2003). In virilocal marriages, the wife settles in the husband's village. In such marriages, when the woman's husband dies or the marriage ends in divorce, the woman may lose access to the land in her husband's village, which would compel her to return to her natal village (Milimo, 1990; Machina, 2002; Mutangadura, 2004). However, she may have lost access to land in her natal village if she lived away in her husband's village for an extended period (Milimo, 1990). In matrilineal systems with uxori-local marriages, meaning the husband settles in the wife's village, women generally have more secure land use and control rights (Republic of Zambia, 2005). For example, if the woman's husband dies or the couple divorces, the widow is entitled to retain as much of the land as she desires (Machina, 2002).

There is much concern about widows' land tenure insecurity in Zambia, particularly when the husband's death is attributed to HIV/AIDS. This is reflected in the comments and recommendations of civil society in response to the Draft Land Policy (Zambia Land Alliance, 2005) as well as in the popular press in headlines such as "HIV/AIDS impact subjects women to property grabbing" and in comments by the Zambian Minister of Gender in Development (Times of Zambia, 2007). Thus, the current analysis is relevant not only to policy makers and donors but also to civil society and the Zambian public in general.

3.0 DATA AND METHODS

3.1. Data

The study's findings are based on nationally representative longitudinal survey data on 5,342 rural households in 394 standard enumeration areas (SEAs)² in Zambia surveyed in May 2001 and May 2004. The survey was carried out by the Central Statistical Office (CSO) in conjunction with the Ministry of Agriculture and Cooperatives (MACO) and Michigan State University. The survey covered the 1999/00 crop year, surveying respondents on their cropping patterns, crop and livestock production and marketing, asset levels, sources of income, and a variety of retrospective and current socio-demographic information on all resident household members. The valid sample size was 6,844 households. These households were revisited again in May/June 2004. Of these, 5,342 households were successfully re-interviewed. Enumerators revisiting these households asked for the whereabouts of the members included in the demographic roster of the initial 2001 survey, and recorded cases of death and illness, departure, and new arrival of individual members. For more details about survey design and sampling procedures see Megill (2004).

3.2 Sample size and attrition

Of the 6,922 households interviewed in 2001, 5,420 were re-interviewed in May 2004. However, 78 households did not appear to be the same households interviewed in 2001 so are excluded from this analysis. This leaves us with 5,342 households (78.1 percent of the original sample) successfully re-interviewed in 2004. If we exclude attrition resulting from several SEAs included in the 2001 survey not being re-visited in 2004, the re-interview rate rises to 88.9 percent. And if attrition caused by adult household members being away from home during the enumeration period and those refusing to be interviewed is excluded, the re-interview rate rises to 94.7 percent.

Table 1 presents basic information on the households surveyed, re-interview rates, and the prevalence of disease-related mortality by gender and position in the household over the 2001-2004 period. Of the 5,342 households successfully re-interviewed, 565 households had at least one prime-age (PA) death over the three-year period, of which 542 were "disease-related" according to respondents, as opposed to accidents or homicides (n=23). Six households had deaths due to both causes. Of the 542 households experiencing disease-related prime-age mortality,³ 91 households experienced male head-of-household death and of these, 73 households became widow-headed. The other 18 households experiencing male head-of-household mortality were reportedly headed by other household members in 2004; six were headed by the son and one by the brother of the widow. To ensure that we are tracking the same households between the two surveys, we used the demographic information enumerated in 2001 and 2004 to match the name, age and education of the wife (now widow) heading the household. Our main interest in this paper is the 73 households which became widow-headed since the first survey in 2001.⁴

² "Standard enumeration areas" (SEAs) are the lowest geographic sampling unit in the Central Statistical Office's sampling framework for its annual Post Harvest Surveys. Each SEA contains roughly 150 to 200 rural households.

³ This paper follows the taxonomy convention of Barnett and Whiteside (2002): "Afflicted" households are those that have incurred a prime-age death among resident household members; households that have not directly suffered a death but are nevertheless affected by the impacts of death in the broader community or extended family are referred to in this study as "affected." The term "non-affected" in our view is probably meaningless in most of eastern and southern Africa because it is doubtful that there are any households in this region that have not been indirectly affected by HIV/AIDS, especially in the more hard-hit communities of the region.

⁴ See Chapoto and Jayne (2008) for results of the impact of illness-related mortality on rural household livelihoods stratified by gender and position of the deceased in the household.

Table 2 presents the relationship between household attrition, dissolution, and household size in 2001. The findings show that the percentage of households “attriting” is inversely related to household size (column C). While 8.5 percent of the households sampled in 2001 contained either one or two members, these households accounted for over 12 percent of the cases of attrition and 19 percent of the cases of household dissolution. In contrast, about 65 percent of the sample contained households with 5 or more members and among these households only 47 percent of attrition due to dissolution is observed.

Table 1. Prime-age mortality^a by province, rural Zambia between 2001 and 2004.

Province	Households interviewed in 2001	Households re-interviewed in 2004 ^b	Household incurring at least one prime-age death due to illness ^c				
			total ^d	male head	female head /spouse	other females	other males
			(c)	(d)	(e)	(f)	(g)
Central	713	572 (80.2)	65	14	13	22	20
Copperbelt	388	307 (79.1)	28	3	6	10	9
Eastern	1328	1123 (84.6)	128	21	21	52	48
Luapula	771	613 (79.5)	51	13	15	14	11
Lusaka	213	160 (75.1)	27	4	8	12	4
Northern	1342	1006 (74.9)	84	17	13	33	25
Northwestern	467	319 (68.3)	22	4	1	6	11
Southern	839	656 (78.1)	78	9	19	34	25
Western	784	586 (74.7)	59	6	26	19	14
Total	6884	5342 (78.0)	542	91	122	202	167

Source: CSO/MACO/FSRP Post Harvest Survey 1999/2000 and Supplemental Survey, 2001 and 2004.

Notes: ^aPrime-age (PA) is defined as ages 15-59 for both men and women. ^bOf the 21.7% not re-interviewed, 0.2% were refusals, 10.2% moved out of SEA, 5.7% were recorded as dissolved, and 5.2% were categorized as “non-contact” (not home but still resident). ^cDescriptive results in 5,342 valid re-interviewed households. ^d542 households have at least one disease-related PA death, 52 of them suffered multiple PA death, with 44 households experiencing 2 deaths, 6 households experiencing 3 deaths and 2 households experiencing 4 deaths. Of those households experiencing multiple PA deaths, 15 households experienced more than one male death and 16 households had more than one female death.

Table 2. Relationship between household size, attrition, dissolution, and PA mortality in 2001-2004.

Household Size	Households in 2001 sample	Households attriting in 2001-2004	Households attriting due to dissolution	Households dissolving as % of 2001 sample	Households dissolving as % of households attriting	Among re-interviewed households	
						Households incurring PA mortality	Households incurring PA mortality as % of re-interviewed household
(A) number	(B) number	(C) number	(D) number	(E) ^a (%)	(F) ^b (%)	(G) ^c number	(H) ^d (%)
1	201	71	30	14.9	42.3	3	2.3
2	383	118	45	11.7	38.1	24	9.1
3	781	194	55	7.0	28.4	44	7.5
4	1011	266	77	7.6	28.9	58	7.8
5	1030	223	47	4.6	21.1	81	10.0
6	920	214	47	5.1	22.0	68	9.6
7	728	125	33	4.5	26.4	54	9.0
8	596	106	22	3.7	20.8	64	13.1
9	377	68	11	2.9	16.2	34	11.0
≥10	818	118	23	2.8	19.5	112	16.0
Total	6845	1503	390	-	-	542	-

Source: Chapoto and Jayne (2008) using data from the CSO/MACO/FSRP Post Harvest Survey 1999/2000 and Supplemental Surveys, 2001 and 2004.

Notes: ^aColumn E=(Column D /Column B)*100. ^bColumn F=(Column D/Column C)*100. ^c36 households incurred more than one prime-age death. ^dColumn H=[Column G/(Column B-Column C)]*100.

In addition, the results show that dissolution was a more important cause of household attrition among smaller households than among larger households. By contrast, larger households were more likely to incur a prime-age adult death. This is because the probability that a household will incur a prime-age adult death is positively correlated with the number of adult members in the household.

Potential bias caused by sample attrition is a major concern in longitudinal survey analysis. Systematic differences between attritors and non-attritors, coupled with a high attrition rate, may cause concern about inference with this data. To deal with potential attrition bias, we use the inverse probability weighting (IPW) method (see Robins *et al.*, 1995; Fitzgerald *et al.*, 1998; Wooldridge, 2002a, 2002b). We construct enumerator quality variables (59 enumeration team categorical variables) to predict re-interview. Each enumeration team was headed by a supervisor who was authorized to decide when enumerators give up trying to contact designated households.

The re-interview model is specified as follows:

$$\text{Prob}(R_{it} = 1) = f(\text{HIV}_{t-j}, X_{i,2000}, E_{it}) \quad (1)$$

R_{it} is one if a household (i) is re-interviewed at time t , conditional on being interviewed in the previous survey, and zero otherwise; HIV_{t-j} is the district HIV-prevalence rate at the nearest surveillance site in 1995; $X_{i,2000}$ is a set of household characteristics in 2000 from the initial survey, including landholding size, productive assets, demographic characteristics (number of children ages 5 and under, number of prime age males and females), and ownership of various assets and E_{it} is a set of 59 enumeration team dummy variables. All of the variables in (1) are observable even for households that were not re-interviewed in 2004. Equation (1) is estimated with Probit for attrition between the 2001 and 2004 surveys, obtaining predicted probabilities (Pr_{2001}). Then, the inverse probability ($1/\text{Pr}_{2001}$) is computed and multiplied by the population weights to obtain a weighting factor applied to the impact models estimated in this paper. Fortunately, the use of IPW to control for possible attrition bias has little effect on the magnitudes of the estimated impact of mortality suggesting that attrition bias is not a major problem.

3.3 Econometric model

To examine whether widow-headed households lose their land after their husbands die of illness-related causes we consider the estimation of a panel data model with the amount of land controlled by the household as the dependent variable and two binary variables for prime-age death: (a) $D_i^w = 1$ for households that incurred the death of a male household head since the 2001 survey and which were headed by a widow in 2004, zero otherwise; and (b) $D_i^o = 1$ for households that incurred a death of another prime-age adult and which were not widow-headed in 2004, zero otherwise.

$$L_{it} = \gamma_t + t^* D_i^w \alpha + t^* D_i^o \beta + \mu_i + \varepsilon_{it} \quad i=1, \dots, N; \quad t=1, \dots, T \quad [2]$$

where L_{it} is landholding size in hectares in household i at time t ; the parameter γ_t denotes a time-varying intercept⁵, μ_i captures the household-level fixed effects (assumed constant over time); and ε_{it} is the time-varying error term.

A comparison of the change in landholding size (L) over time between the treatment group represented by D_i^w and the control group (households without a prime-age death) provides an estimate of the impact of male head of household death among households now headed by a widow. A statistically significant negative coefficient α would be an indication that households experiencing a male head of household death and now headed by a widow are losing land, with the magnitude of the coefficient indicating how much. Differencing the time 1 and time 0, equation 2 yields:

$$\Delta L_i = \gamma + D_i^w \alpha + D_i^o \beta + \Delta \varepsilon_i \quad i=1, \dots, N \quad [3]$$

⁵ Wooldridge, 2002 page 254

where ΔL_i is the difference in landholding size between the two time periods, D_i^w and D_i^o are the treatment indicators, α and β are the treatment effects, γ is a constant, and $\Delta \varepsilon_i$ is the difference between errors at time 1 and time 0.

Assuming that initial household conditions are similar between afflicted and non-afflicted (control group) households, one could use this simple difference-in-difference estimator to evaluate the impact of male head death and subsequent widow-headedness on access to land. However, rural households are heterogeneous in many ways, some of which may be correlated with widow-headed households. There is growing evidence of systematic differences between afflicted and non-afflicted households with respect to wealth status, income, education levels, and age group (see Ainsworth and Dayton, 2000; Yamano and Jayne, 2004; Beegle, 2005; Yamano and Jayne, 2005). Therefore, to control for these heterogeneous factors, a vector of exogenous household initial covariates (X_i) in 2000 and their interaction with the treatment of interest, D^w , are introduced into equation 2. The estimated treatment effect among widow-headed households remains α but it is now interpretable as a *ceteris paribus* effect. The model in equation 2 is extended as follows:

$$L_{it} = \gamma_t + t * D_i^w \alpha + t * D_i^o \beta + t * X_i \varphi + t * X_i * D_i^w \alpha' + t * X_i * D_i^o \beta' + \varepsilon_{it} \quad i=1, \dots, N \quad t=1, T \quad [4]$$

Differencing the time 1 and time 0, equation 4 yields:

$$\Delta L_i = \gamma + D_i^w \alpha + D_i^o \beta + X_i \varphi + X_i * D_i^w \alpha' + X_i * D_i^o \beta' + \Delta \varepsilon_i \quad i=1, \dots, N \quad [5]$$

3.4 Empirical model and estimation strategy

3.4.1 Empirical model

Building from equation 5, we partition X_i into two vectors: (1) a vector of household characteristics in 2000 (X^h); and (2) a vector of widow/current head-specific characteristics ($X^{w/h}$), plus we add community dummy variables (C) to control for the effects of location-specific omitted variables, a dummy variable for a household in a matrilineal village ($M=1, 0$ otherwise), and the interaction of M and D^w . The following model is estimated:

$$\begin{aligned} \Delta L_i = & \gamma + D_i^w \alpha + D_i^o \beta + X_i^h \varphi + X_i^w \vartheta + M_{ik} \phi + X_i^h * D_i^w \varphi' + X_i^{w/h} * D_i^w \vartheta' + M_{ik} * D_i^w \phi' + \\ & X_i^h * D_i^o \varphi'' + X_i^{w/h} * D_i^o \vartheta'' + M_{ik} * D_i^o \phi'' + C_{jj} \eta + \Delta \varepsilon_i \end{aligned} \quad [6]$$

$i=1, \dots, N \quad k=1, \dots, K \quad \text{and } j=1, \dots, J$

Outcome variables: We have comprehensive information on land cultivated and fallowed land under control of the household in both surveys. However, we only have information on virgin land (land yet to be cleared for cultivation) and rented land in the 2001 survey. Fortunately, both of these kinds of land make up a very small proportion of mean household landholding size

(12%) with 74.6% of the households having zero virgin and rented land according to the 2001 survey, so their exclusion is not likely to have a major impact on the overall findings. So the definition we use for landholding size in this analysis is the sum of land cultivated and fallow land.

We need to carefully consider how household labor supply and a set of other variables related to social ties interact with mortality shocks to assess the importance of labor availability versus other factors in influencing changes in land cultivation and fallow land. These social relations variables include the widow's and deceased husband's relation to the village headman, the number of years in which the household's clan settled in the area, and whether the village adheres to matrilineal or patrilineal land inheritance rules. We interact these variables with the mortality variables to help us understand whether widows are losing access to land, and if so, what characteristics of the widow influence the severity of this effect.

Household characteristics conditions: X_i is a vector of initial household conditions in 2000 which are partitioned into a vector of household characteristics in 2000 (X^h) and a vector of widow-specific characteristics in 2000 (X^w). X^h includes household demographic variables (the number of children age 5 and under, children age 6 to 14, males and females age 15 and above), a binary variable indicating household asset wealth status (=1 for households in the top half of the assets distribution, 0 otherwise), two dummy variables on whether head and spouse were related to headman in 2001 (kinship ties), and the number of years the family has been residing in the area. X^w includes the age and years of schooling of the widow as reported in the first survey. Years of schooling are included in dummy variable form for primary (one to seven years), and secondary and higher schooling (eight years and above), with the reference group being those with no formal schooling. We tested for potential non-linearities for continuous variables such as age by including quadratic terms. These variables were interacted with D^w to capture if there are any differential impacts by household and widow initial characteristics. The quadratic terms and interaction effects did not come close to being statistically significant in an F-test ($p=0.629$), hence they were dropped from the final estimations.

Matrilineal inheritance (M): M is a village-level categorical variable for areas of matrilineal inheritance. To examine whether the impacts on land access by widows are different in villages of matrilineal versus patrilineal inheritance, we include an interactions term between D^w and M .

District x time dummies (C): Although the difference-in-difference estimator presented in this section controls for unobserved time-invariant household characteristics, there may be area-specific time-variant effects that might be correlated with both the treatment and the outcome. To control for such area-specific time-variant effects, district x time interaction dummies were added to the estimation models. With the difference-in-difference framework and the inclusion of district*time dummies, equation (6) is able to control for unobserved effects except time-variant household or individual effects.

3.4.2 Estimation

We estimate district fixed effects models of changes in logged land access. We report three models to assess the robustness of results. The first model shows results of the bivariate model with the death variables as the only covariates. Model 2 controls for widow characteristics, initial household characteristics, and community characteristics but no interactions. Model 3 includes interaction terms of the death variables, the widow and initial household characteristics, kinship

ties, years settled in the locality and whether the household is located in a matrilineal village (hereafter referred to as social capital variables).

3.4.3 Identification of impact of death

The DID fixed effects estimator of equation [6] is confounded by the possibility that prime-age death variables are endogenous, hence OLS results may be biased. There is growing evidence that households afflicted by prime-age mortality are not randomly distributed, for they tend to display certain features with respect to initial income, asset levels, education, etc. (see Ainsworth and Semali, 1998; Ainsworth and Dayton, 2000; Beegle, 2005, Yamano and Jayne, 2004; Chapoto and Jayne, 2006). Using the same data set as the one used in the current paper, Chapoto and Jayne (2008, Forthcoming) examined the endogeneity issue in detail and finds that prime-age death is indeed endogenous when OLS and IV results for the pooled sample are compared.

This finding implies that any attempt to measure impacts of prime-age death on rural household welfare with pooled cross-sectional data would yield biased estimates because of the unobserved effects, which are correlated with the error term. However, after differencing out the time-invariant unobserved household characteristics, the Hausman-Wu test indicates that the endogeneity problem is addressed and that OLS estimation using household fixed effects is appropriate. However, this is the first study (to our knowledge) that tests for endogeneity of prime-age mortality when measuring household outcomes and it is possible that future analysis may find evidence that mortality is endogenous even in differenced data, in which case the need for suitable instruments would become relevant.

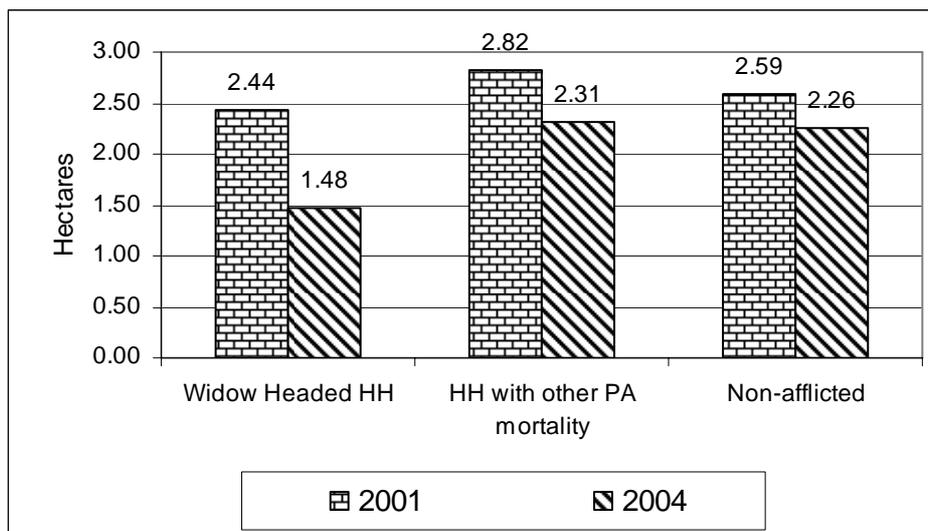
4.0 RESULTS

We begin this section with a descriptive analysis of the characteristics of households experiencing the death of a male household head between 2001 and 2004 and which was not subsequently headed by another man (e.g., through the wife remarrying or an older son joining the household). We hereafter refer to these households as ‘widow-headed households’. The remainder of the section presents the results from the econometric analysis measuring the impact of male household head mortality on changes in landholding size among widow-headed households compared to non-afflicted households and households having suffered the death of another household member.

4.1 Descriptive Results

Figure 1 shows the mean percentage change in landholding size for three groups: (i) non-afflicted households, (ii) households experiencing the death of a prime-age adult other than the male household head, and (iii) households becoming widow-headed due to the death of the male head. Mean landholdings declined for each group: by 12.7 percent among non-afflicted households, 18.7 percent among households experiencing the death of a prime-age adult other than the male household head, and by 39.3 percent among households experiencing male head of household death and now widow-headed. These bivariate findings do not control for other shocks affecting these households, yet they provide at least surface evidence that widow-headed households in general became worse off compared to non-afflicted households. The large decline in landholding size among widow-headed households could be due to at least two factors: (1) after the death of their husband, widows could be experiencing severe labor shortages; or (2) the widows might have lost access to land as a result of property redistribution.

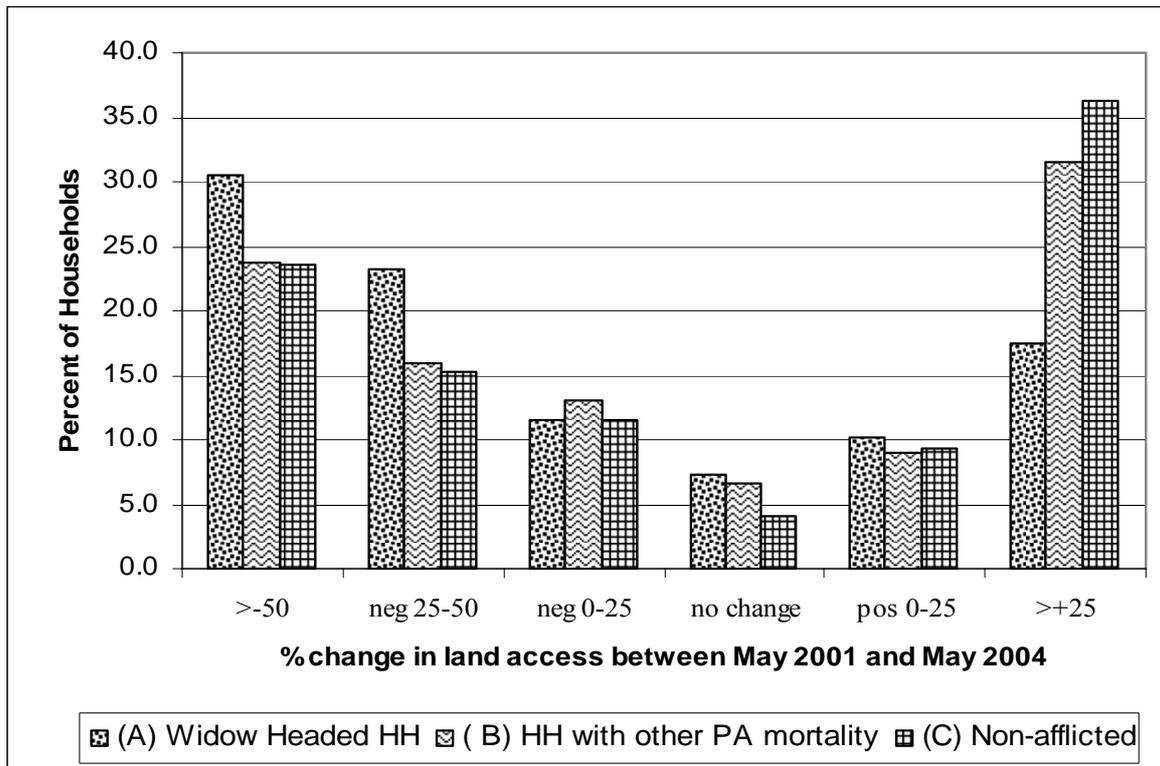
Figure 1: Comparison of landholding size (cropped plus fallow land) in 2001 and 2003 (Hectares)



Source: CSO/MACO/FSRP Post Harvest Survey 1999/2000 and Supplemental Survey, 2001 and 2004

Figure 2 shows distribution of changes in landholding size between 2000 and 2003 for the three groups. Among non-afflicted households, 45.7 percent increased their landholding size between 2000 and 2003, 50.3 percent incurred a decline, and 4.0 percent had no change. The proportion of “other mortality” households incurring more than a 50 percent decline in landholding size was almost the same as that of non-afflicted households but considerably less than households that became headed by a widow. By contrast, only 27.5 percent of the households that became widow-headed between 2000 and 2003 increased their landholding size, while more than 65.0 percent incurred a decline and 6.7 percent had no change. Of the widow-headed households experiencing a decline in land access, almost half of them incurred a greater than 50 percent decline. Of the three groups, widow-headed households were the least likely to increase their land access, the most likely to reduce their land access, and the most likely to suffer a greater than 50 percent decline in land access. However, it is worth noting that more than 34.8 percent of widow-headed households were able to retain or increase the amount of their land access, indicating that the loss of land by widows and their dependents is far from universal. This leads us to ask whether there are some attributes of the widow, the household in which she resides, and/or the community that influence widows’ ability to retain their land. To shed more light to this question we examine the initial household characteristics among widow-headed households by changes in landholding size.

Figure 2. Frequency distribution of changes in landholding size among non-afflicted households, households incurring male-head mortality, and households incurring the death of an adult other than the male head.



Source: CSO/MACO/FSRP Post Harvest Survey 1999/2000 and Supplemental Survey, 2001 and 2004

Table 3 presents initial 2001 conditions of households becoming widow-headed between 2001-2003 for seven groups, according to the percentage change in the household's landholding size between 2001 and 2004. Several interesting observations stand out. *First*, it appears that neither education nor age of the widows had a clear influence on her likelihood of losing a large fraction of land after the death of their husbands. The average age of widows losing more than 50 percent of their land (43.5 years) is only slightly greater than the average age for the full sample of widows (41.7 years) and the average age of widows whose landholdings increased by more than 25 percent (41.2). Furthermore, among widow-headed households losing greater than 50 percent of their land, 33.3 percent had no formal education whilst an equal percentage (33.3 percent) had educational attainment of grade 7 or greater.

Table 3. Characteristics of widow-headed households by percentage change in landholding size between 2000/01 and 2003/04

Attributes	% change in landholding size between 2000/01 and 2003/04						
	Full Sample	Negative			No change	Positive	
		>50	25-50	0-25		0-25	>25 ^a
Number of households	69	21	16	8	5	7	12
Age of widow (years)	41.7	43.5	39.2	43.6	39.6	42.0	41.2
<i>Level of education of widow (=1)</i>							
No education	24.6	33.3	25.0	25.0	20.0		25.0
Lower primary education	21.7	14.3	18.8	12.5	80.0	14.3	25.0
Upper primary education	20.3	19.0	12.5	12.5	-	42.9	33.3
Grade 7 or greater	33.3	33.3	43.8	50.0	-	42.9	16.7
<i>Baseline household characteristics in 2000</i>							
Effective dependency ratio (number)	1.2	1.4	1.2	0.9	1.5	1.1	1.1
Adult equivalent HH members	2.5	3.2	2.2	2.1	2.1	2.3	2.2
Children 5 years and under (number)	0.7	1.0	0.9	0.6	0.2	0.6	0.5
Children age 6 to 14 years (number)	2.2	3.0	2.1	2.0	2.2	1.8	1.7
PA males excluding deceased (number)	1.3	2.0	1.1	1.0	0.8	0.9	1.1
PA females excluding deceased (number)	1.3	1.4	1.3	1.6	0.8	1.6	1.3
Value of assets (000 Kwacha)	956.0	2267.9	202.4	1350.7	161.5	333.9	95.5
Household Income (000 Kwacha)	2741.0	3520.1	2190.5	2336.9	1504.8	5442.9	1320.3
Off-farm income (000 Kwacha) ^b	1357.3	1453.8	1124.0	1124.0	870.5	3427.3	650.6
Value of livestock (000 Kwacha)	655.7	1874.7	71.9	482.7	49.1	8.7	46.6
Value of cattle (000 Kwacha)	539.5	1619.6	0.0	401.5	0.0	0.0	0.0
Value of small animals (000 Kwacha) ^c	116.3	255.2	71.9	81.2	49.1	8.7	46.6

Source: CSO/MACO/FSRP Post Harvest Survey 1999/2000 and Supplemental Survey, 2001 and 2004

Notes: ^aIn only 1 case was the change in landholding size between +25-50 %; the rest are greater than +50%.

^b Off-farm income include salary and wage income, informal and formal business income. ^c Small animals include goats, sheep, pigs, chicken, ducks and rabbits.

Second, widows incurring a greater than 50 percent loss in land had the greatest number of adult equivalents in 2000 (3.2 compared to the mean of 2.5 among all widow-headed households), significantly more children aged 6 to 14 years, and slightly more adult sons and daughters than the mean of all widow-headed households. Using the *ex ante* number of prime-aged adults as an indicator of available household labor, these results suggest that the average widow-headed

household experiencing a large decline in landholding size does not have less available adult labor compared to widow-headed households with positive changes in land access.

Third, widow-headed households experiencing the greatest decline in landholding size appeared to be relatively wealthy in 2000. Table 3 shows that the initial mean value of assets, value of livestock (cattle and small livestock), off-farm income, and household income are substantially higher among widow-headed households experiencing a greater than 50 percent decline in land access compared to other widow-headed households. These results suggest that widows in households that were wealthier to begin with are more likely to lose land and other productive assets after the death of their husband. However, all these are bivariate; we now move to econometric techniques to identify the factors influencing widows' loss of land after controlling for other factors.

4.2 Econometric results

We estimated models (5) and (6) with log-level specification to provide estimates of percentage changes in landholding size. We present side by side results from models not corrected for attrition and corrected for attrition via the inverse probability method discussed earlier. However, we confine the discussion of results from models corrected for attrition (columns D through F).

4.2.1 Changes in landholding size

Results in Table 4 column D indicate a significant decline of 34.6 percent in total landholding size among households becoming widow-headed between 2001 and 2004. By contrast, the death of another prime-age adult (i.e., among households that retained a male head) had a negative but statistically insignificant impact on landholding size. The percentage decline in land among widow-headed households was even slightly more severe (a 36.8 percent decline) after controlling for widow-specific, household and social capital variables (column E).

Column F shows the model results accounting for interaction terms between male head mortality and widow-specific, household and social capital variables. To better understand the magnitude of impact of these interaction terms on widow-headed households, we simulated the predicted changes in landholding size based on results in column F for seven illustrative "profiles" of widow-headed households, as shown in Table 5. Table Annex 1 presents the descriptive statistics of the covariates from which these percentage changes are computed.

4.2.2 Age of widow

We test the hypothesis that the impact of male head mortality on widow's security to land depends on the age category of the widow. Table 4, column F shows that the negative impact of mortality of the male head of household on landholding size is somewhat lower among widows aged 50 and above compared to widows age 16 to 39 (reference group), as indicated by the positive coefficient on the interaction between widows aged 50 and above and death of male head of the household. Profiles 1 and 2 in Table 5 are identical in all characteristics except that the age category of the widow. Landholding size declined by -29.9 percent for widows aged 50 and above, compared to -54.8 percent among households headed by a widow aged 16 to 38. This finding suggests that older women have some protection against loss of land compared to younger

Table 4: Regression results for impact of death on landholding size between 2000 and 2003^a

Covariates	Change in log of land access (hectares) between 2000 and 2003					
	---Not Corrected for attrition---			---- corrected for attrition-----		
	A	B	C	D	E	F
PA male head death: widow-headed (=1)	-0.329** (0.103)	-0.331** (0.100)	0.523 (0.375)	-0.346** (0.087)	-0.368** (0.090)	0.424 (0.466)
All other PA death: not widow-headed (=1)	-0.057 (0.047)	-0.002 (0.047)	0.101 (0.178)	-0.073 (0.053)	-0.017 (0.052)	0.086 (0.203)
Age group of head/widow (=1)						
Age 16-38 (reference group)						
Age 39 to 49 (=1)		-0.010 (0.037)	-0.001 (0.038)		0.007 (0.040)	0.020 (0.042)
Age 50 and above(=1)		-0.096* (0.039)	-0.101* (0.041)		-0.064+ (0.033)	-0.060+ (0.035)
Education level of head/widow (=1)						
No education (reference group)						
Lower primary (1-3 years)		0.080 (0.050)	0.076 (0.054)		0.055 (0.054)	0.051 (0.058)
Upper primary (4-6 years)		0.105 (0.076)	0.120 (0.079)		0.052 (0.050)	0.072 (0.054)
Grade 7 and upper		0.144** (0.044)	0.146** (0.047)		0.126** (0.047)	0.137** (0.051)
Household composition in 2000						
Children under age 5 (number)		-0.004 (0.015)	-0.002 (0.016)		-0.009 (0.017)	-0.008 (0.019)
Children age 6 to 14 (number)		-0.013+ (0.008)	-0.013 (0.008)		-0.005 (0.008)	-0.005 (0.009)
Prime-age male (number)		-0.005 (0.014)	0.000 (0.015)		-0.007 (0.015)	0.000 (0.017)
Prime-age female (number)		0.002 (0.016)	-0.002 (0.018)		-0.007 (0.018)	-0.019 (0.020)
HH wealth status in 2000 (1=non poor,		-0.152** (0.029)	-0.136** (0.031)		-0.154** (0.031)	-0.141** (0.033)
Male head related to headman in 2000		-0.018 (0.031)	-0.019 (0.033)		-0.033 (0.033)	-0.033 (0.035)
Spouse related to headman		0.017 (0.048)	0.003 (0.051)		-0.013 (0.051)	-0.024 (0.054)
Years settled in locality (number)		-0.009** (0.001)	-0.009** (0.001)		-0.010** (0.001)	-0.010** (0.002)
HH in matrilineal inheritance village (=1)		-0.272 (0.177)	-0.276 (0.178)		-0.323 (0.199)	-0.336+ (0.199)
Interaction Terms						
Widow*Age 38-49			0.015 (0.208)			0.009 (0.221)
Widow*Age 50 above			0.274+ (0.158)			0.249* (0.103)
Widow*1-3 years of education			-0.049 (0.111)			-0.056 (0.389)
Widow*4-6 years of education			-0.003 (0.261)			-0.003 (0.297)
Widow*7 years and above			-0.388 (0.354)			-0.422 (0.318)

contd.....

Table 4 continued.

Widow*children under 5			-0.114 (0.093)			-0.110 (0.122)
Widow*children age 6 to 14			-0.083+ (0.047)			-0.078* (0.037)
Widow*PA male			-0.170 (0.118)			-0.161 (0.149)
Widow*PA female			-0.011 (0.112)			-0.017 (0.144)
Widow*Wealth status			-0.406* (0.200)			-0.365+ (0.206)
Widow*Head related to headman			0.027 (0.143)			0.011 (0.143)
Widow*Spouse related to headman			0.450** (0.171)			0.421** (0.162)
Widow*number of years settled			-0.010 (0.009)			-0.009 (0.011)
Widow*Matrilineal village			-0.147 (0.187)			-0.107 (0.201)
Constant	-0.120 (0.092)	0.411** (0.155)	0.395* (0.156)	-0.049 (0.104)	0.526** (0.171)	0.512** (0.171)
Observations	4802	4802	4802	4802	4802	4802
R-squared	0.06	0.10	0.10	0.07	0.10	0.10
<i>Joint Tests</i>						
F-statistic for model	6.09**	7.38**	6.39**	6.39**	7.62**	6.54**
Male head death*Widow/household			7.23**			7.20**
Male head death*All interactions						

Source: CSO/MACO/FSRP Post Harvest Survey 1999/2000 and Supplemental Survey, 2001 and 2004

Notes: ** 1% level of significance, * 5% level of significance and + 10% level of significance. Numbers in parentheses are standard errors. ^aNot reported in the table are the interactions terms between other mortality and widow/current head characteristics and pre-death household characteristics.

Table 5. Simulations^a of the percentage change in landholding size based on specific widow, initial household attributes.

Profile	Household type	Age of widow	Wealth Status	Number of children aged 6 to 14	Widow related to headman	% Δ in landholding size
1	Male head death-widow headed	Age 16-39	mean (0.49)	mean (2.23)	mean (0.10)	-54.8
2	Male head death-widow headed	50 and above	mean	mean	mean	-29.9
3	Male head death-widow headed	50 and above	non-poor	mean	mean	-48.4
4	Male head death-widow headed	50 and above	Poor	mean	mean	-11.9
5	Male head death-widow headed	50 and above	non-poor	90 th percentile (5.0)	mean	-62.3
6	Male head death-widow headed	50 and above	non-poor	90 th percentile (5.0)	no	-66.4
7	Male head death-widow headed	50 and above	non-poor	90 th percentile (5.0)	yes	-24.3

Source: CSO/MACO/FSRP Post Harvest Survey 1999/2000 and Supplemental Survey, 2001 and 2004

Notes: ^aSimulation outcomes based on regression models in Table 4, column F. All other variables in the model are set at their mean levels.

widows. This could reflect assumptions implicit in traditional land inheritance laws that younger women are more likely to remarry and gain access to the new husband's land, thereby obviating her need to keep most of the deceased husband's land. In contrast, older women are considered less likely to remarry; the findings indicate that older widows are therefore more likely to retain most (but not all) of the land formerly controlled by the deceased husband. Also, all other factors held constant, older women might have more "social capital" in the community that protects them from losing rights to land. Notwithstanding this possible rationale, it appears that widow-headed households are particularly vulnerable, regardless of the age of the widow.

4.2.3 Education level

The results in table 4, columns C and F, do not suggest that the educational attainment of the widow has any clear impact on landholding size. All the education variables are statistically insignificant even at the 20 percent level.

4.2.4 Wealth status

The death of a male head of household appears to be particularly severe among widows in households that were initially relatively well-off. The coefficient on the interaction term between male head mortality and initial wealth status is negative and significant at the $p=0.10$ level. Profiles 3 and 4 in Table 5 are identical in all characteristics except that in profile 4 the household is initially in the top half of the wealth distribution in 2000 whilst in profile 3 the household was in the bottom half. Landholding size declines by an estimated 48.4 percent for the initially non-poor household, in contrast to only -11.9 percent for the household that was poor to begin with. If the decline in landholding size was due to severe labor or capital shortages among widow-headed households, then we would have expected the decline to be somewhat less among initially wealthy households, yet we find the reverse. These results are consistent with the premise that widows who remain with substantial assets compared to other households in the community may be more vulnerable to land grabbing and loss of other assets after the passing of her husband. If widows and dependents coming from relatively well-off households are more vulnerable to losing land after the loss of their husbands, then this would suggest the need to safeguard the interests of widows regardless of their initial economic status.

4.2.5 Household composition

If the *ex ante* number of prime-aged adults in the household is used as an indicator of available household labor, one would expect a positive coefficient on the number of prime-age males and females in the family, thus a one unit increase in the number of prime-age males and/or females mitigates the impact of male head mortality on the availability of family labor. However, despite the fact that the coefficients on these variables are statistically insignificant, it is surprising that they are both negative, suggesting that the more adults in the household to begin with, the greater the loss of land after the male head passes away. This result suggests that the decline in landholding size observed in widow-headed households is probably not due to labor shortages but rather due to partial land inheritance by other family claimants after the death of the husband. In contrast, the coefficient on the interaction between male head of household mortality and the number of children age 6 to 14 is negative and statistically significant at 10 percent level. Thus, the negative impact of mortality of the male head of household on land access is also not

mitigated by having more children in the household. For example, profile 3 and profile 5 are identical in all characteristics except that in profile 5 the household has on average 3 more children aged 6 to 14 than the household in profile 3. Landholding size is estimated to decline by -62.3 percent among households with more children aged 6 to 14 compared to -48.4 percent for the household with fewer children. The results on the interaction of death and children aged 6 and 14 are difficult to interpret because children aged 6 to 14 in rural Zambia are considered old enough to assist their parent in crop cultivation. Thus, we would have expected more children in this age group to mitigate the loss of land, if changes in landholdings are driven by a perceived lack of labor to farm the land, or fewer people to feed. Unfortunately, the results in Table 4 suggest that having more children does not protect the widow from losing land access after the death of her husband.

4.2.6 Kinship ties: relation to the headman

The negative impact of mortality of the male head of household on landholding size is somewhat mitigated among widows who are related to the headman, as indicated by the positive and statistically significant coefficient on the interaction between the widow's relationship to the headman and the death of male head of the household. Profile 6 and profile 7 are identical in all characteristics except that in profile 7 the widow is related to the headman. Landholding size declines by 24.3 percent when the widow was related to the headman, and by 66.4 percent if not. This huge difference between these two profiles suggests that social and political capital, in particular the widow's kinship ties to local authorities, play a crucial role in protecting her rights to property and assets after her husband's death. This finding implies that with the willingness and participation of community leadership, it may be possible to provide greater protection to widows more broadly. Community leaders may be important entry points for organizations attempting to provide greater protection for widows.

In contrast, the landholding size of widow-headed households declines even more if the deceased husband was related to the headman, as indicated by the negative but statistically insignificant coefficient on the interaction between mortality of male head of household and the relationship of the deceased husband to the headman. This could reflect a greater ability of male relatives close to the headman to lay claim to the land formerly controlled by his deceased brother. Widows are likely to be in a particularly weak bargaining position to retain land in this situation, which once again points to the important role of sensitizing local authorities and elders to the potential difficulties faced by widows in rural areas.

4.2.7 Number of years settled in locality

Zulu et al. (forthcoming) found that the number of years that a household's clan has settled in a locality was positively associated with landholding size, validating the "first settler" phenomenon, in which early migrants appear to have greater access to land than more recent arrivals. We test whether the number of years settled in the locality influenced the ability of widows to retain their land after the death of their husbands. The negative coefficient on the interaction between the death of male head of the household and the number of years settled in the locality (Table 4, column F) indicates that widows are more vulnerable to losing land when their families are well established in the area, although this effect is significant only at the 20 percent level. A possible explanation of this finding is that the greater the number of years a household has settled in an area, the greater the number of relatives who are likely to lay claim on the widow's husband's estate.

4.2.8 *Households in matrilineal village*

A priori, one might expect that widows living in matrilineal villages would be better protected against loss of land, since the potential heirs to the estate of the deceased husband are normally the male relatives of the widow. Unfortunately, the results in Table 4, column 4 suggest that widows do not benefit from living in a matrilineal village; the coefficient on the interaction term between male head mortality and households in matrilineal villages is actually negative but not statistically significant. Thus, widows living in matrilineal and patrilineal villages are roughly equally at risk of losing their rights to land. This finding is consistent with evidence from focus group interviews in predominately matrilineal northern Mozambique. Participants revealed that property rights violations were common occurrences, suggesting that the matrilineal customs offered little in the way of protection against land tenure loss (Hendricks and Meagher, 2007).

5.0 CONCLUSION AND POLICY RECOMMENDATIONS

This paper is motivated by concerns that the AIDS epidemic is resulting in a large proportion of rural women becoming impoverished due to losing access to land after the death of their husbands. Using nationally-representative panel data of 5,342 rural households in Zambia, surveyed in 2001 and 2004, we estimated difference-in-difference models to assess how landholding sizes change among households becoming headed by a widow, compared to households losing another adult as well as households not incurring any prime-age mortality. The study is designed to identify factors specific to the widow, the household, and the community that influence the magnitude of the change in landholding size.

We highlight eight findings. *First*, more than 66 percent of the households that suffered the death of the male household head and became headed by a widow after the 2001 survey did indeed have less land (defined by the sum of cultivated and fallow land) in 2004 than in 2001. Over 30 percent of the widow-headed households controlled less than half of land they had before the death of the male head. Other factors constant, landholdings declined by 3.6 percent among non-afflicted households, by 8.5 percent among households experiencing the death of a prime-age adult other than the male head, and by 34.6 percent among households experiencing male head-of-household death and becoming widow-headed. Of the three groups, widow-headed households were the least likely to increase the size of their landholdings and the most likely to suffer a greater than 50 percent decline in cropped area. However, it is worth noting that 37.5 percent of widow-headed households were able to retain or increase the amount of their landholding size, indicating that the loss of land by widows and their dependents is far from universal.

Second, the econometric results show that older widows are to some extent protected against the loss of land compared to younger widows. Landholding size declined by 29.9 percent among households headed by a widow aged 50 or above compared to a 54.8 percent decline among households headed by a widow age below the age of 38, holding all other variables at their mean levels. This could reflect assumptions implicit in traditional land inheritance laws that younger women are more likely to remarry and gain access to a new husband's land, thereby obviating the need for her to retain the deceased husband's land. However, this does not appear to be the case in this nationally representative sample from Zambia, at least in the short run. Because the surveys recorded the name of the individuals in the family in both surveys, we were able to determine whether widows left their homes after the death of their husbands. We found that 100 percent of the wives of the household head in the initial 2001 survey were still resident at the household in 2004 after having become widowed in the interim. Additional longitudinal surveys will be necessary to track these individuals and determine how many continue to reside on their farms in subsequent years. Notwithstanding the potential for widows to acquire use rights to land through remarriage, it appears that widow-headed households suffer a non-marginal decline in landholdings regardless of the age of the widow, at least within a 1-3 year period after the death of their husbands.

Third, the results do not suggest any differential impact on land loss according to the education level of the widow. All of the education level variables are statistically insignificant even at a 20 percent level of significance.

Fourth, if we use the initial number of prime-age adults as an indicator of available household labor, our results show that in contrast to the conventional wisdom, having more prime-age males, females and/or children in the household does not protect the widow from losing land

access after the death of her husband. This findings indicate that labor shortages due to mortality are not a cause of the reduction in landholding size among widow-headed households.

Fifth, the greatest decline in landholding size is among widow-headed households that were relatively wealthy prior to the death of the husband. The initial mean 2000/01 value of assets, value of livestock, off-farm income, and income is substantially higher among widow-headed households experiencing a greater than 50 percent decline in landholding size compared to other widow-headed households. Widows whose households were relatively well off compared to other households in the community prior to the husband's death appear to have the most property to lose. However, the programmatic implications of this result are unclear; one might argue that special assistance should be targeted to widow-headed households, or any other kind of household, that are currently the poorest.

Sixth, widows whose family has kinship ties to the village authorities are less likely to lose land. Other factors held constant, landholdings declined by 24.3 percent when the widow was related to the headman and by 66.4 percent if not. This finding suggests that widows with kinship ties to the headman have some protection of their rights to property and assets including land. This finding underscores the importance of social relations within the community in influencing land tenure and allocation decisions.

Seventh, the duration of a household's settlement in the locality tends to exacerbate widow's ability to retain land. Although, the result is weakly statistically significant, the greater the number of years settled in the village, the greater the percentage decline in landholding size. This finding may indicate that the longer an extended family has settled in an area, the greater the number of relatives who are likely to lay claim on the deceased husband's estate.

Finally, contrary to the *a priori* expectation that widows living in matrilineal villages have some protection against loss of land, our results show that there appears to be no difference between widows living in matrilineal versus patrilineal villages; both are equally at risk of losing their rights to productive assets including land to their husbands' brothers and/or uncles.

The view that widows and their dependents face greater livelihood risks in the era of HIV/AIDS is indeed supported by nationally-representative survey results from Zambia. Efforts to safeguard widows' rights to land through land tenure innovations involving community authorities may be an important component of social protection, poverty alleviation, and HIV/AIDS mitigation strategies. Several of the findings reported above show the influence of local traditional authorities in affecting the extent to which widows are able to retain land. Increased government commitment to ensure security of widows' access to land is another approach, but initial evaluations of government efforts provide mixed evidence (see Izumi, 2006). Government decrees appear to have little impact if local community authorities are not part of the agreement. But certainly, national governments, donors, and NGOs have an important role to play in developing programs to work with local authorities to protect widows and children against property grabbing by relatives of the deceased as well as to institute property rights that are more compatible with social protection and anti-poverty objectives in the era of AIDS.

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Table A1: Descriptive statistics

Variable	mean	Percentile				
		10	25	50	75	90
PA male head death-widow headed (=1)	0.014	-	-	-	-	-
PA non male head death (=1)	0.084	-	-	-	-	-
Age group of current head/widow						
Age 18-33	0.196	-	-	-	-	-
Age 35 to 49 (=1)	0.353	-	-	-	-	-
Age 50 and above(=1)	0.448	-	-	-	-	-
Years of education of head/widow						
No education	0.151	-	-	-	-	-
1-3 years	0.155	-	-	-	-	-
4-6 years	0.242	-	-	-	-	-
7 and greater	0.452	-	-	-	-	-
Children 5 years and under in 2000 (number)	0.942	0	0	1	2	2
Children 6 to 14 years in 2000 (number)	2.240	0	1	2	3	5
Prime-age males excluding deceased in 2000 (number)	1.134	0	0	1	2	2
Prime-age females excluding deceased in 2000 (number)	1.220	0	1	1	2	2
Land cultivated in 2000 (Ha)	3.105	0.56	1.06	2.03	4.03	7.11
Assets poverty (1=non poor 0=otherwise)	0.498	-	-	-	-	-
Household value of assets in 2001 ('000 Zkw)	1424.59	0	35	209.96	570.61	3982.06
Husband related to headman (=1)	0.314	-	-	-	-	-
Spouse/Widow related to headman (=1)	0.098	-	-	-	-	-
Number of years settled in locality (years)	14.683	3	5	12	21	31
HH in matrilineal inheritance village (=1)	0.624	-	-	-	-	-

Source: CSO/MACO/FSRP Post Harvest Survey 1999/2000 and Supplemental Survey, 2001 and 2004