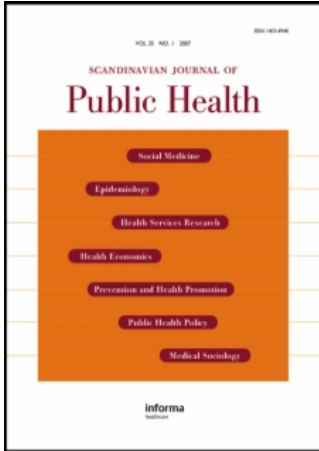


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### "Locusts are now our beef": Adult mortality and household dietary use of local environmental resources in rural South Africa

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ORIGINAL ARTICLE

## “Locusts are now our beef”: Adult mortality and household dietary use of local environmental resources in rural South Africa<sup>1</sup>

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### Abstract

There is currently a lack of research on the association between demographic dynamics and household use of natural resources in rural Africa. Such work is important because in rural Africa natural resources buffer households against shocks, offering both sustenance and income-generating potential. *Aims:* The article focuses on adult mortality as a household shock, examining use of local environmental resources as related to household dietary needs. *Methods:* The authors analyze two sources of data collected during May–December 2004 in the MRC/Wits Rural Public Health and Health Transitions Research Unit (Agincourt) in rural South Africa. Quantitative analyses use survey data from 240 households, stratified by adult mortality experience. Qualitative data are based on 31 interviews with members of households having recently experienced adult mortality. *Results:* The interviews provide insight into a variety of household-level mortality impacts and also suggest the importance of proximate resources in the maintenance of food security following the loss of an adult household member. Quantitatively, there are significant differences, both in patterns of usage of the natural environment and in levels of food security, between households that have lost an adult and those that have not. The association between mortality and household use of local environmental resources is further shaped by the gender of the deceased and the time elapsed since the death. *Conclusions:* Adult mortality, particularly the death of a male wage-earner, affects household food security. Time allocation is affected as resource collection responsibilities shift, and wild foods may substitute for previously purchased goods.

**Key Words:** *Adult mortality, food security, HIV/AIDS, natural resources, rural livelihoods, South Africa*



Understanding the complex interactions between humans and the environment in sub-Saharan Africa is critically important given the centrality of the natural environment to rural livelihoods. In rural Africa, natural resources buffer households against shocks, offering an alternative means of both generating income and meeting dietary needs. Given the continued increase of HIV/AIDS illness and mortality in the region, an increasing number of households are coping with household shock in the form of the death of a prime-age adult household member. In this study, we jointly examine adult mortality and household use of natural resources, particularly in relation to meeting household dietary needs. Our analysis is based on quantitative survey

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data and demographic data from the longitudinal Agincourt health and demographic surveillance system, as well as qualitative data from 31 interviews with members of mortality-affected households. Our results are presented in response to two research questions:

1. What is the level of dietary use of the local environment?
2. Does the death of an adult household member change the household's level of dietary use of the local environment?

## Background

### *Adult mortality in the era of HIV/AIDS*

AIDS is the leading cause of death worldwide for people aged 15 to 49, with 37.8 million individuals (estimate range 34.6–42.3) infected with HIV as of 2003 [1]. And sub-Saharan Africa, with 10% of the world's population, is home to 70% of all people living with HIV [2]. Within sub-Saharan Africa, the southern region remains the most affected; South Africa has a prevalence of 21.5%, mid-range for the region [2]. Our specific study area is in the Limpopo Province, the most northerly of South Africa's nine provinces, where HIV-related tuberculosis and lower respiratory tract infections are among the leading causes of death [3]. Unfortunately, health indicators suggest that the regional impact of HIV/AIDS is only beginning. In 2000, 21.5% of deaths in Limpopo Province were attributed to AIDS; it is projected that by 2010, this will rise to nearly 65% [4].

### *Adult mortality, food security, and the natural environment*

We focus here on the ways in which adult mortality shapes household dietary use of the local environment, using the analytical concept of "food security" as it is commonly defined: "access by all people at all times to enough food for an active, healthy life" [5]. Devereux & Maxwell [6] explain that "sub-Saharan Africa is the only region in the world currently facing widespread chronic food insecurity as well as persistent threats of famine". As for South Africa specifically, a recent report by the nation's Human Sciences Research Council (HSRC) [7] suggested that more than 14 million people, or about 35% of the South African population, are estimated to be vulnerable to food insecurity. One anthropometric indicator of malnutrition is the level of growth stunting in children, often presented as the proportion of children with height for age more than 2

standard deviations below the median for the population. In 1999, the level of stunting among children in Limpopo Province (23.1%) was representative of that in the nation as a whole (23.8%) [8]. In their study of food security in rural farming households in northeastern Limpopo Province, Leroy et al. [9] found that more than 80% of households had a negative balance of energy, protein, and fat intake.

As the HSRC [7] aptly stated, "All dimensions of food security – availability, stability, access and use of food – are affected where the prevalence of HIV/AIDS is high". In general, HIV/AIDS significantly undermines a household's ability to provide for its basic needs [7,10]. In a recent discussion of the impacts of HIV/AIDS on household livelihoods, Haddad & Gillespie [11] bluntly state that "HIV/AIDS strips individuals, households, networks, and communities of assets". Indeed, human, social, financial, and physical capital may all be compromised by HIV/AIDS. The sustainability of natural capital may also be undermined [12]. Such threats may take the form of lessened ability of communities and user groups to collectively manage common property resources such as rangelands [11]; also, agricultural productivity may be compromised as a result of the loss of prime-age labour [10]. Less labour-intensive and less nutritious crops may be farmed, or land may lie fallow, thereby threatening tenure [11]. Providing context-specific evidence of the association between mortality and livelihood strategies, Drimie [13] reviewed the effects of HIV/AIDS mortality on rural households in Lesotho, Kenya, and South Africa. He found that HIV/AIDS mortality did indeed reduce household labour and assets and also necessitated letting land lie fallow [13]. Likewise, Yamano & Jayne [14] found that relatively poor, rural households in Kenya that experienced the death of a male head of household between 1997 and 2000, experienced a 68% reduction in net agricultural output compared with other households [14]. Notably, this decline in productivity was not affected by the time elapsed since the death, indicating that these households were unable to recover effectively. Importantly, however, statistically significant mortality effects were not found for wealthier households or for those experiencing the death of an adult household member other than the head of household. This difference indicates the importance of recognizing the heterogeneity of HIV/AIDS mortality-affected households [14].

Rural livelihoods in the developing world are often characterized by land-based strategies such as crop production, animal husbandry, and natural resource harvesting. In fiscal terms, Adams et al. [15]

estimated that the 1999 aggregate economic value of natural resources harvested on communal land in South Africa was US\$1 billion per annum. Such figures dramatically highlight the importance of wild resources in rural livelihoods [16].

This project is designed to help fill a void in the scientific understanding of the linkages between these natural resources and food security, particularly in mortality-affected households. Policy recommendations stem from these findings, as food security must be a vital component of any intervention aimed at mitigating the effects of HIV/AIDS on rural communities.

### Material and methods

Fieldwork was undertaken during May–December 2004 in a rural sub-district of northeast South Africa, covered by the Agincourt health and demographic surveillance system (AHDSS). The field site

encompasses 400 km<sup>2</sup>, and is approximately 500 km northeast of Johannesburg (see Figure 1). The area includes 21 villages and over 11,500 households.

The study site's settlement pattern is typical of rural communities across northeastern South Africa: distinct villages each surrounded by fields used for grazing and harvesting of natural resources. Homestead yards vary in size and include dwellings, animal pens, and gardens used for small-scale cultivation of maize (the staple crop), vegetables, and sometimes fruit. There is widespread poverty and substantial dependence on remittances from a large migrant population. In addition, a significant proportion of households depend on social security grants as the only reliable source of household income. As for physical context, the region is semi-arid (annual rainfall 550–700 mm) and fairly heavily populated (~170 persons per km<sup>2</sup>), with household garden plots too small to fully support subsistence agriculture [17]. The vast majority of households depend on the natural environment for a variety of

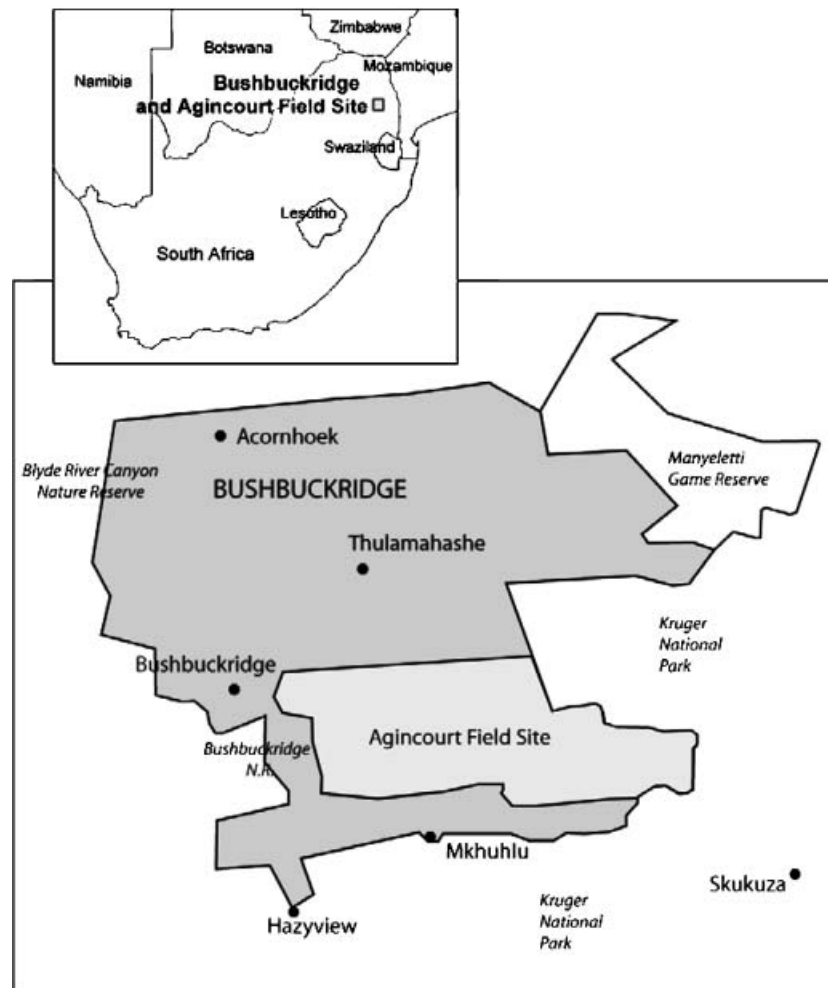


Figure 1. Study region, Agincourt Demographic Surveillance Site, Limpopo Province, South Africa.

uses including livestock grazing, fuelwood, wild foods, thatching grass, construction timber, and other domestic products for both consumption and income generation [18,19]. These natural resources are usually harvested from the village commons, which fall under the jurisdiction of the local traditional authority, but in most cases are essentially open access systems.

Data on the demographic characteristics of the study's households, including the occurrence of mortality, were provided through the Agincourt longitudinal health and demographic surveillance system. Since 1992, the Agincourt team has undertaken annual census updates in all 11,500 households in the Agincourt subdistrict. Quantitative data regarding natural resource usage, dietary patterns, and household food security were collected through a module on these issues contained within the 2004 annual census of study site households. The census module asked about collection of vegetables, fruits, and insects, while also exploring household dependence on homestead garden plots. Data were analyzed for a sample of 240 households in 8 villages in the central region of the study site, drawn for a broader study also including issues related to fuelwood and water collection. The sample was stratified by mortality experience, with half of the sampled households randomly selected from those that had experienced the death of a household member aged 15–49 since 2001, and half randomly selected from those that had experienced no such mortality. This mortality age group was chosen to represent “prime age” mortality, the deaths of those individuals most vulnerable to HIV/AIDS and most economically productive. The survey data allowed for exploration of covariates related to household sustenance and use of the local environment. Specifically, we considered household size, household composition (sex ratio and young or old age structures, where households were considered “young” or “old” if at least one-third of their members were aged less than 15 or more than 60 years, respectively), and socioeconomic status (SES). Household socioeconomic status was discerned from the Agincourt health and demographic surveillance data through an “asset index”. The index is based on an asset register, including the presence of a tap and toilet on the household stand, and ownership of appliances (e.g. radio) and equipment (e.g. wheelbarrow). Values range from 1 (least assets) to 5 (most assets).

Qualitative data were obtained through interviews with members of 31 adult-mortality-affected households included in the survey sample. (We did not interview any members of households not affected by mortality, so our qualitative data do not allow for

control-group comparison and are used only to supplement the quantitative survey data.) These households ranged in size from 1 to 18 (mean=7.9). Within each household, 30- to 60-minute interviews were conducted with individuals involved in resource collection, and the interviewers specifically asked about changes in the household resulting from the recent death. During the interviews, a native speaker of the local language (Shangaan) acted as translator; for analyses, all interviews were translated and fully transcribed. The results reported here reflect patterns evident within the transcripts; the quotations have been deemed especially illustrative of these patterns. All names are pseudonyms.

During the interviews we asked specifically about *marula* (a local fruit), *guxe* (an indigenous annual herb), and several other types of wild herbs and vegetables. The *marula* (*Sclerocarya birrea*), a medium-sized deciduous tree, plays a central role in the livelihoods of rural households in the northeastern savanna woodlands of South Africa [20–22]. The fruit is rich in vitamin C [24], and the nut contains 2–3 edible oil-rich kernels that are either extracted and eaten raw or cooked with wild herbs and eaten as a relish [23]. These kernels are an important food supplement, especially during the lean winter months [23]. Finally, the bark, leaves, and roots of the *marula* tree are used in traditional medicine for treating ailments such as diarrhea, diabetes, and fever [22].

Previous research in the region suggests that over 90% of households seasonally collect *marula* fruit, collecting an average of 1,250 kg of fruit per household per season [23]. Shackleton & Shackleton [25] found that 74% of households interviewed produced *marula* beer, while approximately 50% produced *marula* jam. In addition, *marula* plant parts were used by 30% of households for medicinal purposes. Shackleton [25] also found that an average of 13% of households in the region sold *marula* beer, most of these being among the poorest households. Among the beer-selling households, 47% had no formal source of income, and over 60% had monthly incomes of less than R500 (US\$86) [25].

With regard to local vegetables, we asked about *guxe* (pronounced *gooshee*), a term used locally to refer to indigenous leafy vegetables, mainly in the genus *Corchorus* in the family Tiliaceae [22,26]. These are erect annual herbs that grow wild, often in disturbed sites such as fields [22,26]. A total of 41 species of wild vegetables have been documented as being used in the study region, of which *guxe* were the most widely used (90% of households) [26]. These wild vegetable species are rich in minerals, amino acids, and vitamins A and C, and have been reported by users to be drought tolerant [22,26].

*Guxe* are boiled and eaten as a relish with maize porridge [22], the staple in the region.

**Results**

*Dietary use of the local environment*

Both the quantitative and qualitative data demonstrate the centrality of the local environment in household diets (see Table I). There are two sections of results, one related to wild foods and the other to homestead garden plots.

*Wild foods:* Approximately 67% of the surveyed households reported harvesting wild herbs from the bush, while 27% reported harvesting wild fruit. Interview results further document the continuing dietary and cultural importance of both *marula* and *guxe*. Of the 31 households with interviewees, 27 (87%) reported brewing traditional *marula* beer, making *marula* jams, and/or consuming the kernels. The discrepancy between survey and interview data on fruit harvesting is probably due to seasonal variation in *marula* availability. The survey asked about fruit harvesting in general, and was not undertaken during *marula* season, so that harvesting of *marula* is probably under-reported. The vast bulk of *marula* processing and consumption was for home use, with only two respondents noting that their households sold seasonal *marula* products for income. These findings support previous research in the study region documenting high levels of *marula* collection and use [23,25].

Only one interview respondent suggested that the household did *not* harvest *guxe*; two others reported harvesting only from large gardens as opposed to fields. These results are in line with the findings of Shackleton et al. [26] that households ate *guxe* between four and five times a week, tending or nurturing the species in or near their homesteads. The remaining households in our interview sample reported collecting wild vegetables regularly for dietary consumption, from three times per week to daily, although nine households also had small homestead gardens from which limited sustenance was supplied. Additionally, approximately 20% of the surveyed households reported harvesting insects from the bush in order to supplement their diet. In general, the level of dependence on wild foods appears similar to that in other rural regions of sub-Saharan Africa, and the results provide useful documentation of such reliance in the Agincourt field site specifically.

The multivariate models (see Table II) showed that household size was positively associated with the

Table I. Food acquisition and household characteristics, Agincourt 2004.

	Proportion / mean		
	All HHs	Non-mort <sup>a</sup>	Mort <sup>b</sup>
<b>Food acquisition</b>			
<b>Gather food from bush</b>			
Gather herbs	0.67	0.65	0.68
Gather fruit	0.27	0.27	0.27
Gather insects	0.20	0.18	0.21
<b>Grow crops on own plot</b>			
Grow maize	0.21	0.24	0.19
Grow crops other than maize	0.58	0.56	0.61
Grow fruit	0.25	0.22	0.29
Grow vegetables	0.40	0.41	0.39
Grow other foods	0.13	0.08	0.17*
<b>Food security</b>			
Not had enough food to eat in last month	0.37	0.36	0.38
Not had enough food to eat in last year	0.41	0.40	0.43
<b>Household characteristics</b>			
<b>Household size</b>			
	6.64	6.75	6.54
<b>Composition</b>			
Sex ratio (male:female)	0.82	0.94	0.70*
Young age structure	0.70	0.71	0.70
Older age structure	0.10	0.07	0.12
<b>Socioeconomic status</b>			
Possessions index	3.21	3.11	3.30
<b>Mortality variables</b>			
Adult mortality	0.53		1.00
Adult female mortality	0.24		0.41
Years since death			0.95

\* $p < 0.05$ . <sup>a</sup>: non-mortality households. <sup>b</sup>: mortality-affected households.

likelihood of harvesting both herbs ( $b=0.13$ ,  $p < 0.05$ ) and fruit ( $b=0.14$ ,  $p < 0.01$ ) from the bush. These results may reflect reciprocal causality in that households with more labour available can both allocate time for collecting wild foods, and also need more food.

*Homestead plots:* Our survey results also suggest that many households rely rather heavily on crops grown on homestead plots. Approximately 21% of the surveyed households reported growing maize on a homestead plot, while 58% reported growing other crops. Approximately 25% reported growing fruit, 40% reported growing vegetables, and 13% reported growing other crops, most often groundnuts and peanuts.

Higher socioeconomic status was positively associated with growing fruit ( $b=0.41$ ,  $p < 0.01$ ) as well

Table II. Logistic regression estimations of use of local environmental resources related to food security, by household adult mortality experience, Agincourt 2004.

	<b>Gather food from bush</b>	<b>Crops gathered from bush</b>			<b>Crops grown on own homestead garden plot</b>				<b>Food Security</b>	
	1=yes	Herbs	Fruit	Insects	Maize	Fruit	Vegs	Other	not enough to eat in past month	not enough to eat in past year
<b>Baseline models with household characteristics</b>										
<b>Household size</b>	0.13 **	0.13 **	0.14 ***	0.07	0.07	-0.10	0.04	0.08	0.06	0.06
<b>Household composition</b>										
Sex ratio	-0.15	-0.15	-0.14	-0.20	-0.03	-0.23	0.27	0.22	0.10	0.21
Young age structure	0.32	0.32	0.04	-0.22	0.15	-0.17	0.44	-0.20	-0.03	0.14
Older age structure	0.16	0.16	0.39	-1.70	-0.36	0.15	0.21	1.89 ***	0.64	0.63
<b>Socioeconomic status</b>										
Possessions index	-0.02	-0.02	-0.08	0.04	-0.06	0.41 ***	0.25 **	-0.11	-0.21 **	-0.29 ***
<b>Constant</b>	-0.18	-0.18	-1.62 ***	-1.57 ***	-1.66 ***	-2.07 ***	-2.08 ***	-2.44 ***	-0.43	-0.14
<b>R-squared</b>	0.04	0.04	0.03	0.03	0.02	0.05	0.05	0.06	0.02	0.04
<b>n</b>	238	238	238	238	238	238	238	238	224	223
<b>Separate models with mortality experience added</b>										
Adult mortality within past 2 years	-0.57	-0.57	-0.57	-1.37	-2.25 **	-0.57	0.14	1.46	1.43 *	0.57
Mortality*female interaction	-0.32	-0.32	-0.08	-0.02	0.23	0.38	0.29	0.43	-0.97 **	-0.89 **
Mortality*SES interaction	-0.01	-0.01	0.13	0.22	0.22	0.21	0.12	0.20	-0.13	-0.09
Mortality*years since death interaction	0.51 *	0.51 *	0.09	0.48	0.60 *	-0.05	-0.40	-0.81 **	-0.24	0.19
<b>R-squared</b>	0.05	0.05	0.04	0.05	0.04	0.06	0.06	0.12	0.05	0.05

\*\*\* $p < 0.01$ ; \*\* $p < 0.05$ ; \* $p < 0.1$ .

as vegetables ( $b=0.25$ ,  $p<0.05$ ), perhaps evidence of the importance of financial capital and access to water. This is in line with the findings of Dovie et al. [28], in another rural village in the same region, of a positive correlation between the direct use value of household crop production and formal wages, as well as investment in crop production.

Interestingly, households with older age structures were more likely to grow “other” crops (not maize, fruit, or vegetables) on their homestead plots ( $b=1.89$ ,  $p<0.01$ ). Groundnuts and peanuts, and other crops in this catch-all category, are generally more traditional crops, and our findings may suggest an attrition in the use of traditional crops by younger generations. Since traditional crops generally have greater resilience to local environmental conditions, this transition may be cause for concern as households become more vulnerable to food insecurity resulting from droughts, poor soils, and crop pests.

#### *Adult mortality and household dietary use of the local environment*

As Table II shows, the survey revealed significant differences between mortality affected households and those households not affected in regard to food security and use of the local environment. We intersperse interview data with discussion of these survey results to provide a more nuanced understanding of household coping strategies in response to adult mortality.

Adult mortality decreased food security, increasing a household’s likelihood of having gone without enough food at least once in the past month ( $b=1.43$ ,  $p<0.10$ ). Adult mortality also significantly decreased the likelihood that a household would grow maize on its plot, indicating that some insecurity may result from lessened use of homestead gardens ( $b=-2.25$ ,  $p<0.05$ ). These estimates are in line with results from KwaZulu-Natal, South Africa, where mortality-affected households reduced cultivation because of reductions in both available labour and assets [13]. In addition, households lost ability to care for the land that did remain cultivated – so that, for example, inadequate weeding might further lessen productivity [13].

Importantly, impacts were not uniform across households, since shifts in food security and use of local resources were shaped by the past role of the deceased in the household economy. If the deceased had been a resource collector, for example, but had not engaged in income-generating work outside the household, his or her collection duties were typically taken on by other household members. Of course, shifts in collection duties (e.g., fuelwood) often had

implications for diet, as time available for tending household gardens and/or gathering wild edibles declined. As an example, following the death of her sister, Tintswalo and her younger brother spent more time collecting fuelwood. When asked what she was unable to do as a result of increased collection time, Tintswalo noted “hoeing the field” as one particular forgone activity.

Still, the most substantial impacts on food security appear to be due to wages lost because of the death, with these impacts revealed in the quantitative data as gender effects. Households that had experienced a female adult death reported going without enough food to eat less often than those households with a male death ( $b=-0.81$ ,  $p<0.05$ ).

Tsakani’s story illustrates the impact of the loss of a male wage earner. Tsakani’s employed adult son recently passed away. He had worked regularly and, as Tsakani explained, “would remember us every month end, buying groceries and a sack of maize-meal [a local staple]”. Since his income had not been replaced, she explained, “there is a serious gap now”. Also illustrative is Zodwa’s story. She collected wild vegetables from behind the road on communal property for her 12-person household. Zodwa’s household had no regular income, but she bought maize meal, sugar, and soap with money from relatives. Her husband had held a good job at a local game reserve, but once he became ill, he no longer worked. She explained that her household had experienced substantial changes in diet: “there is a big change now because we no longer have food, we just get assisted by the relatives ... and we depend more now on the field”. Triza’s deceased husband had worked long-distance on a contract basis, regularly remitting “some money which we used for groceries”. She had since found a job as a domestic worker, but explained that “it used to be very hard because we had nothing to keep us surviving ... we relied [on wild vegetables] on a day-to-day basis because in the past we used to buy chicken, wors [sausage], and fish”.

The time elapsed since the death was also associated with patterns of usage of the natural environment, as households came to substitute collected or grown food for that previously purchased. Greater time since the death was associated with increased likelihood of gathering herbs ( $b=0.51$ ,  $p<0.1$ ) and growing maize ( $b=0.60$ ,  $p<0.10$ ), although decreased likelihood of growing other crops ( $b=-0.81$ ,  $p<0.05$ ). The interviews also reflected the latter association, with respondents noting that edibles collected from the local environment often replaced previously purchased goods. As one respondent whose household had lost its

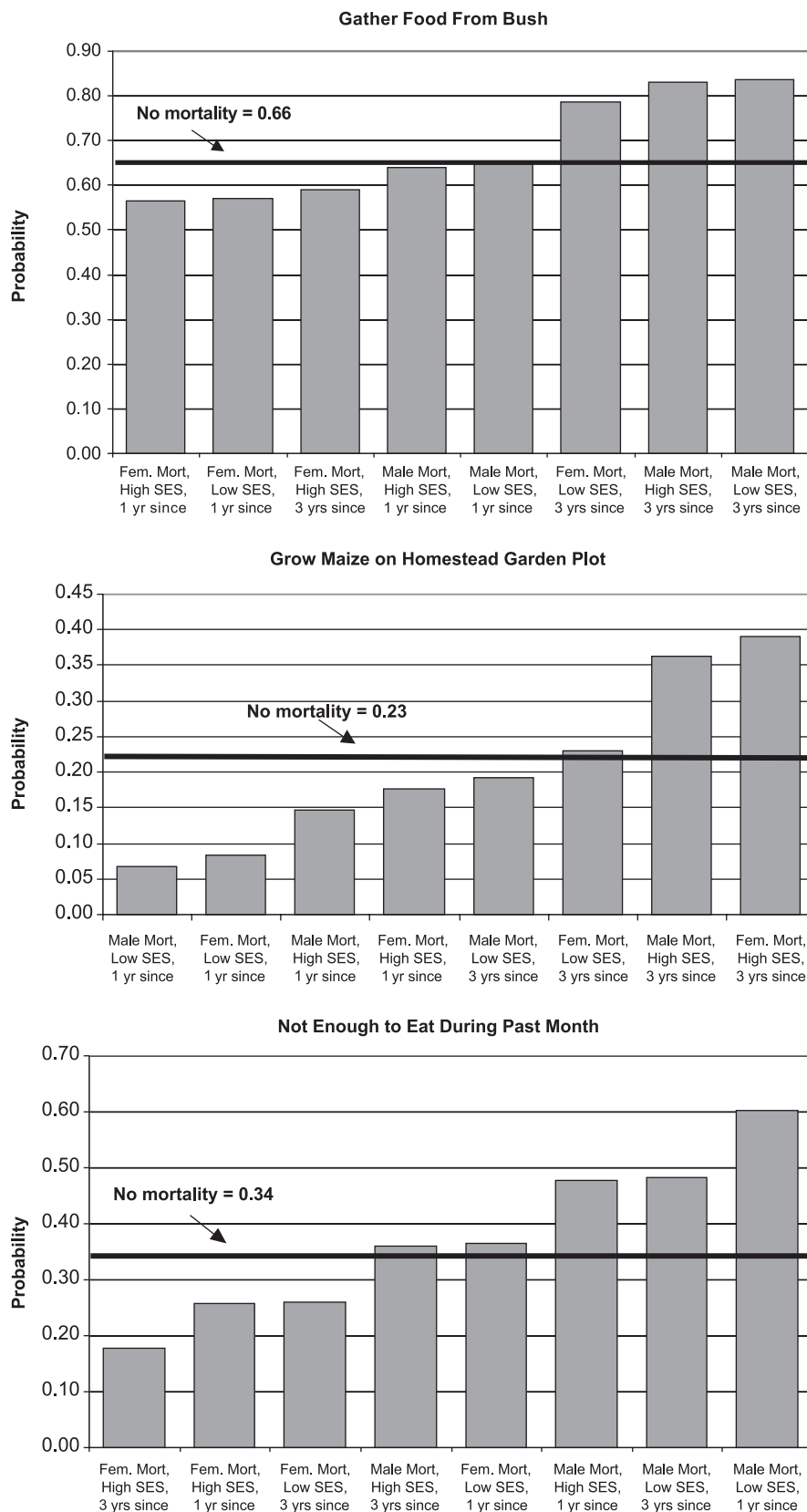


Figure 2. Predicted values for selected outcome variables reflecting hypothetical probability of household use of environmental resources and food security. Households characterized by mortality experience (male or female death and time elapsed) and socio-economic status (highest or lowest quintile using asset index); other predictive variables, from logistic regression (Table II), held constant at mean values.

primary wage earner said, “locusts are now our beef”.

Calculated predicted values (hypothetical probabilities), shown in Figure 2, attempt to illustrate the significant associations. Households experiencing a male death were more likely to supplement their food intake from the natural environment than were those experiencing a female death. Such an association is logical, since wild foods tend to be harvested by women [16]; further, the death of an adult woman reduces both labour and knowledge for harvesting. Mortality impacted households are less likely to grow maize on homestead plots; this is accentuated among households of low socioeconomic status that have recently experienced a death.

The estimations also demonstrate that households experiencing a male death were more prone to food insecurity than were those experiencing a female death. The interview stories suggest how the gendering of individuals’ roles in the household economy shapes these impacts. A male death is more likely to result in wages lost. In addition, research elsewhere in Africa suggests that where gender is important for economic relations, the loss of a male household member may, for example, leave remaining women without market access [29]. In some cultural contexts, women may be at a disadvantage with regard to land rights following the death of a male household head, further exacerbating food insecurity [29].

## Discussion and conclusions

Of course, regardless of cultural context, the death of a productive, adult household member has important impacts on those remaining. In poverty-stricken households, the loss of an adult member exacerbates persistent struggles to meet day-to-day needs. Our survey data and the personal stories revealed through our interviews confirm that an adult death decreases the household’s human, social, financial, and physical capital, especially if the deceased had been a male wage-earner. In addition, lost human capital often results in lowered household productivity, while individual household members’ time allocation shifts as the labour of healthy individuals is diverted to different household chores.

We also find evidence of changes in households’ use of local natural capital. Additional household responsibilities sometimes cut into time to tend gardens and fields. In other cases, households respond to an adult death with an increased reliance on gardens and fields to replace previously purchased goods. Such dependence continues even several years after the death, suggesting that

increased dependence on the bush is *not* only a short-term coping strategy.

Indeed, both the quantitative and the qualitative data provide substantial evidence of the centrality of local vegetation in household diets and the maintenance of food security across households *generally*. Our findings thus support Haddad & Gillespie’s assertion [11] that these resources are critical to household food security in rural African communities, both through direct provisioning and as sources of household income. Our results also suggest that natural resources buffer rural African households against shocks, since mortality-affected households evince greater dietary dependence on local vegetation even in the longer term.

The results presented here have important implications with regard to both science and policy. Most research relating adult mortality, HIV/AIDS, and the environment has focused on only those natural resources important for cultivation and animal husbandry [28]. Our analyses specifically incorporate food security, with the results suggesting that the direct associations between HIV/AIDS, “natural capital”, and food security merit continued research.

An increased understanding of the interrelations between the local environment, food security, livelihoods, and adult mortality would better inform programs aimed to improve resilience and decrease vulnerability of rural African households. In particular, early evidence suggests that improvements in the productivity of homestead gardens, including the cultivation of indigenous wild herbs and traditional crops, could ease some food insecurities. Our findings suggest that suitable interventions may vary according to the deceased’s role. Households experiencing the death of a male household member and/or a breadwinner may be most vulnerable to food insecurity.

Further, documentation of the role of the local environment provides an important foundation for conservation policy, particularly since “food security is sustainable only when the natural resource base is not undermined” [30]. An enhanced understanding of the complex interactions between humans and the environment is especially important given the centrality of the natural environment within rural South African livelihoods.

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## References

- [1] UNAIDS. Global report on the AIDS epidemic: 4th global report. [Monograph on the Internet]. Geneva: 2004 [cited 2004 July]. Available at: [http://www.unaids.org/bangkok2004/report\\_pdf.html](http://www.unaids.org/bangkok2004/report_pdf.html).
- [2] UNAIDS. AIDS epidemic in sub-Saharan Africa: Fact sheet. [monograph on the Internet]. Geneva: 2004 [cited 2004 July]. Available at: <http://www.unaids.org/bangkok2004/factsheets.html>.
- [3] Thom A. Limpopo: Limping behind in health care. Pretoria: University of Pretoria, Centre for the Study of AIDS; 2004.
- [4] Day C, Gray A. Health and related indicators. In: Ijumba P, editor. South African Health Review 2002. Durban: Health Systems Trust; 2003. p 511–31.
- [5] World Bank. Poverty and hunger: Issues and options for food security in developing countries. Washington, DC: World Bank; 1986.
- [6] Devereux S, Maxwell S. Introduction. In: Devereux S, Maxwell S, editors. Food security in sub-Saharan Africa. London: ITDG Publishing; 2001. p 1–12.
- [7] Human Sciences Research Council (HSRC). Food security in South Africa: Key policy issues for the medium term. Pretoria: Integrated Rural and Regional Development, Southern African Regional Poverty Network; 2004.
- [8] Labadarios D, editor. The National Food Consumption Survey (NFCS): Children aged 1–9 years, South Africa, 1999. Pretoria: Department of Health; 2000.
- [9] Leroy JL, Van Rooyen J, D’Haese L, de Winter A. A quantitative determination of the food security status of rural farming households in the Northern Province of South Africa. Development Southern Africa 2001;18:5–17.
- [10] DeWaal A, Whiteside A. New variant famine: AIDS and food crisis in southern Africa. Lancet 2003;362:1938–9.
- [11] Haddad L, Gillespie S. Effective food and nutrition policy responses to HIV/AIDS: What we know and what we need to know. J International Development 2001;13:487–511.
- [12] Van Liere MJ. HIV/AIDS and food security in sub-Saharan Africa. 7th Annual ECOWAS Nutrition Forum, 2–6 September. Banjul, Gambia, 2002.
- [13] Drimie S. HIV/AIDS and land: Case studies from Kenya, Lesotho, and South Africa. Development Southern Africa 2003;20:647–58.
- [14] Yamano T, Jayne TS. Measuring the impacts of working age adult mortality among small-scale farm households in Kenya. World Development 2004;32:323–5.
- [15] Adams M, Cousins B, Manona S. Land tenure and economic development in rural South Africa. In: Cousins B, editor. At the crossroads: Land and agrarian reform in South Africa into the 21st century. Cape Town: University of the Western Cape; 2000. p 111–28.
- [16] Shackleton CM, Shackleton SE, Cousins B. The role of land-based strategies in rural livelihoods: The contribution of arable production, animal husbandry and natural resource harvesting in communal areas in South Africa. Development Southern Africa 2001;18:581–604.
- [17] Hargreaves JR, Pronyk PM. HIV/AIDS and rural development: Realities, relationships and responses. Development Update 2003;4:85–112.
- [18] Shackleton CM. Potential stimulation of local rural economies by harvesting secondary products: A case study of the central Eastern Transvaal lowveld, South Africa. Ambio 1996;25:33–8.
- [19] Shackleton CM, Shackleton SE. Direct use values of savanna resources harvested from communal savannas in the Bushbuckridge lowveld, South Africa. J Tropical Forest Products 2000;6:28–47.
- [20] Van Wyk P. Field guide to the trees of the Kruger National Park. Cape Town: Struik Publishers; 1998.
- [21] Pooley E. A complete field guide to trees of Natal, Zululand and Transkei. Durban: Natal Flora Publications Trust; 1997.
- [22] Van Wyk B, Gericke N. People’s plants: A guide to useful plants of southern Africa. Pretoria: Briza Publications; 2000.
- [23] Shackleton SE, Shackleton CM. Use of *marula* products for domestic and commercial purposes by households in the Bushbuckridge district, Limpopo Province, South Africa. DIFID Report. Grahamstown: Department of Environmental Sciences, Rhodes University; 2002.
- [24] Holzhausen LC. Ennobling and domestication of the indigenous African *marula*. Indigenous Plant Use Newsletter 1993;1:1–3.
- [25] Shackleton SE. The informal *marula* beer traders of Bushbuckridge, Limpopo Province, South Africa. DIFID Report. Grahamstown: Department of Environmental Sciences, Rhodes University; 2002.
- [26] Shackleton CM, Dzerefos CM, Shackleton SE, Mathabela FR. Use and trading of wild edible herbs in the central lowveld savanna region, South Africa. Economic Botany 1998;52:251–59.
- [27] Dovie DBK, Witkowski ETF, Shackleton CM. Monetary valuation of livelihoods for understanding the composition and complexity of rural households. Agriculture and Human Values 2005;22:87–103.
- [28] Barnett T, Whiteside A. AIDS in the twenty-first century: Disease and globalization. Basingstoke: Macmillan Palgrave; 2002.
- [29] Mather D, Donovan C, Jayne T, Weber M. Using empirical information in the era of HIV/AIDS to inform mitigation and rural development strategies: Selected results from African case studies. MSU International Development Working Paper No. 84. East Lansing: Department of Agricultural Economics, Department of Economics, Michigan State University; 2005.
- [30] Moorehead S, Wolmer W. Food security and the environment. In: Devereux S, Maxwell S, editors. Food security in sub-Saharan Africa. London: ITDG Publishing; 2001. p 93–116.