Chapter 4

Labor Market and Wage Impacts of HIV/AIDS in Rural Malawi

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Introduction and Objectives

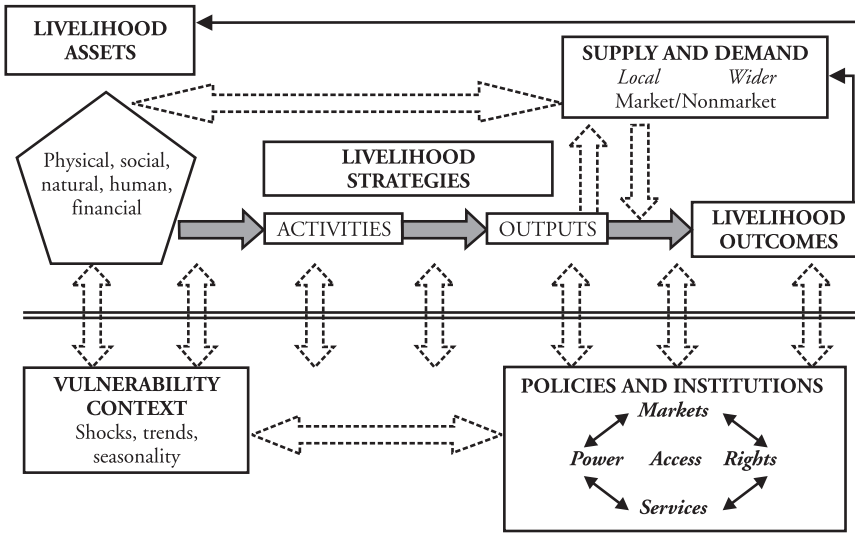
There is a limited but growing literature on direct impacts of HIV/AIDS morbidity and mortality on the livelihoods of poor rural people. Less is known, however, about indirect impacts of the HIV/AIDS epidemic on the livelihoods of rural communities, allowing for market interactions between households. These are difficult to study, but unskilled wages and food prices are critically important to the welfare of poor people, whether directly affected by HIV/AIDS or not: If the HIV/AIDS epidemic depresses labor demands more than it contracts labor supply, this could lower wage rates in affected communities, damaging the livelihoods of poor households. Promotion of laborsaving enterprises and technologies under such circumstances could have disastrous consequences for the healthy poor.

In this chapter we report preliminary work investigating these issues with household and rural economy (meso) models describing livelihoods and livelihood interactions in Malawi. After this introduction, we briefly review possible livelihood and rural economy impacts of HIV/AIDS and the issues investigated in the chapter. We then describe the models used in the chapter and the different scenarios we investigate. Succeeding sections present the results of modeling these scenarios. This leads on to discussion of the robustness of the findings and their implications for policy and further research.

Potential Livelihood and Rural Economy Impacts of HIV/AIDS

A total of 900,000 adults and children are estimated to be living with HIV in Malawi, which has an adult HIV prevalence (15–49 years) of 14.2 percent, although

Figure 4.1 Livelihoods in markets framework



this varies between, for example, urban and rural areas, men and women, and people with different occupations (National AIDS Commission 2003): There tend, for example, to be higher rates of male infection among more wealthy men but higher rates of female infection among the poor. These varying infection rates affect the demographic structure and growth of the population and labor force, but labor is further affected by culturally determined responsibilities, such as women's common responsibilities to care for the sick.

Mwale (2004) reviews literature on the economic and livelihood impacts of HIV/AIDS in Malawi and more generally in Africa. In this, a "livelihoods in markets" framework modified from Dorward et al. (2003) is helpful in identifying the major direct and indirect, individual and systemic impacts of HIV/AIDS on rural livelihoods (see Fig. 4.1).

Direct impacts arise first through reductions in HIV/AIDS-affected households' human capital (labor time, strength, and skills/knowledge) as a result of morbidity and mortality of infected individuals. Further human capital effects arise from direct reductions in the productivity of caregivers and withdrawal of children (particularly girls) from education. These effects are associated with reduced enterprise and household income and increased expenditure demands for treatment and funerals. These losses and expenditures have further long-term impacts on affected households' ownership of and access to physical, human, social, financial, and nat-

ural capital. Indirect changes arise in affected households' livelihoods as they change their livelihood strategies and activities to try to respond to all these effects of sickness. Changes in crop and other enterprises are common (with a shift toward less labor- and cash-demanding activities and increased fallow areas), and these may depend on who within the household is infected. Reduced asset holdings also make affected households more vulnerable to shocks.

Figure 4.1 also assists in the identification of wider system effects when significant numbers of households in a rural community or economy experience and react to the direct and indirect household-level impacts of HIV/AIDS morbidity and mortality discussed above. These system effects occur mainly through changes in policies and institutions and in local and wider demand for resources, goods, and services affecting market and nonmarket exchange. Systemic changes that have been observed in policies and institutions include, for example, changes in land tenure systems, family structures, age and gender roles, funeral responsibilities, and social safety net systems. Widespread shifts in consumption, in asset use and ownership, and in productive and welfare activities may also lead to changes in prices. Wages and food prices are particularly important to the poor because they respectively account for very significant parts of their incomes and expenditures, and they affect both those households directly affected by HIV/AIDS morbidity or mortality and those without any sick or deceased members.

Critical though they may be to people's welfare, the impacts of widespread HIV/AIDS and mortality on wages and food prices are not easy to study or to predict. Difficulties in studying them are common to most of the possible systemic effects of high rates of HIV/AIDS in rural communities. Although some of these changes may be obviously related to the HIV/AIDS epidemic (for example, switches in government and private expenditure into health care or changes in marriage customs), for most of them HIV/AIDS may be only one possible factor among many affecting change, and it is not possible to empirically observe and identify the specific impacts of HIV/AIDS. Even where HIV/AIDS is likely to be a major determinant of change (as in the example of health care expenditure), the rate and course of that change will be strongly moderated by other factors (such as general economic performance, political leadership, social attitudes, availability and cost of treatments, treatment delivery capacity, external support), and these factors themselves are subject to uncertainty, change, and complex interactions.

The effects of HIV/AIDS on wages and food prices, and indeed on general price levels, are particularly difficult to observe as the effects of HIV/AIDS may be dominated by other more proximate factors such as weather, macroeconomic policies and performance, international trade relations and prices, other economic or natural shocks, government policies, and so on. The interactions among these factors are

complex and often poorly understood, and HIV/AIDS may have ambiguous direct price effects (as described below) as well as modifying the wage or price impacts of changes in other factors (for example by undermining people's capital, it may make people's livelihoods and local markets more vulnerable and sensitive to shocks). HIV/AIDS may also increase social and economic inequality in rural economies and communities, with far-reaching effects on social and economic processes. These difficulties in teasing out the systemic impacts of HIV/AIDS are well illustrated by the debate around the impacts of HIV/AIDS on the recent Southern Africa crisis (see, for example, De Waal and Whiteside 2003).

Unfortunately, as already suggested, HIV/AIDS impacts on wages and food prices are also difficult to predict from theory. HIV/AIDS is likely to lead to local contractions in both production and demand of food. Net price effects will then depend on the balance between these changes, links to wider markets, and uncertain government and donor actions to promote food security. Furthermore, in the longer term, prices themselves influence production decisions, incomes, and demand.

Food prices and production also influence, and are influenced by, labor markets and wages. It is commonly suggested that HIV/AIDS-induced contractions in the labor force will generally increase wages. There is, however, an alternative set of hypotheses:

- Problems in raising cash to meet immediate AIDS-related expenses cause poor households to hire out more labor (at the expense of own farm production) so that, paradoxically, HIV/AIDS leads to an increase in labor supply in the market.

- There is reduced demand for unskilled on-farm labor among less-poor HIV/AIDS-affected households because (1) they are unable to finance labor hire from savings, from semiskilled or skilled employment earnings, or from remittances if the individuals generating these earnings are hit by AIDS, and (2) reductions in family labor and in capital shortages lead to a shift out of generally more labor-demanding cash crops (see, for example, Yamano and Jayne 2004).

- Wider nonfarm labor demand also falls as local demand for nontradable goods and services is reduced by depressed incomes (first of HIV/AIDS-affected households but ultimately of most households as these processes depress the general economy), with further depression from multiplier effects (Arndt and Lewis 2001).

- Consequent increases in poverty incidence and severity raise unskilled labor supply in the market.

In the remainder of this chapter we investigate these hypotheses and the conditions affecting them using a set of Malawian rural livelihood and economy models.

Methodology

Dorward (2003) describes the development of a set of farm/household models that replicate the behavior of major Malawian farm/household types in response to various exogenous changes and the impact of these changes on their welfare. The essential elements of the approach involved the development of (1) a typology of farm/household types across the country, (2) a set of farm/household models describing the behavior of these different farm/households, and (3) a system for tying these farm/household models into a model of the informal rural economy in which they are located, to capture the partial equilibrium interactions between their behavior and local wage rates and maize prices.

The Farm Household Typology

The development of the typology is described in detail by Dorward (2002). With data from the 1997/98 Integrated Household Survey (IFPRI and NSO 2002), cluster analysis was used to identify seven types of households within the mid-altitude areas that hold 60 percent of rural households. Details of these household types are given in Table 4.1. Apart from households with members in formal employment, the data from which the cluster analysis was developed did not

Table 4.1 Farm household classification for plateau zone

Household type label	Rural household		Area (ha/ household member)	Assets (MK/ household)	Kept maize (kg/member)	Consumption (MK/day)	Poverty count (%)
	Local (%)	National (%)					
"Larger farmers"	4	2	0.86	165	315	16	29
"Medium assets"	18	10	0.36	975	203	10.3	49
"Borrowers"	9	5	0.28	695	107	9.2	57
"Poor male-headed"	34	18	0.20	208	50	6.6	72
"Poor female-headed"	18	10	0.22	105	50	6.6	75
"Employed"	13	7	0.18	360	81	9.8	53
"Remittance"	4	2	0.31	540	128	11.2	49
All	100	53	0.28	240	83	8.4	62

Note: MK = Malawi Kwacha (in 1997/98 approx. MK 25 equivalent to US$1.00).

contain information about skilled employment opportunities. However, in operationalizing the household composition for the livelihood modeling, male members of the "larger farmer" and "medium assets" household types also had access to skilled wage rates.

The Farm/Household Model

A nonlinear programming farm/household model was developed using a Stone-Geary utility function with a linear expenditure system as shown below (see Dorward 2003).

$$MaxE(U) = \sum_{s} P_s \prod_{j*m} (C_{jm} - \gamma_{jm})^{\beta_{jm}} \tag{4.1}$$

such that, for m = 1 to 2,

$$-t_{jm} + t_{j(m+1)} + \sum_{ij} e_{ijm} x_i + C_{jm} \leq B_{jm} \tag{4.2}$$

for m = 3 to 4,

$$-t_{jms} + t_{j(m+1)s} + \sum_{ij} e_{ijms} x_{is} + C_{jms} \leq B_{jm} \tag{4.3}$$

and for m = 4,

$$-t_{j(m+1)s} = t_{j(m=1)} \tag{4.4}$$

where

m are periods within a year: $m = 1$ describes the "cropping period" (November to January); $m = 2$ the "preharvest period" (February and March); $m = 3$ the "harvest period" (April to June); and $m = 4$ the "postharvest period" (July to October)

s are alternative market conditions (end-of-season maize prices) in periods m = 3 and m = 4

P_s are subjective probabilities of alternative market conditions s

C_{jm} represent total consumption of commodity or resource j in period m

γ_{jm} are minimum consumption requirements for commodity or resource j in period m

β_{jm} are the marginal propensities to consume commodity or resource j in period m

t_{jms} represent transfers of commodity or resource j from periods m to $m+1$ in market condition s

e_{ijms} are technical and price coefficients of use or production of resource or commodity j by activity x_{is} in period m under market condition s

x_{is} are activities undertaken by the household. These include cropping activities, buying and selling of stocks and labor, and stock transfers between periods. For those activities that take place wholly in periods 3 or 4, these are distinguished according to the market condition s under which they are followed.

B_{jm} are supply constraints on commodity or resource j in period m

j^*m is the subset of commodities or resources directly consumed by the household and for which consumption is included in the objective function: cash consumption by period, consumption of maize (or calorific equivalents from other crops) by period, leisure ("slack" labor) by period, and end-of-season cash savings

Commodity or resource j includes land, labor, cash stocks, maize stocks, purchased crop inputs, and postharvest cash crop stocks.

Equation 4.1 maximizes expected utility using a linear expenditure system (LES). Equations 4.2 and 4.3 describe constrained resource use and production opportunities in different periods, with buying and selling of those commodities and resources for which there is a market, stock transfers between periods where appropriate, and household consumption where appropriate. Equation 4.3 allows for alternative stocking, market, and off-farm employment strategies to be followed under different market conditions (maize price regimes) in the harvest and postharvest periods and to this extent allows for food purchase price risk, which may encourage subsistence maize production. Equation 4.4 ensures that the model maintains the same opening and closing stocks from year to year and does not generate artificial windfall gains by portfolio changes (for example, by replacing maize stocks by cash).

The model also included upper bounds on some activities to represent practical constraints not allowed for in the general formulation, for example, limited maize storage capacity, sequencing of activities within time periods and transport, labor and market constraints on large-scale root crop sales.

This model structure provides the following important features in its description of farm/household opportunities, constraints, and behavior:

- *Seasonal constraints:* The year is divided into four periods (cropping, preharvest, harvest, and postharvest). The first period involves heavy crop labor demands, but there are also potential trade-offs with other non-own farm work generating lower but more immediate returns, which may be important for poorer households needing to sustain minimal levels of consumption before harvest. There is then limited farm labor demand and lower wages in the preharvest period, but then crop prices fall, and both farm labor demand and wage rates rise in the harvest period. Crop prices then rise in the postharvest period, some farm labor is required for land preparation, and nonfarm employment opportunities and wages rise.

- *Varied activities* are modeled, with seasonal crop demands for labor and purchased inputs. The model allows flexibility in linking these to stocking, buying, and selling activities across and within time periods. Non-own-farm activities are described in terms of hiring out of labor. Specific activities describe borrowing, technical change, and the introduction of new opportunities. No attempt is made to model specific nonfarm enterprises (for example, in terms of capital requirements), and all nonfarm activities (skilled or unskilled) earn a wage, recognizing that this might in fact represent self-employment. Households with semiskilled labor could sell it off the farm for a wage above the unskilled wage rate or use it on-farm with identical returns as unskilled labor.

- *Heterogeneity* between households (as discussed earlier) is described by differences in cropping activities in different agroecological areas, in asset holdings (for example, land, seasonal labor, preseasonal holdings of cash, and grain stocks), and in relations between consumption needs and assets.

- *Partial engagement with imperfect markets* is modeled by a "wedge" between market, farm-gate, and local purchase prices while transaction costs in unskilled labor markets include time demands for supervision when hiring labor and search costs (in terms of time) for those seeking *ganyu* (casual off-farm) employment. Complete credit market failure is assumed in the base model: households cannot borrow without special interventions such as credit tied to the provision of tobacco inputs.

- *Food security objectives in uncertain markets:* Food consumption was modeled in terms of calorific requirements. In the crop and preharvest periods these are

met by maize consumption from stocks from the previous season or from purchases. In the harvest and postharvest periods, calories could be provided from own-farm production of grain or root crops or from maize purchases. Subsistence production arose as a result of (1) risks of high purchase prices in adverse seasons and (2) the wedge between maize purchase and sales prices.

- *Nonseparability:* The modeling of seasonal constraints, imperfections in maize, labor, and credit markets (see above), and household objectives allows for strong competition and interaction between consumption and production activities.

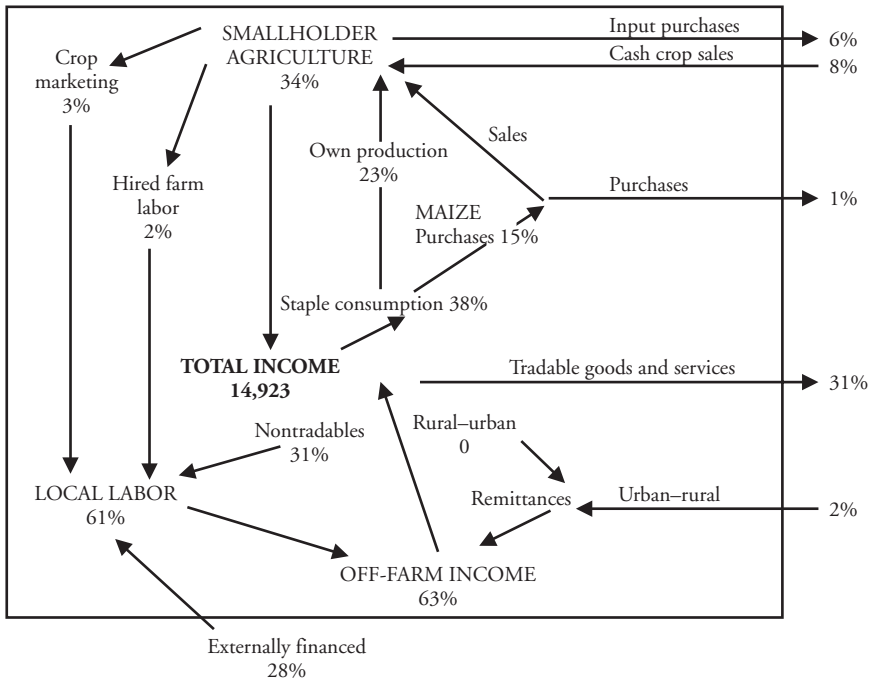
- *HIV/AIDS morbidity and mortality effects:* Modifications were made to labor supply, cash needs, and composition for each household type, as described later.

Modeling the Informal Rural Economy

A model of income flows and resource allocations within the informal rural economy (IRE) and between the IRE and the rest of the world[1] was then constructed using information from aggregating farm and household model results. First, aggregate income and expenditure flows were estimated by multiplying the model's income estimates for each farm household type by the estimated number of households of each type. The results of this are shown diagrammatically for the base scenario (using 1997/98 prices) in Figure 4.2. This may be considered as a diagrammatic representation of a social accounting matrix (SAM).

The static representation of the rural economy as an aggregation of independently determined livelihood activities was then turned into a partial equilibrium model responding to HIV/AIDS shocks by simulating the way that individual households' behavior and income and expenditure flows are modified through interaction (1) with each other within the informal economy (as shown by the arrows within the informal rural economy in Fig. 4.2) and (2) with the rest of the world (as shown by the arrows leaving or entering the informal rural economy in Fig. 4.2). In this it was assumed that prices of cash crops and farm inputs are largely determined by world markets (and hence are unaffected by rural Malawi's supply and demand) but that national unskilled wage rates are likely to be affected by supply and demand in rural Malawi and will in turn cause changes in wage rates within the rural economy. The farm household models were therefore run with parameters representing different HIV/AIDS morbidity and mortality scenarios (as described later) and then rerun with wage rates modified so that they gave a partial equilibrium solution[2] with aggregate labor balances consistent with assumptions about elasticities of demand for labor exports from the area.

Figure 4.2 The informal rural economy (income flows in million MK and in percentages of total income)



HIV/AIDS Morbidity and Mortality Scenarios

As a preliminary investigation of the plausibility of and influences on the hypotheses outlined above, the study does not use detailed epidemiologic information as a basis for scenario construction. Instead, scenarios allow for plausible and workable variation in mortality and morbidity and in their effects.

To allow simple comparison of the direct impacts of a range of different intensities of a common shock on different individual households, morbidity was initially simulated by varying proportionate loss of (1) labor standardized in terms of the proportion of an unskilled woman's seasonal labor supply, and (2) MK 1,600 cash expenditure (on treatment, etc.) spread across the year. Differential effects of morbidity of skilled household members were investigated for those households that contained these members by varying proportionate loss of such member's labor together with the same proportionate increase in MK 1,600 consumption or expenditure. The effects of mortality were represented by the loss of one (unskilled female or skilled male) adult's labor from a household, a matching reduction of

Table 4.2 Incidence of sick and bereaved households in different IRE scenarios

IRE scenario	"Healthy" households (%)	"Sick" households (%)	"Bereaved" households (%)
Base	100	0	0
A	90	10	0
B	80	20	0
C	70	20	10
D	60	20	20

household consumption and expenditure needs, and an MK 800 reduction in cash stocks at the start of the season.[3]

The IRE model scenarios described a range of morbidity and mortality rates in the population by varying the proportions of "healthy," "sick," and "bereaved" households. "Healthy" households were unchanged from the base, but "sick" households were without 40 percent of the labor of one unskilled female adult (or one skilled male adult) but incurred an extra MK 640 expenditure spread across the year. The characteristics of bereaved households were unchanged from those described in the previous paragraph. Rates of sickness and bereavement in different scenarios are shown in Table 4.2.

Results

Table 4.3 presents estimated impacts of varying morbidity and of mortality on different households' cropping activities, labor use, and net income.

Increasingly severe morbidity leads to declining net income per capita; this is particularly severe for the two poorest household types, poor male-headed and female-headed households (households 4 and 5), and indeed, poor female-headed households where the adult woman becomes sick will not be able to maintain even a greatly reduced minimum consumption level. Poor male-headed households with a sick adult female may be able to survive for longer, but erosion of seasonal capital will fairly quickly become unsustainable. As would be expected, for those households with skilled members, the loss of a skilled member has a greater impact on income per capital than the loss of an unskilled member.

Increasingly severe morbidity also leads to changing cropping patterns as labor and seasonal capital constraints become tighter, with a shift out of hybrid maize and/or tobacco by those (less poor) households initially able to grow these crops.[4] This means that increasing morbidity leads most households to increase areas under low-input maize. For those households that are initially too poor to be able to grow the more capital- and labor-demanding hybrid maize or tobacco, increasing morbidity leads to their increasing inability to cultivate even low-input maize, and they

Table 4.3 Individual household type responses to AIDS morbidity

Household type	AIDS severity	Base consumption	Crop area	Local maize	Hybrid maize	Tobacco	Farm labor (Nov–Jan)	Hire out (in) unskilled (Nov–Jan)	Skilled labor out	Net income per capita (MK)
1. Sk	Base: 0	100%	1.5	0.73	0.75	0.02	1,036	(848)	1,355	5,420
	30%	100%	100%	100%	89%	500%	100%	96%	70%	79%
	60%	100%	100%	126%	53%	900%	94%	85%	40%	58%
	90%	60%	100%	156%	9%	1450%	87%	75%	10%	32%
	Bereaved	100%	99%	145%	36%	800%	89%	80%	0%	70%
2. Sk	Base: 0	100%	1.31	0.75	0.29	0.27	831	(288)	1,936	3,210
	30%	100%	100%	100%	100%	100%	100%	87%	70%	85%
	60%	100%	100%	100%	100%	100%	99%	74%	40%	70%
	90%	75%	100%	100%	59%	100%	107%	94%	10%	51%
	Bereaved	100%	100%	100%	100%	100%	99%	78%	0%	74%
3. UnSk	Base: 0	100%	1.3	0.81	0.49	0	769	458	0	2,374
	30%	100%	100%	117%	71%	NA	94%	83%	NA	89%
	60%	100%	100%	136%	33%	NA	90%	66%	NA	77%
	90%	80%	100%	131%	29%	NA	94%	27%	NA	63%
	Bereaved	100%	100%	144%	24%	NA	86%	53%	NA	94%
4. UnSk	Base: 0	100%	0.56	0.51	0	0	262	921	0	2,219
	30%	100%	57%	61%	NA	NA	57%	99%	NA	87%
	60%	95%	29%	25%	NA	NA	27%	93%	NA	74%
	90%	80%	27%	24%	NA	NA	25%	80%	NA	59%
	Bereaved	85%	54%	47%	NA	NA	59%	74%	NA	88%

5. UnSk	Base: 0	100%	0.39	0.34	0	0	178	673	0	1,969
	30%	100%	33%	38%	NA	NA	35%	97%	NA	81%
	60%	75%	28%	32%	NA	NA	30%	77%	NA	60%
	~~90%~~	~~60%~~	~~54%~~	~~62%~~	~~NA~~	~~NA~~	~~56%~~	~~76%~~	~~NA~~	~~44%~~
	Bereaved	70%	46%	41%	NA	NA	52%	61%	NA	81%
6. Sk	Base: 0	100%	0.8	0.18	0.55	0.07	575	34	1,936	3,849
	30%	100%	100%	167%	91%	0%	93%	509%	70%	83%
	60%	85%	100%	217%	75%	0%	88%	733%	40%	63%
	90%	60%	100%	128%	24%	0%	120%	233%	13%	41%
	Bereaved	70%	100%	344%	24%	71%	77%	939%	0%	51%
7. UnSk	Base: 0	100%	1.2	0.32	0.88	0	840	77	0	3,854
	30%	100%	100%	122%	92%	NA	98%	10%	NA	93%
	60%	100%	101%	178%	69%	NA	92%	–47%	NA	85%
	90%	100%	100%	238%	44%	NA	85%	–111%	NA	77%
	Bereaved	100%	100%	194%	66%	NA!	91%	–204%	NA	106%

Notes: Household type: Results are presented for the seven household types outlined in Table 4.1 with mortality and varying severity of morbidity in skilled (Sk) or unskilled (UnSk) labor. AIDS severity: Percentage of labor time lost and of MK1,600 extra expenditure incurred. Base consumption: Percentage of base consumption needs met; if substantially less than 100% (with ~~strikethrough~~) the household cannot survive. Crops (local and hybrid maize, tobacco) indicate area cropped in hectares. Unskilled and farm labor is shown for November to January (the peak farm labor demand period) in hours. Percentages indicate percentage of base (no morbidity or mortality).

are forced to decrease the area under this and leave an increasing amount of fallow while maintaining a small area of cassava.

In regard to the effects of morbidity on labor use and markets, morbidity of unskilled labor leads to a reduction in on-farm labor use in almost all households, but only for the two poorest households is this reduction very substantial. Increasing morbidity leads most households who hire out labor in the base scenario to reduce the labor offered into the market, by varying amounts—in some cases turning to hire in labor if this could be financed from skilled labor or remittances. Households who hire in labor in the base scenario increase their labor hire if an unskilled household member becomes sick but decrease labor hire if a skilled member becomes sick.

Bereaved households show patterns of change in net income per person, in cropping patterns, and in labor use and hire broadly similar to those found with increasing morbidity.

Table 4.4 presents results for different morbidity and mortality scenarios in the informal rural economy (IRE), as described earlier. Four sets of scenarios are examined, one in which only unskilled household members are affected by HIV/AIDS, the second in which skilled members are affected in those households in which they are found, and the third and fourth, as for the second, but with unskilled wage rates reduced to 95 percent and 90 percent of their base level, respectively.

In the first scenario set (where AIDS morbidity and mortality is concentrated among unskilled household members and there are no wage changes), increasing morbidity and mortality in the population lead to declining real incomes of affected households (with poorer households affected disproportionately, with increasing inequity), increasing land left under fallow (from a low base), and declining areas under local and hybrid maize and tobacco. There is a slight increase in surplus skilled labor for sale outside the IRE, but a tightening of the unskilled labor market as less unskilled labor is offered for sale outside the IRE.

In the second scenario set, three households now have AIDS morbidity and mortality affecting their skilled rather than unskilled members, and the other households are the same as in the previous scenario set. Wage rates and prices are fixed at base levels. Some results are markedly different; for example, average household income for affected households with skilled labor now falls more than the average income of the poorest households, hybrid maize area falls more, but the tobacco area holds up. The most marked difference, however, is in the surplus labor for sale, as the skilled labor market has dramatically contracted, whereas the unskilled labor market has loosened not just in comparison with the previous scenario set but in comparison with the base situation.[5] This suggests that unskilled wages should fall

but that skilled wages should rise. The extent of wage changes will depend on elasticities of skilled and unskilled labor demand outside the IRE, the proportions of skilled and unskilled labor sales outside the IRE, and the ways that this demand may be affected by AIDS. In the final two scenario sets, we therefore simulate the impact of 5 percent and 10 percent reductions in unskilled wage rates. As expected, results in the lower part of Table 4.4 show that a fall in unskilled wages depresses the incomes of all poorer households (including "healthy" households without sickness or bereavement). However, healthy households that normally hire in labor benefit from these lower wages. Lower wages also increase the area under fallow (by squeezing sick and bereaved households harder). Local maize and hybrid areas are similarly depressed, but tobacco areas are stimulated by lower wages.

Discussion

This chapter set out to investigate four hypotheses outlined above. The results presented do not support two of these hypotheses (1 and 4): there is no evidence that impoverishment of households through AIDS leads to an increase in the supply of labor in the unskilled labor market. There is, however, some support for the hypotheses that morbidity and mortality among skilled members of the community can lead to reduced demand for both on-farm labor and unskilled labor providing nontradable goods and services within the local economy (hypotheses 2 and 3). Furthermore, under the particular circumstances described by these models, this reduction in labor demand more than outweighs the small reduction in supply in the unskilled labor market, leading to an overall loosening of the labor market and hence a fall in unskilled wages.

How robust are these findings? Ignizio (1982) identifies four criteria for model validation: logical consistency in model construction; reliability of the data on which the model is based; logical consistency of model responses to simple stimuli; and correspondence of model outputs with reality. The models used in this study do suffer from a number of limitations (Dorward 2003). These include (in the household models) dividing the year into only four seasons; using a unitary household model with limited gender divisions of labor; the rudimentary treatment of risk and of transaction costs; the omission of dry season *dimba* production (growing of crops in irrigated swampy land in valley bottoms) and of horticultural crops and livestock keeping; limited data on labor supply, use, and wages; treating all nonfarm activities as hiring out of skilled or unskilled labor; and not capturing the full extent of inherent variability and heterogeneity in Malawian livelihood systems. The IRE model does not allow for different parts of the country with similar

Table 4.4 IRE responses to and household welfare impacts of AIDS morbidity and mortality

			Scenario (%)				Scenario (%)			
		Base (%)	A	B	C	D	A	B	C	D
Morbidity/mortality effects			Only unskilled				Skilled and unskilled			
Wage rate (% of base)			100%				100%			
All households' real income	All	100	98	97	94	91	98	96	91	87
	"Healthy"	100	100	100	100	100	100	100	100	100
	"Sick"		84	84	84	84	79	79	79	79
	"Bereaved"				69	69			56	56
Poor male- and female-headed households' real income	All	100	98	96	93	89	98	96	93	89
	"Healthy"	100	100	100	100	100	100	100	100	100
	"Sick"		79	79	79	79	79	79	79	79
	"Bereaved"				68	68			68	68
Fallow area		100	195	291	367	443	195	291	367	443
Local maize area		100	98	96	94	91	98	97	95	94
Hybrid area		100	99	98	95	92	98	96	90	83
Tobacco area		100	98	97	91	84	99	98	98	98
Skilled labor exports (value)		100	101	102	103	104	94	88	74	59
Unskilled labor exports (value)		100	98	96	89	82	103	105	107	109

Morbidity/mortality effects			Skilled and unskilled							
Wage rate (% of base)			95%				90%			
All households' real income	All	100	97	95	91	86	96	94	90	85
	"Healthy"	100	99	99	99	99	98	98	98	98
	"Sick"		78	78	78	78	78	78	78	78
	"Bereaved"				54	54			54	54
Poor male- and female-headed households' real income	All	100	95	93	89	86	92	90	87	84
	"Healthy"	100	97	97	97	97	94	94	94	94
	"Sick"		75	75	75	75	74	74	74	74
	"Bereaved"				65	65			65	65
Fallow area		100	256	345	415	485	279	346	404	462
Local maize area		100	96	94	93	92	93	93	91	90
Hybrid area		100	90	89	83	77	73	72	67	62
Tobacco area		100	108	106	106	105	107	106	102	98
Skilled labor exports (value)		100	95	90	75	61	130	122	102	82
Unskilled labor exports (value)		100	90	92	95	97	58	60	62	63

agroecology having different land pressure (with smaller or larger holding sizes affecting local labor demand and wages) nor variations in market access. It is also a partial equilibrium model, without allowance for more general changes in the wider economy, involving, for example, changes in demand for labor, in general price levels, in government expenditures, and, as applied in this chapter, not allowing for changes in maize prices. The IRE model as applied here also assumes uniform price changes across the year, whereas prices are likely to change differently at different times of year. Nevertheless, despite these weaknesses, Dorward (2003) argues that the livelihood and IRE models perform sufficiently well on Ignizio's criteria to provide useful insights into the general behavior of individual households and of the IRE and to pose serious and insightful questions about this behavior. The model is also a significant advance on other available formal or informal models of household and IRE behavior.

The validity of the modeling of HIV/AIDS morbidity and mortality in this chapter can also be judged against the four criteria set out above and, for a preliminary study, performs well. We therefore conclude that the possibility of HIV/AIDS leading to falling wages for unskilled labor is very real. The scale and seriousness of this effect is, however, not clear. The results reported here suggest a relatively mild loosening of the market in that the highest incidence of morbidity and mortality modeled leads to a relatively small (probably around 5 percent) fall in wages. This is, however, sensitive to the particular scenarios that were modeled and to the accuracy of the models' descriptions of individual household behavior and of the interactions within the IRE and between the IRE and the rest of the Malawian economy. These effects would be higher with larger cash costs of morbidity or mortality, with allowance for the double burden of rural households' lost remittances and extra costs in caring for sick family members previously working in towns, with allowance for general depression of the national economy, with more inelastic demand for unskilled labor in the rest of the economy or with a less open economy (with less trade and greater relative importance of nontradables in production and consumption). Allowance for the development of land rental markets would probably lead to a loosening of the labor market as compared with model results presented here. It is unclear how the results would be affected by more sophisticated scenarios allowing for different morbidity and mortality rates among male and female adults in the different household types, for loss of labor by caregivers, for seasonal differences in morbidity and in wages, and for household disintegration and its impact on other households. The effects on model results of changing morbidity and mortality rates in line with epidemiologic models would depend on the nature and scale of specific morbidity and mortality rate changes.

Conclusions

This chapter has put forward and tested hypotheses that HIV/AIDS can lead to falling unskilled rural wages, a particularly worrying possibility given the dependence on unskilled labor markets of poor people in Malawi and more widely in Africa. The preliminary analysis presented here suggests

- There is a serious danger of this being the case in some circumstances as a result of reduced on-farm and off-farm demand for unskilled labor.

- The extent to which HIV/AIDS will depress wages is not clear but will depend on the extent of morbidity and mortality, on the morbidity and mortality distribution among skilled and unskilled men and women, and on impacts on skilled labor earnings and remittances.

- Segmentation and other aspects of labor market behavior, land rental markets, the openness of the local economy, and elasticities of labor demand outside the informal rural economy will also be important determinants of wage sensitivity to HIV.

- Where HIV/AIDS does depress unskilled wages, this is likely to increase inequality within rural communities and impose further pressures on poor people and their livelihoods.

- The introduction of laborsaving technologies to assist labor-constrained AIDS-affected households may have very negative impacts in areas where wages are already falling. Indeed, more conventional "labor-demanding" crop technologies may offer the best opportunities for both AIDS-affected and "healthy" poor households, where labor-demanding technologies are defined as increasing both labor and land productivity, but with greater increases in the latter. This leads to both increased returns to labor and increased labor demand, supporting rather than depressing wages. Emphasis may need to be placed on other ways of assisting labor-constrained AIDS-affected households, such as cash transfers to help them with labor hire as well as antiretroviral treatment.

These results should not be generalized: the impact of HIV/AIDS on rural livelihoods is highly context-dependent (see, e.g., Yamano and Jayne 2004; Tumushabe 2005). It is, however, clear that this is an issue that needs further attention in research and policy, first to establish the extent of the problem (how widespread it

is, how serious it is when it occurs) and then to determine appropriate responses. An immediate and fairly simple aid in this would be the identification of risk factors predisposing areas to higher risk of depressed wages from HIV/AIDS and the construction of a typology of characteristics of high-risk areas and of appropriate interventions to address this.

Notes

1. The "informal rural economy" is distinguished from large commercial agriculture and from business, government, or NGO operations in rural areas. It includes all the activities of the rural households described by the household models and allows for interactions between the informal economy (these households) and the rest of the world (other agents or activities not explicitly allowed for in the household models, whether located physically in rural space, in other parts of Malawi, or abroad).

2. This is a partial equilibrium because equilibria are allowed for in only two markets. Dorward et al. (2004) describe general equilibrium models linked to the informal rural economy and household models described in this chapter. Dorward (2003) also allows for maize price changes in the IRE, but changes in the maize balance did not appear to be significant with the scenarios modeled in this chapter.

3. Cash expenditures associated with morbidity and mortality were derived from Shah et al. (2002).

4. There is some variation between households with varying balances in their access to labor and capital. Also, with very high morbidity of its skilled member, household 6 puts some land into groundnuts because of their lower capital requirements as compared with tobacco and hybrid maize.

5. These results assume strong segmentation between the skilled and unskilled labor markets.

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