***FOOD SECURITY RESEARCH PROJECT***

# SECURITY OF WIDOWS' ACCESS TO LAND IN THE ERA OF HIV/AIDS: PANEL SURVEY EVIDENCE FROM ZAMBIA

**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. A huge number of conceptual and qualitative studies highlight gender inequalities in property rights, and the difficulties that widows and their dependents face in retaining access to land after the death of their husbands. HIV/AIDS has undoubtedly exacerbated such problems. However, there remains limited quantitative evidence using representative survey data on the extent to which widows lose their rights to land after the death of their husbands, whether they lose all or part of the land they were formerly controlling, and whether there are certain characteristics of the widow, her deceased husband, and/or her household that influence the likelihood of her losing land rights. It is highly possible that government programs designed to provide a safety net to vulnerable groups may not reach their potential if they ignore gender dimensions of local institutions and property rights.

Using nationally-representative longitudinal survey data of 5,342 rural households in Zambia surveyed in 2001 and 2003 we examine whether widows lose their rights to land after the death of their husbands. We only have data on total land under control of the household in 1999/00 but not in 2002/03. So instead we use changes in land cultivated between 1999/00 and 2002/03 as an indicator of arable land controlled by the household. This variable could be problematic in that it may not reflect land access but rather a shortage of labor. Therefore, we 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. These social relations variables include the widow's and deceased husband's relation to the village headman, the number of years in which the households' clan settled in the area, and whether the village adheres to matrilineal or patrilineal land inheritance rules.

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*, we find that about 56% of the households that suffered the death of the male household head and became headed by a widow after the 2001 survey did indeed cultivate less land in 2004 than in 2001. Over 27% of the widow-headed households cultivated less than half of the land they cultivated in 2001. On average, land cultivation declined among household incurring a prime-age mortality (afflicted) and households not incurring any mortality (non-afflicted): -7.6 % among non-afflicted households, -14.3% among households experiencing other prime-age deaths and household not widow-headed, and -36.2% among households experiencing male head-of-household death and widow-headed. An examination of the change in cropped area among afflicted and non-afflicted groups reveals that widow-headed households were the least likely to increase their area under cultivation, the most likely to reduce their cropped area, and the most likely to suffer a greater than 50 percent decline in cropped area. However, it is worth noting that more than 40% of widow-headed households were able to retain or increase the amount of their land under cultivation, indicating that the loss of land by widows and their dependents is far from universal.

*Second***,** the econometric results show that to some extent older widows have protection against loss of land access compared to younger widows. Land cultivation declined by 12.5% among households headed by a widow age 50 and above compared to a 45.0% decline among households headed by a widow age 18 to 33, 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 the new husband's land, thereby obviating the need for her to keep most of the deceased husband's land. Notwithstanding this possible rationale, it appears that widow-headed households are particularly vulnerable, regardless of the age of the widow. An implication of this finding is that poverty reduction programs will be more effective if they address younger widows' livelihood problems after the death of their husband.

*Third*, the results do not suggest any differential impact on land cultivation by education level of the widow, as all the education level variables are statistically insignificant even at a 20 percent level of significance.

*Fourth*, if we use the *ex ante* 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 finding suggests that labor shortages due to mortality are not the main cause for the reduction in cropped area but rather that the widow and her dependents may have insecure land tenure rights and thus lose part or all of the land formerly cultivated by the family.

*Fifth*, widow-headed households experiencing the greatest decline in cropped area appeared to be relatively wealthy prior to the death of the husband. Generally, we find that the initial 2000/01 mean value of assets, value of livestock, off-farm income, and household income is substantially higher among widow-headed households experiencing a greater than 50% decline in cropped land compared to other widow-headed households. Cropped land declined by 34.2% if the household was initially non-poor compared to an increase of 9.0% if the household was poor to begin with, other factors held constant at their mean levels. Thus, widows whose households were relatively well off compared to other households in the community, prior to the husband's death, appear to be more vulnerable to losing assets after the passing of her husband.

*Sixth*, widows whose family has kinship ties to the village authorities are less likely to lose land. For example, other factors held constant, land cultivation declined by only 12.4% when the widow was related to the headman and by 73.4% 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, including the disposition of land used by widows.

*Seventh,* the negative impact of mortality of the male head of household on land cultivation is not mitigated by the number of years the household was settled in the locality. The greater the number of years settled in the village, the more vulnerable is the widow to losing access to land. This finding may indicate that the longer 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.

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 livelihood risks faced by widows and their dependents in the era of HIV/AIDS are 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.  Increased government commitment to ensure security of widows' access to land and other productive assets may not only directly reduce an important dimension of rural poverty but also possibly reduce the spread of AIDS caused by risky sexual behavior driven by poverty. 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. 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. A huge number of conceptual and qualitative studies highlight gender inequalities in property rights, and the difficulties that widows and their dependents face in retaining access to land after the death of their husbands. HIV/AIDS has undoubtedly exacerbated such problems. However, there remains limited quantitative evidence using representative survey data on the extent to which widows lose their rights to land after the death of their husbands, whether they lose all or part of the land they were formerly controlling, and whether there are certain characteristics of the widow, her deceased husband, and/or her household that influence the likelihood of her losing land rights. It is highly possible that government programs designed to provide a safety net to vulnerable groups may not reach their potential if they ignore gender dimensions of local institutions and property rights.

Using nationally-representative panel survey data of 5,342 rural households surveyed in 2001 and 2004, we estimate difference-in-difference models to assess how land cultivation changes among households becoming headed by a widow after 2001 compared to households not incurring prime-age mortality. The surveys were rich with 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 provided an ability to examine whether land cultivation (and changes in land cultivation over time) differs by initial household characteristics, attributes of the widow, social capital, and community characteristics such as matrilineal versus patrilineal inheritance institutions.

We begin in Section 2, by a brief on land inheritance patters in Zambia. In Section 3, we describe the data, issues related to sample attrition between the 2001 and 2004 surveys, and estimation methods. Estimation results and their interpretation are presented in Section 4. Section 5 discusses the conclusions and implications for donor and government policy.

## 2. LAND INHERITANCE PATTERNS IN ZAMBIA

Access to land is an important indicator of welfare among rural farm households. It is especially critical for women, particularly for those who have lost their husband who formerly had use rights over a parcel of land. In Southern Africa, 60% of small farmers are women and women make up about 75% of the food production and processing workforce (UNECA, 2003). But in Zambia and elsewhere in the region 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 of land tenure. Under the customary system, traditional authorities, such as the chief and/or village headman, allocate vacant land to families and individuals. Whilst 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% of the land area in the country is controlled by the customary system whilst 6% 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). Inheritance of land and other property and productive assets is almost always the prerogative of the deceased man's male kin (WLSA, 1997; Amstrong, 1992; Milimo, 1990). For example, among female-headed households, Milimo (1990) found that about 43% of the households accessed land through their father (23.0%), uncle or brother (11.8%) or husband (7.8%) whilst the remainder is either inherited (25.3%), given by the headman (24.7%) or given by the mother (7.4%). Under statutory law, women have the right to own land but titles are passed through male relatives in both matrilineal and patrilineal systems (The Republic of Zambia, 2005). Furthermore, socio-economic and cultural factors such as illiteracy, the high cost of land, lack of capital, and patriarchal attitudes among men prevent women from applying to lease or own land (UNECA, 2003; Keller, 2000; Republic of Zambia, 2005).

Historically, customary law had safeguards for women's access to land with limited rights of control over it. Access was always only through a male relative--father, brother, and/or uncle (Shezongo-Macmillan, 2005). However, these safeguards are at risk in some cases due to the property grabbing. For example, Kajoba (2002), in a study undertaken in a village community in Chibombo District in Central Province, found that women complained that land was grabbed from them 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% of the deceased's estate and, together with the children, the house (Milimo 1990).

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 both patrilineal and matrilineal systems, land and property is passed through male relatives of a figurehead; this figurehead is male in patrilineal systems and female in matrilineal systems. 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; 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 uxorilocal marriages, meaning the husband settles in the wife's village, women generally have more secure land use and control rights (Republic of Zambia, 2005).

## 3. DATA AND METHODS

### 3.1. Data

The study's findings are based on nationally representative longitudinal survey data on 5,342 rural households in 393 standard enumeration areas (SEAs)[1] 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's Food Security Research Project. The 1999/2000 nationally representative Post Harvest Survey (PHS), which surveyed about 7,500 households, was the base for the Supplemental Survey (SS) of May/June 2001. The SS covered the same reference period as the 1999/00 PHS, but collected additional information on non-farm income, adult and child mortality, and retrospective social, demographic, and economic history on all individuals listed in the 1999/00 PHS demographic roster. Because of missing information on some households, the valid sample was reduced to 6,922 households. These 6,922 households contained in the 2001 SS were revisited in the SS of May/June 2004. Of the 5,420 households successfully re-interviewed, 78 households did not appear to be the same households interviewed in 2001 so are excluded from this analysis. 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

Potential bias caused by sample attrition is a major concern in longitudinal survey analysis. Of the 6,922 households interviewed in 2001, 5,342 (77.1%) were successfully re-interviewed in May 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 88.7%. 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 94.5%.

Table 1 presents basic information on the households surveyed, re-interview rates, and the prevalence of disease-related mortality by gender and position in household over the 2001-2004 period. Of the 5,342 households successfully re-interviewed, 571 households had at least one prime-age (PA) death in the sample, of which 547 of these households had at least one disease-

1. "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 and at least 20 households were surveyed from each SEA.

related PA death over the three-year period (i.e., “afflicted” households).[2] Thirty households had prime-age deaths due to accidents or homicide, and 6 households had deaths due to both causes. Of the 547 households experiencing prime-age mortality, 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; 6 were headed by the son and 1 by the brother of the widow. To ensure that we are tracking the same households between the two surveys, we used the

**Table 1. Prime-age mortality1 by province, rural Zambia between 2001 and 2004.**

| Province | Households interviewed in 2001 | Households re-interviewed in 2004[2] | Household incurring at least one prime-age deaths due to illness[3] | | | | |
|---|---|---|---|---|---|---|---|
| | | | total[4] | male head | female head /spouse | other females | other males |
| | | | (c) | (d) | (e) | (f) | (g) |
| Central | 714 | 573 (80.3) | 65 | 14 | 13 | 22 | 20 |
| Copperbelt | 393 | 312 (79.4) | 28 | 3 | 6 | 10 | 9 |
| Eastern | 1331 | 1126 (84.6) | 128 | 21 | 21 | 52 | 48 |
| Luapula | 777 | 619 (79.7) | 51 | 13 | 15 | 14 | 11 |
| Lusaka | 214 | 161 (75.2) | 27 | 4 | 8 | 12 | 4 |
| Northern | 1363 | 1027 (75.3) | 84 | 17 | 13 | 33 | 25 |
| Northwestern | 472 | 324 (68.6) | 22 | 4 | 1 | 6 | 11 |
| Southern | 872 | 690 (79.1) | 78 | 9 | 19 | 34 | 25 |
| Western | 786 | 588 (74.8) | 59 | 6 | 26 | 19 | 14 |
| Total | 6922 | 5420 (78.3) | 542 | 91 | 122 | 202 | 167 |

Source: from Chapoto and Jayne (2006) using data from the CSO/MACO/FSRP Post Harvest Survey 1999/2000 and Supplemental Survey, 2001 and 2004.

Notes: [1]Prime-age (PA) is defined as ages 15-59 for both men and women. [2]Of 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). [3]Descriptive results in 5342 valid re-interviewed households. [4]542 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.

[2] This paper follows the taxonomy convention of Barnett and Whiteside (2002): “Afflicted” households are those that have incurred a prime-age death in their households; households that have not directly suffered a death but are nevertheless affected by the impacts of death in the broader community are referred to in this study as “affected.” Households not directly suffering a death may be non-afflicted, but it is doubtful that there are any non-affected households in hard-hit communities of Eastern and Southern Africa.

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.[3]

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 8.4% of the households sampled in 2001 contained either one or two members, these households accounted for over 12% of the cases of attrition and 18% of the cases of household dissolution. In contrast, 65.5% of the sample contained households with 5 or more members and among these households only 47% of attrition due to dissolution is observed. 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.

To test for possible bias in results due to household attrition, the mean levels of control variables measured in May 2001 were compared for households that were re-interviewed versus those that attrited. At 5% significance level, the means of many variables differed statistically between re-interviewed and attrited households. For example, households not re-interviewed had slightly younger household heads (43 years vs. 45 years), smaller household sizes with fewer children age 5 and below, fewer boys and girls age 6 to 14, fewer prime-age males and females and elderly males, slightly smaller landholdings, less farm equipment and animals, and slightly higher rates of chronically ill adults in 2001. This is not surprising given the fact that attriting households were smaller to start with in 2001. Systematic differences between attritors and non attritors, coupled with a high attrition rate, may cause concern about inference with this data. Also, if the attrited households suffered a higher incidence of PA mortality between 2001 and 2004, there would be attrition bias when estimating the *ex ante* socioeconomic characteristics of individuals who died of AIDS-related causes.[4] So one should be worried about the possibility of systematic attrition leading to selection bias.

To deal with potential attrition bias, the inverse probability weighting (IPW) method is adopted. All model results reported in the paper are weighted by the inverse predicted probabilities ($1/Pr_{2001}$) computed from the IPW technique. The IPW method is described in detail in Wooldridge (2002), and its usage in this particular context, including results of the household re-interview model, is described in Chapoto and Jayne (2006).[5]

[3] See Chapoto and Jayne 2006 for results of the impact of illness-related mortality on rural household livelihoods stratified by gender and position of the deceased in the household.

[4] Available evidence on attrition rates in longitudinal surveys in developing countries range from 5 to 30 percent for two rounds (see Alderman, et al, 2001; Yamano and Jayne, 2004). For a discussion of IPW see Wooldridge, 2002.

[5] The literature addressing the detection and correction of selection bias is extensive, and a complete review of this literature is beyond the scope of this paper. Overviews of sample selection models can be found in Fitzgerald, Gottschalk, and Moffit (1998), and Alderman et al ( 2001).

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

| Household Size (A) | Households in 2001 sample (B) | Households attriting in 2001-2004 (C) | Households attriting due to dissolution (D) | Households dissolving as % of 2001 sample (E)[a] | Households dissolving as % of households attriting (F)[b] | Households incurring PA mortality (G)[c] | Households incurring PA mortality as % of reinterviewed household (H)[d] |
|---|---|---|---|---|---|---|---|
| Number | number | number | Number | (%) | (%) | number | (%) |
| 1 | 199 | 68 | 30 | 15.1 | 44.1 | 1 | 0.8 |
| 2 | 385 | 118 | 43 | 11.2 | 36.4 | 12 | 4.5 |
| 3 | 781 | 196 | 57 | 7.3 | 29.1 | 27 | 4.6 |
| 4 | 1021 | 263 | 76 | 7.4 | 28.9 | 36 | 4.7 |
| 5 | 1041 | 224 | 48 | 4.6 | 21.4 | 55 | 6.7 |
| 6 | 924 | 211 | 46 | 5 | 21.8 | 46 | 6.5 |
| 7 | 730 | 126 | 32 | 4.4 | 25.4 | 40 | 6.6 |
| 8 | 606 | 108 | 24 | 4 | 22.2 | 44 | 8.8 |
| 9 | 387 | 70 | 11 | 2.8 | 15.7 | 25 | 7.9 |
| ≥10 | 848 | 119 | 23 | 2.7 | 19.3 | 76 | 10.4 |
| Total | 6922 | 1503 | 390 | | | 362 | |

Source: Chapoto and Jayne (2006) using data from the CSO/MACO/FSRP Post Harvest Survey 1999/2000 and Supplemental Surveys, 2001 and 2004.

Notes: [a]Column E =Column D /Column B. [b]Colum F=Column D/Column C. [c]36 households incurred more than one prime-age death.

### 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.

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

where $L_{it}$ is landholding size in hectares in household i at time t; the parameter $\gamma_t$ denotes a time-varying intercept[6]; $\mu_i$ captures the household-level fixed effects (assumed constant over time); and $\varepsilon_{it}$ is the time-varying error term.

[6] Wooldridge, 2002 page 254.

A comparison of the change in landholding size (L) over time between the treatment group represented by $D_i^w$ and control group (household without a PA 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 $\alpha$ would be an indication that households experiencing a male head of household death and now headed by a widow are losing land access. Differencing the time 1 and time 0, equation 2 yields:

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

where $\Delta L_i$ is the difference in landholding size between the two time periods, $D_i^w$ and $D_i^o$ are the the treatment indicators, $\alpha$ and $\beta$ is the treatment effects respectively, $\gamma$ 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 widow-headed households on access to land. However, rural households are heterogeneous in many variables that change and evolve differently for different types of households, including presumably 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 Yamano and Jayne, 2004; Ainsworth and Dayton, 2000; 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 $\alpha$ but it is now interpretable as a *ceteris paribus* effect. The model in equation 1 is extended as follows:

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

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

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

### 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:

$$\Delta L_i=\gamma + D_i^w\alpha + D_i^o\beta + X_i^h\varphi + X_i^w\vartheta + M_{ik}\phi + X_i^h{*}D_i^w\varphi' + X_i^{w/h}{*}D_i^w\vartheta' + M_{ik}{*}D_i^w\phi' + X_i^h{*}D_i^o\varphi'' + X_i^{w/h}{*}D_i^0\vartheta'' + M_{ik}{*}D_i^o\phi'' + C_{jj}\eta + \Delta\varepsilon_I \qquad [6]$$

i= 1,…N  k=1,……K  and j=1, ……J

*Outcome variables*: We use land under cultivation as an indicator of arable land controlled by the household. We only have data on total land under control of the household in 1999/00 but not in 2002/03. So instead we consider using changes in land cultivated between 1999/00 and 2002/03 as a proxy for land access. This variable could be problematic in that it may not reflect land access but rather a shortage of labor. Therefore, we 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. These social relations variables include the widow's and deceased husband's relation to the village headman, the number of years in which the households' 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.

While information on assets would have been useful in this study, comparable data was not available from the two surveys.

*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, boys age 6 to 11, girls age 6 to 11, males and females age 12 and above), asset poverty status, 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. The inclusion of quadratic terms of age is tested for because the partial impact of age of the widow may be non- linear. These variables were interacted with $D^w$ to capture if there are any differential impacts by household and widow initial characteristics.

*Matrilineal inheritance (M):* M is a village-level categorical variable for areas of matrilineal inheritance. In order 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 corrected 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.

### *3.4.2 Estimation*

We estimate district fixed effects models of changes in logged land cultivation. We report four models to assess the robustness of results. The first model shows results of the naïve 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 and the widow and initial household characteristics excluding kinship ties, years settled in the locality and whether the household is located in a matrilineal village (hereafter referred to as social capital variables). Model 4 includes all covariates and their interaction terms.

### *3.4.3 Identification of impact of death*

The DID fixed effects estimator of equation [6] is confounded by the possibility that PA 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 (2006) 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.

## 4. RESULTS

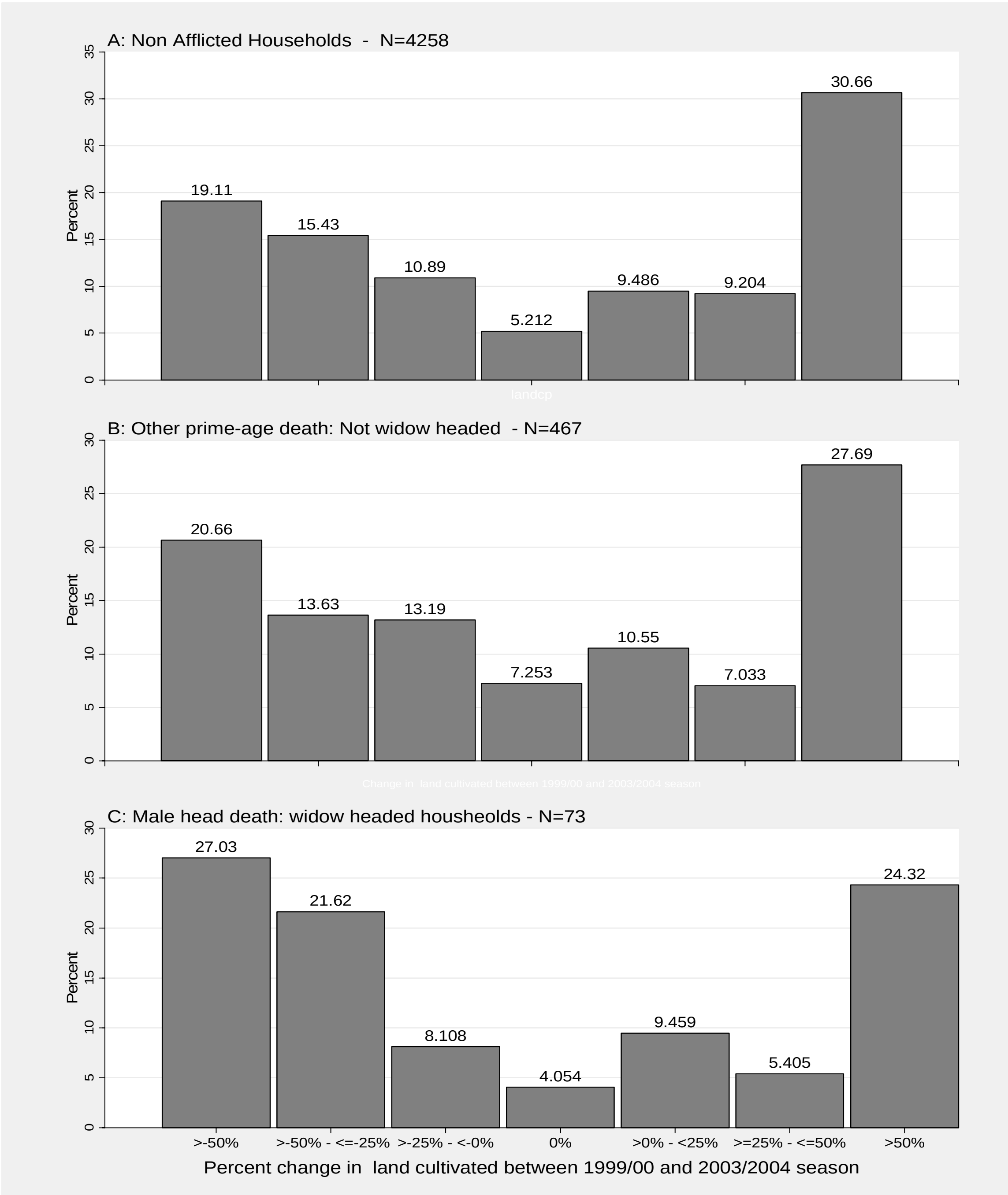
We begin this section with a descriptive analysis of the characteristics of households experiencing the death of a male household head between 2001 and 2004. To save words, we hereafter refer to these households as 'widow-headed households'. The remainder of the section presents the results from the econometric analysis measuring the impact of male head mortality on land cultivated (proxy for land access) among widow-headed households compared to non-afflicted household.

### 4.1 Descriptive Results

Figure 1 shows distribution of changes in land cultivation between 2000 and 2003 for three groups: non-afflicted households, households that became widow-headed, and households suffering the death of a prime-age adult but not widow-headed. Among non-afflicted households (Panel A), 49.3 percent increased their area under cultivation between 2000 and 2003, 45.4 percent incurred a decline in cultivation, and 5.2 percent had no change. Panel B shows that the proportion of "other mortality" households incurring more than a 50% decline in land cultivation was greater than that of unafflicted households but considerably less than households that became headed by a widow. By contrast, only 39.2 percent of the households that became widow-headed between 2000 and 2003 increased their area under cultivation, while 56.7 percent incurred a decline (Panel C). Of the widow-headed households experiencing a decline in cropped area, almost half of them incurred a greater than 50% decline. Of the three groups, widow-headed households were the least likely to increase their area under cultivation, the most likely to reduce their cropped area, and the most likely to suffer a greater than 50 percent decline incurred a decline (Panel C). Of the widow-headed households experiencing a decline in cropped area, almost half of them incurred a greater than 50% decline. Of the three groups, widow-headed households were the least likely to increase their area under cultivation, the most likely to reduce their cropped area, and the most likely to suffer a greater than 50 percent decline in cropped area. However, it is worth noting that more than 40% of widow-headed households were able to retain or increase the amount of their land under cultivation, 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.

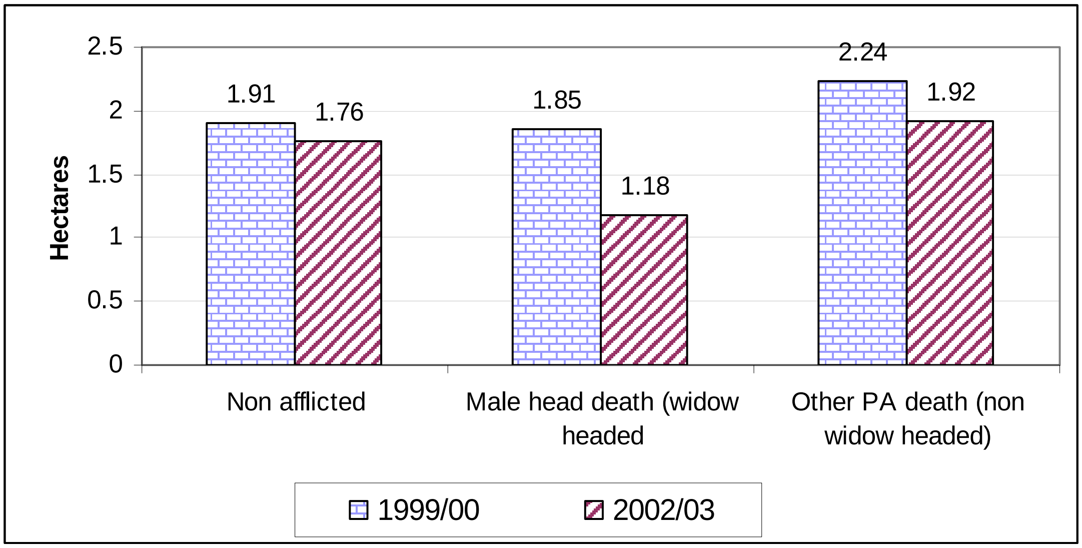
Turning to the actual average cultivated land in 2000 and 2003, Figure 2 shows that on average cropped land declined among all the types of households analyzed, by 7.6 % in non-afflicted households, 14.3% among households experiencing prime-age death but not widow-headed, and by 36.2% among households experiencing male head of household death and widow-headed. These results show that widow-headed households in general became worse off compared to non-afflicted households. The huge decline in cropped land among widow-headed households could at least be due to two factors: after the death of their husband, widows could be experiencing severe labor shortages or the widows might have lost access to land as a result of property redistribution. Unfortunately, these descriptive results alone can not provide a definitive answer to the question of whether widows are losing access to their land. Therefore to shed

**Figure 1. Percent changes in cropped area among non-afflicted households, households incurring male-head mortality, and households incurring other prime-age mortality (not widow-headed).**




Source: CSO/MACO/FSRP PHS 1999/2000 and SS 2001 and 2004

**Figure 2: Comparison of land cultivated in 2001 and 2003 (Hectares)**




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

more light to this question we examine the initial household characteristics among widow-headed households by changes in cropped land.

Table 3 reveals several interesting observations. *First*, it appears that neither education nor age of the widows had any clear influence on her likelihood to lose a large relative share of land after the death of their husbands. Younger widows seemed to be no younger or older than the mean of all widows (42 years). The proportion of widows losing over 50% of their land who had no formal education (25%) was very close to the mean of all widow-headed households in the sample.

*Second,* widows experiencing the greatest relative decline in cultivated area had the largest families in 2000. Households with cropped area declining by more than 50% had the greatest number of adult equivalents (3.7 compared to the mean of 2.5 among all widow-headed households), significantly more children 6-14 years, and slightly more adult males and adult females than the mean of all widow-headed households. Using *ex ante* number of PA adults as an indicator of available household labor, these results suggests that the average widow-headed household experiencing a decline in cropped land does not have less available PA adult labor compared to widow-headed households with positive changes in land cultivated (the household having +3.5 change in land cultivation is treated as an outlier) . A logical explanation for the decline in cropped land among the 62% of the households experiencing a male head of household death could be that the widow and her dependents may have insecure land tenure rights and thus lose part or all of the land formerly cultivated by the family.

**Table 3. Characteristics of widow-headed households by percentage change in land cultivation between 2000 and 2003**

| Attributes | Full Sample | % Δ in cropped land between 1999/2000 and 2002/2003 (Ha) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Negative | | | No Change | Positive | | |
| | | >50 | 25-50 | 0-25 | | 0-25 | 25-50 | >50 |
| Number | 73 | 20 | 16 | 6 | 3 | 7 | 4 | 17 |
| Age of widow/current head(years) | 42.2 | 42.8 | 40.6 | 44.7 | 31.3 | 37.3 | 53.5 | 43.5 |
| Level of education of widow/current head (=1) | | | | | | | | |
| No education | 24.7 | 30.0 | 31.3 | 33.3 | 33.3 | - | - | 23.5 |
| Lower primary education (1-3 years) | 21.9 | 15.0 | 18.8 | 16.7 | 66.7 | - | 50.0 | 29.4 |
| Upper primary education (4-6 years) | 21.9 | 20.0 | 18.8 | 16.7 | - | 42.9 | 25.0 | 23.5 |
| Grade 7 or greater | 31.5 | 35.0 | 31.3 | 33.3 | - | 57.1 | 25.0 | 23.5 |
| Household characteristics in 2000 | | | | | | | | |
| Effective dependency ratio (number) | 1.2 | 1.3 | 1.2 | 1.2 | 1.4 | 1.1 | 1.3 | 1.1 |
| Adult equivalent (number) | 2.5 | 3.7 | 1.5 | 2.0 | 2.5 | 2.4 | 1.9 | 2.1 |
| Children 5 years and under (number) | 0.7 | 0.8 | 1.0 | 0.8 | 0.0 | 0.1 | 1.0 | 0.6 |
| Children age 6 to 14 years (number) | 2.2 | 3.0 | 1.7 | 1.8 | 2.7 | 2.5 | 3.3 | 1.5 |
| PA males excluding deceased (number) | 0.5 | 0.9 | 0.3 | 0.0 | 0.3 | 0.1 | 1.5 | 0.4 |
| PA females excluding deceased (number) | 1.3 | 1.4 | 1.3 | 1.5 | 0.3 | 1.6 | 1.3 | 1.1 |
| Value of assets (000 Kwacha) | 959.9 | 2527.2 | 125.9 | 1720.8 | 258.8 | 362.1 | 163.4 | 189.7 |
| Household Income (000 Kwacha) | 2663.2 | 4140.1 | 1464.8 | 2263.7 | 1846.3 | 5849.3 | 1678.3 | 1170.9 |
| Off-farm income (000 Kwacha)[1] | 1951.2 | 3644.1 | 446.3 | 1349.1 | 1334.7 | 4372.2 | 1590.3 | 731.1 |
| Value of livestock (000 Kwacha) | 661.9 | 2047.0 | 79.6 | 621.7 | 71.5 | 40.4 | 119.7 | 82.1 |
| Value of cattle (000 Kwacha) | 548.3 | 1808.6 | 0.0 | 525.0 | 0.0 | 0.0 | 0.0 | 41.2 |
| Value of small animals (000 Kwacha)[2] | 113.6 | 238.4 | 79.6 | 96.7 | 71.5 | 40.4 | 119.7 | 40.9 |

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

Notes: [1] Off-farm income include salary and wage income, informal and formal business income. [2] Small animals include goats, sheep, pigs, chicken, ducks and rabbits.

*Third*, widow-headed households experiencing the greatest decline in cropped area 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 is substantially higher among widow-headed households experiencing a greater than 50% decline in cropped land compared to other widow-headed households. These results seem to suggest that widows in households that were wealthier to begin with are more likely to lose land access and other productive assets after the death of their husband.

## 4.2 Econometric results

We estimated models analyzing the impact of the death of a male head of household on cropped land. The log-level specifications provide estimates of percentage changes in land cultivated. We cannot report all parameter estimates on one page so Table 4 is confined only to the main variables of interest (the complete set of results is presented in the Appendix A2).

### *4.2.1 Changes in land cultivation*

Results in Table 4 column 1 indicate a significant decline in total land cultivated among households experiencing a prime-age death. Cropped land declined by 25.2% among widow-headed households (households experiencing mortality of male head of household) and by 5.5% among households experiencing the death of another prime-age adult. Ceteris paribus, the percentage decline in cropped land rose slightly, from 25% to 27% after controlling for widow, household and social capital variables (column 2). Similar to the descriptive analysis, we cannot use these results in columns 1 and 2 to make any conclusions regarding the loss of land rights by widows. Therefore, we estimated models 3 and 4 with the interactions of widow, household and social capital variables to provide greater clarity on this issue. Also, to better understand the magnitude of these interaction terms, we simulated the predicted changes in land cultivation based on Model 4 estimates for 12 "profiles" of statistically significant interactions (Table 5).

### *4.2.2 Age of widow*

We test the hypothesis that the impact of male head mortality on land cultivation and widow's security to land depends on the age category of the widow. Table 4, column 4 shows that the negative impact of mortality of the male head of household on land cultivation is somewhat lower among widows aged 50 and above compared to widows age 18 to 33 (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. Based on sensitivity analysis, profiles 3 and 4 in Table 4 are similar in all characteristics except that in profile 4 the widow is aged 50 and above. Land cultivation declined by 12.5% compared to a 45.0% decline among households headed by a widow age 18 to 33. This finding suggests that older women have protection against loss of land compared to younger 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 the need to keep most of the deceased husband's land. In contrast, older women may be considered less likely to remarry and are therefore allowed to continue to cultivate most of the land formerly controlled by the deceased husband. Notwithstanding this possible rationale, it appears that widow-headed households are particularly vulnerable, regardless of the age of the widow. The implication of this finding to policy is that efforts need to be made to protect the rights of younger widows who are more likely to lose their productive assets after the death of their husband.

### *4.2.3 Education level*

The results in table 4, column 4, do not suggest that the educational attainment of the widow has any differential impact on land cultivation. All the education variables are statistically Insignificant even at the 20 percent level.

## Table 4. Regression results for impact of death on land cultivated between 2000 and 2003[1]

| Covariates | Change in log of land cultivated (hectares) between 2000 and 2003 | | | |
|---|---|---|---|---|
| | ----------Corrected for attrition-------- | | | |
| | 1 | 2 | 3 | 4 |
| PA male head death: widow-headed (=1) | -0.252* | -0.270* | 0.376 | 0.621 |
| | -2.16 | -2.36 | -1.08 | -1.60 |
| All other PA death: not widow-headed (=1) | -0.055 | 0.000 | 0.192 | 0.073 |
| | -1.26 | 0.00 | -1.23 | -0.45 |
| Age and education groups of head/widow | no | yes | yes | yes |
| HH composition variables in 2000 | no | yes | yes | yes |
| Kinship ties and years settled in locality | no | no | yes | yes |
| HH in matrilineal inheritance village (=1) | no | no | yes | yes |
| **Interaction Terms** | | | | |
| Widow*Age 34-49 | | | -0.230 | 0.050 |
| | | | -0.90 | -0.20 |
| Widow*Age 50 above | | | 0.384 | 0.609* |
| | | | -1.23 | -1.99 |
| Widow*1-3 years of education | | | -0.116 | -0.078 |
| | | | -0.34 | -0.27 |
| Widow*4-6 years of education | | | -0.039 | -0.028 |
| | | | -0.14 | -0.10 |
| Widow*7 years and above | | | 0.160 | -0.196 |
| | | | -0.60 | -0.73 |
| Widow*children under 5 | | | -0.232* | -0.155+ |
| | | | -2.02 | -1.82 |
| Widow*children age 6 to 14 | | | -0.116+ | -0.120+ |
| | | | -1.87 | -1.90 |
| Widow*PA male | | | -0.179 | -0.201 |
| | | | -1.13 | -1.31 |
| Widow*PA female | | | -0.068 | -0.101 |
| | | | -0.55 | -0.96 |
| Widow*Wealth status | | | -0.408* | -0.348+ |
| | | | -2.04 | -1.85 |
| Widow*Head related to headman | | | | -0.035 |
| | | | | -0.19 |
| Widow*Spouse related to headman | | | | 0.594** |
| | | | | -2.68 |
| Widow*number of years settled | | | | -0.022** |
| | | | | -2.64 |
| Widow*Matrilineal village | | | | -0.073 |
| | | | | -0.29 |
| Constant | 0.072 | 0.351* | 0.332* | 0.327* |
| | -0.85 | -2.32 | -2.11 | -2.12 |
| Observations | 5402 | 5402 | 5402 | 5402 |
| R-squared | 0.08 | 0.11 | 0.12 | 0.12 |

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 t-ratios calculated with Huber-White-Robust standard errors. [1]See Table A2 for the rest of the results.

**Table 5. Simulations[1] of the percentage change in land cultivation based on specific widow, initial household attributes.**

| Profile | Household type | Widow age 50 and above | Wealth Status | Children Age 6-14 | Widow related to head | Years settle in locality | All other variables | % Δ in cropped land |
|---|---|---|---|---|---|---|---|---|
| 1 | Non afflicted | mean | mean | mean | mean | mean | mean | -0.48 |
| 2 | Other PA death-not widow headed | mean | mean | mean | mean | mean | - | -0.57 |
| 3 | Male head death-widow headed | no[2] | mean | mean | mean | mean | - | -45.0 |
| 4 | Male head death-widow headed | yes | mean | mean | mean | mean | - | -12.5 |
| 5 | Male head death-widow headed | yes | non-poor | mean | mean | mean | - | -34.2 |
| 6 | Male head death-widow headed | yes | poor | mean | mean | mean | - | 9.0 |
| 7 | Male head death-widow headed | yes | non-poor | 5 | mean | mean | - | -67.4 |
| 8 | Male head death-widow headed | yes | non-poor | 5 | no | mean | - | -73.4 |
| 9 | Male head death-widow headed | yes | non-poor | 5 | yes | mean | - | -12.4 |
| 10 | Male head death-widow headed | yes | non-poor | 5 | yes | 20 | - | -23.8 |
| 11 | Male head death-widow headed | yes | Poor | 5 | yes | 20 | - | 19.4 |

Source: CSO/MACO/FSRP Post Harvest Survey 1999/2000 and Supplemental Survey, 2001 and 2004
Notes: [1]Simulation outcomes based on regression models in Table 5, column 4. [2]Widow age 18 to 33.

Notes: Appendix 2 presents the descriptive statistics of the covariates from which the percentage changes are computed; however, we should point out that these profiles and simulations are in no way exhaustive.

### *4.2.4 Wealth status*

The negative impact of mortality of the male head of household on land cultivation is not mitigated among widows in households which were initially non-poor, as indicated by the negative coefficient on the interaction between death of male head of the household and initial wealth status. For example, profile 5 and profile 6 in Table 5 are similar in all characteristics except that in profile 5 the household is initially non-poor whilst in profile 6 the household was poor in 2000. Land cultivation went down by -34.2% if the household was initially non-poor and increased by +9.0% if the household was poor to begin with. One would argue that if the decline in land cultivation was due to severe labor shortages among widow-headed households then to some extent initial household wealth status could mitigate the negative impact. However, widows who remain with substantial assets compared to other households in the community may be more vulnerable to losing some of the household's assets after the passing of her husband. The implication of this finding is that efforts should be made to protect both poor and non-poor widows from losing property rights after the death of their husbands.

#### *4.2.5 Household composition*

If the *ex ante* number of PA 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 mortality on land cultivation. However, despite the fact that the coefficients on these variables are statistically insignificant, it is surprising that they are both negative suggesting that the impact of mortality of the male head of household on land cultivation is not mitigated by having more prime-age adults in the household. This result suggests that the decline in land cultivation observed in widow-headed households is probably not due to a severe labor shortage but rather because of a loss of land due to inheritance after the death of the husband.

In contrast the coefficients on the interaction between male head of household mortality and the number of children under 5 and children age 6 to 14 are negative and statistically significant at 5 percent level. Thus, the negative impact of mortality of the male head of household on land cultivation is also not mitigated by having more children in the household. For example, profile 5 and profile 7 are similar in all characteristics except that in profile 7 the household has on average 3 more children age 6 to 14 than the household in profile 5. Land cultivation is estimated to decline by 67.4% among households with more children age 6 to 14 compared to 34.2% for the household with less children age 6 to 14.

The results on the interaction of death and children under 5 is intuitively plausible because more time is needed to care for younger children reducing the time available to tend to crop production. However, because children aged 6 to 14 in rural Zambia are considered old enough to assist their parent in crop cultivation, we would expect to get a positive impact on land cultivated. 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 land cultivation 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 headman and the death of male head of the household. For example, profile 8 and profile 9 are similar in all characteristics except that in profile 9 the widow is related to the headman, land cultivation went down by only -12.4% when the widow was related to the headman and -73.4% if not. The 61.0% difference between these two profiles arguably has little to do with availability of labor but is more related to the protection of the widow's rights to property and assets including land because of the widow's kinship ties to the head man. This finding implies that with the willingness and participation of community leadership it may be possible to protect widows from losing their assets and land to other relatives. This finding also underscores the importance of social relations within the community in influencing land tenure and allocation decisions, including the disposition of land used by widows.

In contrast, the negative impact of mortality of the male head of household on land cultivation is not mitigated if the deceased husband was the one related to the headman, as indicated by the negative but statistically insignificant coefficient on the interaction between mortality of male head of household (household now widow-headed) and the relationship of the deceased husband to the headman. This finding supports our earlier assertion that kinship ties are only important if the widow herself is the one with kinship ties to the village headman.

#### *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. Using the change in land cultivated as a proxy of land access we test whether the number of years settled in the locality helped the widow retain her land after the death of the husband. The results in Table 4, column 4 show that the impact of mortality of the male household head is not mitigated by how long the household has settled in the locality, as indicated by the statistically significant negative coefficient on the interaction between the death of male head of the household and the number of years settled in locality. For example, profile 9 and profile 10 are similar in all characteristics except that in profile 10 the household has been in the locality for 6 additional years compared to the household in profile 9. Land cultivation declines by 23.8% for the household that had spent 20 years in the locality compared to -12.4% for the household that had spent about 14 years in the locality. One 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*

Assuming that the impact on the change in cropped land is capturing widow's security on land access, *a priori* one would expect some protection again loss of land access for widows living in matrilineal villages since the heir to the estate of the deceased husband is normally selected from the male relatives on the widow's side. Unfortunately, the results in Table 4, column 4 suggest that the widow does not benefit for living in a matrilineal village; the coefficient on the interaction between the death of male head of household and households in matrilineal village is actually negative but not statistically significant. Thus, there appear to be no differences between widows living in matrilineal or patrilineal villages; both are still all at risk of losing their rights to productive assets including land to their brothers and/or uncles.

## 5. 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 their loss of 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 land cultivation changes among households becoming headed by a widow after 2001 compared to households not incurring prime-age mortality. The study is also designed to identify factors specific to the widow, the household, and the community that influence the severity of the impact on land cultivation among widow-headed households.

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*, we find that about 56% of the households that suffered the death of the male household head and became headed by a widow after the 2001 survey did indeed cultivate less land in 2004 than in 2001. Over 27% of the widow-headed households cultivated less than half of the land they cultivated in 2001. On average, land cultivation declined among afflicted and non-afflicted households: -7.6 % among non-afflicted households, -14.3% among households experiencing other prime-age deaths and household not widow-headed, and -36.2% among households experiencing male head-of-household death and widow-headed. An examination of the change in cropped area among afflicted and non-afflicted groups reveals that widow-headed households were the least likely to increase their area under cultivation, the most likely to reduce their cropped area, and the most likely to suffer a greater than 50 percent decline in cropped area. However, it is worth noting that more than 40% of widow-headed households were able to retain or increase the amount of their land under cultivation, indicating that the loss of land by widows and their dependents is far from universal.

*Second***,** the econometric results show that to some extent older widows have protection against loss of land access compared to younger widows. Land cultivation declined by 12.5% among households headed by a widow age 50 and above compared to a 45.0% decline among households headed by a widow age 18 to 33, 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 the new husband's land, thereby obviating the need for her to keep most of the deceased husband's land. Notwithstanding this possible rationale, it appears that widow-headed households are particularly vulnerable, regardless of the age of the widow. An implication of this finding is that poverty reduction programs will be more effective if they address younger widows' livelihood problems after the death of their husband.

*Third*, the results do not suggest any differential impact on land cultivation by education level of the widow, as all the education level variables are statistically insignificant even at a 20 percent level of significance.

*Fourth*, if we use the *ex ante* 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 finding suggests that labor shortages due to mortality are not the main cause for the reduction in cropped area but rather that the widow and her dependents may have insecure land tenure rights and thus lose part or all of the land formerly cultivated by the family.

*Fifth*, widow-headed households experiencing the greatest decline in cropped area appeared to be relatively wealthy prior to the death of the husband. Generally, we find that the initial 2000/01 mean value of assets, value of livestock, off-farm income, and household income is substantially higher among widow-headed households experiencing a greater than 50% decline in cropped land compared to other widow-headed households. Cropped land declined by 34.2% if the household was initially non-poor compared to an increase of 9.0% if the household was poor to begin with, other factors held constant at their mean levels. Thus, widows whose households were relatively well off compared to other households in the community, prior to the husband's death, appear to be more vulnerable to losing assets after the passing of her husband.

*Sixth*, widows whose family has kinship ties to the village authorities are less likely to lose land. For example, other factors held constant, land cultivation declined by only 12.4% when the widow was related to the headman and by 73.4% 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, including the disposition of land used by widows.

*Seventh,* the negative impact of mortality of the male head of household on land cultivation is not mitigated by the number of years the household was settled in the locality. The greater the number of years settled in the village, the more vulnerable is the widow to losing access to land. This finding may indicate that the longer 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.

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 livelihood risks faced by widows and their dependents in the era of HIV/AIDS are 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. Increased government commitment to ensure security of widows' access to land and other productive assets may not only directly reduce an important dimension of rural poverty but also possibly reduce the spread of AIDS caused by risky sexual behavior driven by poverty. 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.

# References

Ainsworth, M., and J. Dayton. 2000. *Is the AIDS Epidemic Having an Impact on the Coping Behavior and Health Status of the Elderly?* Evidence from Northwestern Tanzania. Washington, D.C.: World Bank.

Ainsworth, M., and I. Semali. 1998. Who Is Most Likely to Die of AIDS? Socio- economic Correlates of Adult Deaths in Kagera Region, Tanzania. In *Confronting AIDS: Evidence for Developing World,* eds. M. Ainsworth, L. Fransen, and M. Over. Brussels: European Commission.

Alderman, H., J. Behrman, Hans-Peter Kohler, J. Maluccio, and S. Watkins. 2001. Attrition in Longitudinal Household Survey Data: Some Tests for Three Developing Country Samples. *Demographic Research* 5: 78-124.

Armstrong A.K. 1992. Struggling over scarce resources: Women and maintenance in Southern Africa. Women and Law in Southern Africa Trust, Harare, Zimbabwe.

Barnett, T., and A. Whiteside. 2002. *AIDS in the Twenty-First Century: Disease and Globalization.* Basingstoke, UK: Palgrave Macmillan.

Beegle, Kathleen. 2005. Labor Effects of Adult Mortality in Tanzanian Households. *Economic Development and Cultural Change* 53(3): 655-684.

Chapoto, A. and T.S Jayne 2005. *The Impact of AIDS-related Prime-age Mortality on Rural Farm Households: Panel Survey Evidence from Zambia.* Working Paper No. 15. Lusaka, Zambia: Food Security Research Project.

Economic Commission for Africa – Office for Southern Africa (ECA-SA), 2003. *Land Tenure Systems and Sustainable Development in Southern Africa*, Lusaka.

Fitzgerald, J., P. Gottschalk, and R. Moffitt. 1998. An Analysis of Sample Attrition in Panel Data. The Michigan Panel Study on Income Dynamics. *Journal of Human Resources* 33: 251-299.

Kajoba, G.M., 2002. Women and Land in Zambia: A case study of Small-Scale Farmers in Chinema Village, Chibombo District, Central Zambia. *Eastern Africa Social Science Research Review*, Vol XVIII, No. 1, January, pp 35-61.

Keller, B. 2000. *Women's Access to land in Zambia*. International Federation of Surveyors (FIG) Commission of (Cadastre and Land Management) Task Force on Women Access to Land, Koln, Germany.

Available at: http://www.swedesurvey.se/files/pdf/Seminar_Womens_Zambia_2000.pdf

Machina, Henry. 2002. Women's Land Rights in Zambia: Policy Provisions, Legal Framework and Constraints. Paper presented at the Regional Conference on Women's Land Rights, held in Harare, Zimbabwe, from 26 – 30 May 2002. Available at: http://www.oxfam.org.uk/what_we_do/issues/livelihoods/landrights/downloads/womenzam.rtf

Megill, D.J. 2004. *Recommendations on Sample Design for Post Harvest Surveys in Zambia Based on the 2000 Census*. Working Paper No. 10. Lusaka, Zambia: Food Security Research Project.

Milimo, J. T., 1990. Differential *Impacts of Zambia's Macro-Economic and Sectoral Policies on Agricultural Production by Female and Male Farmers*. A Consultancy Report for the Women's Section of the National Commission for Development Planning, Lusaka.

Ministry of Lands. 2002. The Draft Land Policy. Lusaka, Zambia. Available at: http://www.sarpn.org.za/documents/d0000626/P591-Land_Policy.pdf

Mutangadura G. B. "Gender, HIV/AIDS and Rural Livelihoods in Southern Africa: Addressing the Challenges," *JENDA: A Journal of Culture and African Women Studies:* Issue 7, 2005. Available at: http://www.jendajournal.com/issue7/mutangadura.html

Mutangadura, G. B. 2004. *Women and Land Tenure Rights in Southern Africa: A human rights-based approach*. A paper presented to the Land in Africa: Market Asset, or Secure Livelihood? held from 8-9 November 2004, Westminster, London. Available at: http://www.iied.org/docs/events/Working_Group_2_Gladys_Mutangadura.pdf

Shezongo-Macmillan 2005. *Women's property rights in Zambia.* A paper presented to the Strategic Litigation Workshop held from 14-18 August 2005, Johannesburg, South Africa. Available at: http://www.cohre.org/womenlitigation/zambia.doc

The Republic of Zambia, Gender in Development Division. 2005. *Baseline Survey on Women's Access to Agricultural Land in Zambia Final Research Report*. Produced in Partnership with Zambia Land Alliance & Dan Church Aid. Lusaka, Zambia. Available at : http://www.landcoalition.org/pdf/zla_women_Feb05.pdf

UNECA, Southern Africa Office. 2003. *Land Tenure Systems and Sustainable Development in Southern Africa*. Available at: http://www.uneca.org/eca_resources/Publications/srdcs/Land_Tenure_Systems_and_sustainable_Development_in_Southern_Africa.pdf

Wooldridge, J.M. 2002. *Econometric Analysis of Cross Section and Panel Data*. Boston: MIT Press.

WLSA, 1997. *The changing Family in Zambia*. Women and Law in Southern Africa Trust, Lusaka, Zambia

Yamano, T., and T.S. Jayne. 2004. Measuring the Impacts of Working-Age Adult Mortality on Small-Scale Farm Households in Kenya. *World Development* 32.1: 91-119.

Yamano, T., and T.S. Jayne. 2005. Working Age Adult Mortality and Primary School Attendance in Rural Kenya. *Economic Development and Cultural Change* 53.3: 619-653.

Zulu B., Jayne, T.S. and G. Kajoba. Forthcoming. *Access To Land And Poverty Reduction In Rural Zambia: Connecting The Policy Issues*. Working Paper, Food Security Research Project, Lusaka, Zambia.

# APPENDICES

**Table A1: Regression results for impact of death on land cultivated between 2000 and 2003[1]: Complete set of results**

| Covariates | Change in log of land cultivated (hectares) between 2000 and 2003 | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | ----------Corrected for attrition-------- | | | | ---------Not corrected for attrition------- | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| PA male head death: widow-headed (=1) | -0.252* | -0.270* | 0.376 | 0.621 | -0.276* | -0.291** | 0.297 | 0.680+ |
| | -2.16 | -2.36 | -1.08 | -1.60 | -2.48 | -2.66 | -0.90 | -1.79 |
| All other PA death: not widow-headed (=1) | -0.055 | 0.000 | 0.192 | 0.073 | -0.067 | -0.016 | 0.084 | 0.069 |
| | -1.26 | 0.00 | -1.23 | -0.45 | -1.58 | -0.39 | -0.57 | -0.43 |
| **Age group of head/widow (=1)** | | | | | | | | |
| Age 18-33 (reference group) | | | | | | | | |
| Age 35 to 49 (=1) | | -0.012 | -0.017 | -0.016 | | -0.003 | -0.01 | -0.01 |
| | | -0.32 | -0.45 | -0.42 | | -0.08 | -0.28 | -0.26 |
| Age 50 and above(=1) | | -0.133** | -0.140** | -0.138** | | -0.106** | -0.114** | -0.112** |
| | | -3.28 | -3.27 | -3.21 | | -2.73 | -2.76 | -2.71 |
| **Education level of head/widow (=1)** | | | | | | | | |
| No education | | | | | | | | |
| Lower primary (1-3 years) | | 0.101* | 0.100* | 0.099* | | 0.108* | 0.099* | 0.099* |
| | | -2.24 | -2.06 | -2.05 | | -2.46 | -2.12 | -2.12 |
| Upper primary (4-6 years) | | 0.137** | 0.155** | 0.155** | | 0.122** | 0.134** | 0.135** |
| | | -3.21 | -3.42 | -3.41 | | -2.99 | -3.11 | -3.11 |
| Grade 7 and upper | | 0.211** | 0.213** | 0.213** | | 0.209** | 0.208** | 0.209** |
| | | -5.18 | -4.95 | -4.94 | | -5.33 | -5.01 | -5.02 |
| **Household composition in 2000** | | | | | | | | |
| Children under age 5 (number) | | -0.008 | -0.005 | -0.005 | | 0.002 | 0.004 | 0.004 |
| | | -0.57 | -0.34 | -0.35 | | -0.14 | -0.30 | -0.30 |
| Children age 6 to 14 (number) | | -0.007 | -0.003 | -0.003 | | -0.011 | -0.008 | -0.008 |
| | | -0.88 | -0.36 | -0.36 | | -1.62 | -1.13 | -1.12 |
| Prime-age male (number) | | -0.021 | -0.017 | -0.017 | | -0.018 | -0.012 | -0.012 |
| | | -1.57 | -1.21 | -1.22 | | -1.37 | -0.89 | -0.90 |
| Prime-age female (number) | | 0.013 | 0.016 | 0.016 | | 0.004 | 0.005 | 0.005 |
| | | -0.87 | -0.98 | -0.99 | | -0.31 | -0.32 | -0.33 |
| HH wealth status in 2000 (1=non poor, 0=poor) | | -0.204** | -0.193** | -0.193** | | -0.211** | -0.203** | -0.202** |
| | | -7.22 | -6.52 | -6.48 | | -7.87 | -7.2 | -7.17 |
| Male head related to headman in 2000 | | 0.001 | 0.003 | 0.011 | | 0.014 | 0.015 | 0.023 |
| | | -0.04 | -0.10 | -0.37 | | -0.48 | -0.53 | -0.80 |
| Spouse related to headman | | 0.015 | 0.016 | -0.007 | | 0.026 | 0.03 | 0.009 |
| | | -0.32 | -0.36 | -0.15 | | -0.62 | -0.7 | -0.20 |
| Years settled in locality (number) | | -0.003* | -0.003* | -0.003* | | -0.003** | -0.003** | -0.003* |
| | | -2.47 | -2.38 | -2.37 | | -2.7 | -2.63 | -2.55 |
| HH in matrilineal inheritance village (=1) | | -0.113 | -0.121 | -0.115 | | -0.076 | -0.088 | -0.081 |
| | | -0.65 | -0.68 | -0.66 | | -0.40 | -0.46 | -0.43 |
| **Interaction Terms** | | | | | | | | |
| Widow*Age 34-49 | | | -0.230 | 0.050 | | | -0.155 | 0.07 |
| | | | -0.90 | -0.20 | | | -0.63 | -0.29 |
| Widow*Age 50 above | | | 0.384 | 0.609* | | | 0.402 | 0.591+ |
| | | | -1.23 | -1.99 | | | -1.36 | -1.96 |
| Widow*1-3 years of education | | | -0.116 | -0.078 | | | -0.007 | -0.125 |
| | | | -0.34 | -0.27 | | | -0.02 | -0.44 |
| Widow*4-6 years of education | | | -0.039 | -0.028 | | | -0.011 | -0.082 |
| | | | -0.14 | -0.10 | | | -0.04 | -0.30 |
| Widow*7 years and above | | | 0.160 | -0.196 | | | 0.089 | -0.25 |
| | | | -0.60 | -0.73 | | | -0.34 | -0.97 |

contd……

Table A4 continued.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Widow*children under 5 | | | -0.232* | -0.155+ | | | -0.188+ | -0.165 |
| | | | -2.02 | -1.82 | | | -1.72 | -1.52 |
| Widow*children age 6 to 14 | | | -0.116+ | -0.120+ | | | -0.108+ | -0.120+ |
| | | | -1.87 | -1.90 | | | -1.74 | -1.87 |
| Widow*PA male | | | -0.179 | -0.201 | | | -0.211 | -0.18 |
| | | | -1.13 | -1.31 | | | -1.36 | -1.18 |
| Widow*PA female | | | -0.068 | -0.101 | | | -0.026 | -0.11 |
| | | | -0.55 | -0.96 | | | -0.22 | -1.08 |
| Widow*Wealth status | | | -0.408* | -0.348+ | | | -0.386+ | -0.432* |
| | | | -2.04 | -1.85 | | | -1.94 | -2.37 |
| Widow*Head related to headman | | | | -0.035 | | | | -0.001 |
| | | | | -0.19 | | | | -0.01 |
| Widow*Spouse related to headman | | | | 0.594** | | | | 0.611** |
| | | | | -2.68 | | | | -2.75 |
| Widow*number of years settled | | | | - [illegible] | | | | - [illegible] |
| | | | | -2.64 | | | | -2.66 |
| Widow*Matrilineal village | | | | -0.073 | | | | -0.054 |
| | | | | -0.29 | | | | -0.22 |
| Other PA death*Age 34-49 | | | 0.110 | 0.096 | | | 0.129 | 0.115 |
| | | | -0.76 | -0.66 | | | -0.92 | -0.82 |
| Other PA death*Age 50 and above | | | 0.064 | 0.014 | | | 0.06 | 0.015 |
| | | | -0.52 | -0.11 | | | -0.50 | -0.12 |
| Other PA death*1-3 years of education | | | -0.011 | -0.010 | | | 0.039 | 0.039 |
| | | | -0.08 | -0.07 | | | -0.29 | -0.28 |
| Other PA death*4-6 years of education | | | -0.251+ | -0.262+ | | | -0.183 | -0.194 |
| | | | -1.79 | -1.89 | | | -1.35 | -1.45 |
| Other PA death*7 years and above | | | -0.068 | -0.062 | | | -0.021 | -0.018 |
| | | | -0.51 | -0.48 | | | -0.16 | -0.15 |
| Other PA death*children under 5 | | | -0.007 | -0.015 | | | -0.007 | -0.013 |
| | | | -0.17 | -0.36 | | | -0.17 | -0.33 |
| Other PA death*children age 6 to 14 | | | -0.019 | -0.021 | | | -0.012 | -0.013 |
| | | | -0.91 | -0.98 | | | -0.57 | -0.65 |
| Other PA death*PA male | | | -0.017 | -0.015 | | | -0.03 | -0.03 |
| | | | -0.43 | -0.39 | | | -0.76 | -0.74 |
| Other PA death*PA female | | | -0.025 | -0.024 | | | -0.008 | -0.007 |
| | | | -0.60 | -0.59 | | | -0.20 | -0.18 |
| Other PA death*Wealth status | | | -0.104 | -0.116 | | | -0.071 | -0.08 |
| | | | -1.14 | -1.28 | | | -0.79 | -0.90 |
| Other PA death*Head related to headman | | | | -0.101 | | | | -0.103 |
| | | | | -1.04 | | | | -1.09 |
| Other PA death*Spouse related to headman | | | | 0.170 | | | | 0.119 |
| | | | | -0.97 | | | | -0.77 |
| Other PA death*Number of years settled | | | | 0.004 | | | | 0.004 |
| | | | | -1.05 | | | | -0.87 |
| Other PA death*Matrilineal village | | | | 0.021 | | | | 0.032 |
| | | | | -0.22 | | | | -0.35 |
| Constant | 0.072 | 0.351* | 0.332* | 0.327* | 0.107 | 0.357* | 0.350* | 0.342* |
| | -0.85 | -2.32 | -2.11 | -2.12 | -1.35 | -2.09 | -2.00 | -1.98 |
| Observations | 5402 | 5402 | 5402 | 5402 | 5403 | 5403 | 5403 | 5403 |
| R-squared | 0.08 | 0.11 | 0.12 | 0.12 | 0.08 | 0.11 | 0.11 | 0.12 |
| Joint Tests | | | | | | | | |
| F-statistic for model | 6.09** | 7.38** | 6.39** | 6.27** | 6.39** | 7.62** | 6.54** | 6.43** |
| Male head death*Widow/household attributes | | | 7.23** | 7.36** | | | 7.20** | 7.73** |
| Male head death*All interactions | | | | 7.76** | | | | 8.04** |

**Table A2: 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