

**The Influence of Ill Health on Chronic
and Transient Poverty: Evidence
from Uganda**

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David Lawson¹

Abstract

The paper uses nationally representative household panel data to investigate if ill health is important in influencing poverty persistence and transitions in Uganda, a country that was both at the centre of Africa's HIV/AIDS pandemic and experienced impressive poverty reduction during the 1990's. Through a combined discrete choice and micro growth level approach we find that ill health and long term sickness, such as that associated with HIV/AIDS, is particularly associated with households moving into poverty. However, households affected by ill health also experience larger land and livestock reductions, providing some support for participatory evidence that has found land and asset sales to be a major coping mechanism for Uganda's poor.

Keywords: Uganda, Chronic Poverty, Transient Poverty, Health, HIV/AIDS
JEL Classification: I12, I32

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1. Introduction

Uganda's dramatic poverty reduction of the 1990's has been well documented, with poverty levels falling from 56% in 1992 to 35% in 1999.ⁱ However, and despite this excellent progress, approximately 20% of households are persistently poor (Table 1) and there are substantial proportions of households that have moved into and out of poverty (Okidi and McKay 2003). From a qualitative perspective in particular, ill health has been identified as a major cause of such poverty. For example, Uganda's Participatory Poverty Assessment Process (UPPAP) indicated that over 37% of communities thought ill health was a major cause of moving into poverty (Republic of Uganda 2002). Despite this however, and considering that Uganda is relative rich in household data, it is perhaps surprising that there has been little quantitative investigation which both tests the aforementioned qualitative findings and establishes the extent to which ill health influences poverty persistence and transitions, relative to other factors.

For Uganda in particular knowing the impact of ill health on poverty is especially important. Firstly, for most of the last two decades the government has based government economics reforms around creating an environment for economic agents to exploit by using their endowment of capabilities – health is obviously a major component of this. Furthermore, and secondly, the importance of understanding such a relationship is accentuated when considering that Uganda was at the centre of Africa's AIDS pandemic in the 1980's and early 1990's when incidence levels of HIV/AIDS peaked at more than 25%. Although incidence levels have now fallen to less than 7% (2003), morbidity levels have increased from 17% (1992) to 28% (2002) (Republic of Uganda 2003).ⁱⁱ

Intuitively, and considering the interconnected nature of health and poverty, such high levels of sickness are likely to have an impact on the capacity of households to escape poverty, and may even move households below the poverty line (Wagstaff 2002). However ill health, and especially HIV/AIDS, also have other implications such as damaging traditional social support networks and increasing health care costs, all of which make breaking out of the cycle of poverty and ill health even more difficult.

Using household panel data for 1992-99 this paper fills a void in the health and poverty research arena, providing a rare investigation into the direct link between ill health and chronic and transient poverty, and on income growth. Considering the complex interconnected nature of health and poverty we not only control for the endogeneity issues between health and poverty but also investigate how ill health may impact on important factors such as asset depletion, which in turn has consequences for poverty dynamics. This enables us to also draw some tentative insights regarding household coping mechanisms. Furthermore, and considering the history of HIV/AIDS in Uganda we differentiate between long and short term sickness and establish how serious illnesses, such as HIV/AIDS might differ in the impact on poverty status, compared to less serious illnesses.

The paper is therefore outlined as follows. Section two discusses the options for modelling poverty dynamics and previous empirical evidence, before outlining the empirical specification adopted in the analysis. Section three details the data used in addition to the matching process which was undertaken to ensure households in both waves of data are the same. Issues of attrition, and selection sample bias, are also considered in section three. Sections four and five then contain a discussion of the descriptive and econometric analysis, respectively, using panel data to consider the importance of ill health on poverty dynamics, we find supporting evidence for previous qualitative findings, with ill health particularly associated with descents into poverty. Section 6 concludes the article.

2. Modelling and Evidence, Econometric Specification

Modelling and Literature

In considering the approach to modelling poverty dynamics many previous studies have complementing descriptive analysis with an explicitly econometric approach. For example, McCulloch and Baulch (1999) distinguish chronically, transitorily and never poor households, for Pakistan, and model the associated characteristics using both an ordered logit model and a multinomial logit model.ⁱⁱⁱ Although the multinomial logit method may suffer from heterogeneity of the transient poor group when modelling whether a household is in chronic poverty, transient poverty or never

poor, this can be overcome by distinguishing the transient poor into those that have fallen in to, and escaped poverty. Furthermore, although the method inherits the independence of irrelevant alternatives drawback, other options such as the multinomial probit have their own problems, such as the dimensionality of the response probabilities and being computationally extremely resource intensive.

However, simply distinguishing the poor from the non-poor, as in the aforementioned discrete choice modelling approaches mentioned above, implies the loss of substantial information about the household's living standard. As such, complementing the multinomial logit approach with the modelling of dynamics of living standards directly, through changes in household living standards, substantially enhances the analysis. Such an approach essentially reflects a micro-level growth equation (Dercon, 2003; Fields *et al.* 2003) and has the advantage of allowing us to forego some of the concerns relating to the level at which the poverty line is set.

Of the previous literature that has investigated the characteristics associated with poverty and living standard dynamics, human capital related findings tend to be largely restricted to the impact of education. Results generally support axioms, and intuition, that suggest increased levels of human capital will decrease the probability of being chronically poor. In particular, Adam and Jane (1995) in Pakistan and Campa and Webb (1999) in Peru, all found that increased levels of education reduced the probability of chronic poverty. Evidence from some studies suggests that increased education in general (McCulloch and Baulch, 2000) or specifically of the household head (Jalan and Ravallion, 1998) also reduces transient poverty.^{iv}

Of the few empirical pieces that have focused on the impact of ill health, Jalan and Ravallion (1998) for rural China, found ill health of household members to be an important determinant for chronic poverty, but not transient poverty. Sen (2003) for Bangladesh, using panel data, also found sickness to be particularly important as a factor associated with transient (movements into) poverty whilst Dercon (2003), for Ethiopia, also found the poor to suffer disproportionately from health shocks.

In the Ugandan context, and as mentioned earlier, Uganda's Participatory Poverty Assessment Process (UPPAP) has provided the clearest indication of the link between poor health and persistent poverty. In both participatory surveys (2000 and 2002) sickness was identified as a major determinant of poverty transitions and especially for movements into poverty. However, there is extremely limited quantitative research that supports such findings. Deininger (2001) has provided the main published work on income change and although health was not the main focus of the paper, and chronic and transient poverty was not directly studied, he found households affected by health problems to experience lower income growth, than those free of health problems. Geographical location also appears to play a major part in the opportunities available to households and therefore the probability of being classified as long-term poor. For example, in Uganda, Deininger and Okidi (2002) found there to be a significant rural long term poverty bias. Of the other findings Okidi and Kempaka (2002) for Uganda found that self employed farming households are more likely to be chronically poor. Before investigating such issues further, we now focus on the econometric specification.

Econometric Specification

When modelling poverty dynamics, one of the first issues to consider is how to classify when a household is in poverty. In this instance, we adopt a poverty line which represents the minimum cost of a nutritionally adequate diet and the accepted poverty lines, calculated by Appleton (2001).^v

Adopting a poverty spells approach we use four poverty states as the dependant variable in a multinomial logit model: the never poor, those poor in both periods (1992 and 1999), those poor in 1992 and not in 1999 (escaping poverty), and those non-poor in 1992 but that were poor in 1999 (falling into poverty).^{vi} As previously stated, the second dependant variable used will be continuous in nature and will represent the difference between the log of expenditure per adult equivalent in 1999 and that in 1992. These approaches can be represented algebraically as follows:

$$\Delta P \text{ or PovertyLevel} = \beta(X_{99} - X_{92}) + a X_{92} \quad (1)$$

Poverty status (and income change) will have the right hand side explanatory variables comprising of a combination of dynamic variables (β), such as the changes in; household composition or changes in health, and static independent variables such as the level of education (α).^{vii} These latter variables will represent original values of such things as the education level and gender of the household head, as at the 1992 start period.

3. Data

Ugandan household survey data is particularly rich, having had three national surveys of approximately 10,000 households in each. For this research, both the Integrated Household Survey (IHS) of 1992 and Ugandan National Household Survey (UNHS) 1999/2000 are invaluable as they form a two wave panel (1992-1999) covering 1,398 re-interviewed households. It is this panel that will provide the basis for the quantitative analysis that follows.

Firstly, however it is important to note that given one of the main objectives is to focus on the impact health status on chronic poverty, the health of the household head will be adopted as the health indicator. This is logical from several perspectives, but most importantly because the head, in the majority of cases, is the main income earner. Therefore to ensure that the household heads are the same across the two waves of data, a matching process was undertaken which ensured both the sex and age of the household head from 1992 matched that of the household head in 1999.^{viii} This matching process produced a sample of 1,005 households that contained the same household head. It is this reduced sample that is used for the empirical work.

Naturally, given that the sample is being reduced from the full 9,886 IHS households to a nationally representative 1,398 households in the 1992 and 1999 panel and to a further 1,005 matched households, it is pertinent to ensure the sample is not selective. Given that 393 households (28%) of households surveyed in 1992 and 1999 are attrited, this may at first appear to constitute a major problem. However, such figures are not surprising given that we are following households with the same household head, over an eight year period. Nevertheless as non random attrition can bias the results we assess the relevance of attrition. In this instance we perform two kinds of

analysis (Davis and Stampini 2002). Firstly, we will compare the initial characteristics of both the reduced and full panel with the 1992 IHS, to establish if the families ‘dropping out’ of the final panel are different from those that stayed in. Secondly, we estimate probits in order to analyse which variables predict attrition.

The results of the aforementioned tests (Tables A1 and A2) outline the mean values of the main household characteristics for the panel and attrited households and test to see if the differences between the attrited and matched panel are significant. Perhaps most importantly we find no statistically differences for the main variable of the change in income, in fact only the level of spouse primary education and household head age are significantly different. However, the probit regression in Table A2 shows that such characteristics are insignificant and therefore not of concern.^{ix} Furthermore, and reassuringly, the probit regression indicates very few variables to be of significance for the matched panel.^x

Such results add re-assurance that attrition is not a major problem, and confirm that it is appropriate to adopt standard regression techniques. However a further, intuitively based, test corroborates these findings (Appendix Table A3). Using the full panel to undertake a multinomial logit regression of chronic and transient poverty we incorporate a dummy variable that represents whether a household has been attrited. The dummy variable is not significant for any of the poverty states, i.e. households which have been excluded from the final panel are not more or less likely to be in the sample of the never, chronic or transiently poor.

4. Descriptive Data

In this section we will review some of the descriptive characteristics of chronic and transient poverty but before reviewing some of the characteristics we establish the levels of chronic and transient poverty in this Ugandan panel, before examining the impact of health status.

Poverty Trends

Using a sub sample of the household surveys, the 1992/99 two wave household panel, we find 48.6% of these households were poor at the beginning of the period, and this had fallen to 29.3% by the end. As can be seen in the first row of Table 1, we also find that 18.9% of the panel households were chronically poor (poor in both years) while 41.7% were non-poor in both periods. The remainder moved into or out of poverty between these years, so indicating substantial mobility: 29.4% of the panel households moved out of poverty, while 9.9% of the panel households slipped in.^{xi} Figures that are consistent with the full panel and national figures for chronic and transient poverty.

Table 1: Chronic and Transient Poverty By Health Status

	Chronic Poor	Moving out of Poverty	Moving in to Poverty	Never In Poverty	All
	(1)	(2)	(3)	(4)	(5)
Poverty Figures					
Poverty Levels 1992-1999 Panel (All Households)	18.9%	29.5%	9.9%	41.7%	-
Household Head Health Status (by column)					
Proportion of households with head who has a long term sickness (>10 days), in 1992	6.84%	6.44%	8.08%	6.92%	6.87%
Proportion of households with head sick, in 1992	21.8%	15.6%	28.3%	18.9%	17.9%
(by row)					
Proportion of households with head who has a long term sickness (>10 days), in 1992	18.8%	27.5%	11.6%	42.0%	-
Proportion of households with head sick, in 1992	15.0%	25.6%	15.6%	43.9%	-

Health Status

If we look at the influence of ill health on persistent and transient poverty, we can see from columns one and three of Table 1 that households with sick heads in 1992 comprise larger proportions of those chronically poor and moving into poverty.^{xii} The evidence suggests that disproportionate numbers of the chronically poor (moving into poverty) 21% (28.3%) are headed by individuals who were sick in 1992, compared to households moving out of poverty (15% were headed by sick individuals). Descriptive data for the ‘long term’ sick also indicate similar patterns.^{xiii} More than 8% of households headed by an individual classified as ‘long term sick’ moved into poverty, compared to a 6.8% overall average.

Analysing health and poverty status by row also suggests that the initial health status of the household head and poverty level are potentially closely associated. In particular, column 3 shows that there is a disproportionately large number of sick headed households moving into poverty (15.6%) relative to the proportion of the total sample moving into poverty (9.9%). The reverse is true for moving out of poverty, with disproportionately low proportions of sick households (25.6%) relative to the sample average (29.4%).

The descriptive data is therefore suggestive of an association between the original health status of the household head and household moving into poverty, i.e. this is in line with intuitive suggestions that sickness can limit welfare enhancing opportunities. Perhaps surprisingly the linkage between original health status of the head and households staying in poverty appears less clear. However, such associations will be further investigated in the econometrics section. Some of the other key characteristics are now highlighted, enabling us to establish how sickness might interact with other variables, and how important health factors are relative to other variables of interest.

Other Factors

Of the growing poverty dynamics literature demographic and household composition changes are of particular interest for Uganda when comparing the sick and non-sick households (Table 2). For households, with a sick head at 1992, either chronically poor or moving into poverty there is at least a 5% increase in the number of children per household, compared with a 9% reduction for households moving out of poverty. The negative effect on the capacity to generate earnings, of this increase in young dependants, is further compounded by an 18% (9%) decrease in working age household members for the chronic (moving into) poverty households. As a result, the proportionate increase in household size for the sick headed chronically poor is close to 12%. This is in contrast to the non sick chronically poor, who have a household size decrease of 0.5%, and could have potentially huge consequences for escaping persistent poverty.

Table 2: Household Head Health Status and Demographics

	Chronic Poor		Moving out of Poverty		Moving into Poverty		Never In Poverty		All	
	Sick (1)	Not Sick (2)	Sick (3)	Not Sick (4)	Sick (5)	Not Sick (6)	Sick (7)	Not Sick (8)	Sick (9)	Not Sick (10)
Households Demographics										
Size of Household at 1992	6.29	6.14	5.26	5.89	4.82	5.01	4.95	4.96	5.12	5.43
Size of Household at 1999	6.53	6.84	4.17	6.08	6.25	6.95	6.02	5.81	5.72	6.20
Dependency Ratio at 1992	1.31	1.52	1.31	1.42	1.50	1.42	1.20	1.29	1.29	1.39
Proportion of Household which are 'dependants'	50.1%	58.3%	50.2%	54.0%	52.7%	52.6%	47.8%	50.3%	49.5%	53.1%
Change in the Proportion of ..										
..0-5 year olds in household	-2.6%	-9.7%	-2.2%	-6.0%	-0.7%	-4.8%	0.6%	-8.3%	-0.8%	-7.6%
..0-14 year olds in household	5.2%	-4.4%	-8.7%	-4.1%	5.4%	9.5%	2.1%	-0.2%	2.0%	-1.4%
..>60 year olds in household	6.3%	3.9%	12.0%	5.7%	0.5%	-1.6%	6.5%	4.2%	7.0%	4.1%
..15-59 year olds in household	-17.9%	-3.7%	-11.2%	-5.1%	-9.5%	-9.4%	-13.7%	-12.1%	-15.1%	-8.1%
...household who are dependants	11.5%	-0.5%	3.3%	1.6%	5.9%	8.0%	8.6%	4.1%	8.9%	2.7%
Change in Dependency Ratio	0.57	0.10	-0.16	0.06	0.06	0.36	0.41	0.22	0.24	0.16

Descriptive data in Table 3 indicate that the levels of enterprise assets are also associated with poverty dynamics. Comparing healthy and non healthy headed households, column 11 indicates that not only are land areas smaller for the sick than non-sick (3.54 acres and 4.59 acres respectively) but land increases for the sick are almost half that of the non-sick (65.7% compared with 36.7% for the sick). Similar trends exist for other enterprise assets such as chickens and cows. For instance non-sick households have increases in the quantity of cows of 26%, compared to the decrease of 22% for sick households. Sick households moving into poverty experience chicken number decreases by up to one third compared to a 50% increase for the non sick. This suggests a depletion of assets during the process of immiseration.

Households with sick heads and moving into poverty have a tendency to stay in own account agricultural production (Table A5, row 1, column 5). This links in with the demographic characteristics which showed that households moving into poverty also experienced large declines in working age individuals and increases in the number of young dependants. Immiseration may therefore arise because of the need to generate more food for incoming dependants, whilst income falls as the prime aged most productive adults leave the household.

Table 3: Household Head Health Status and Assets

Asset Levels and Change	Chronic Poor		Moving out of Poverty		Moving into Poverty		Never In Poverty		Long Sickness Periods (> 10 days) (9)	All		
	Sick (1)	Not Sick (2)	Sick (3)	Not Sick (4)	Sick (5)	Not Sick (6)	Sick (7)	Not Sick (8)		Sick (10)	Not Sick(11)	
Land												
Land Area at 1992	2.85	2.71	2.63	2.80	2.60	2.35	2.48	2.87	2.66	2.59	2.77	
Land Area at 1999	3.81	3.21	3.88	5.36	3.00	2.27	3.46	5.18	3.94	3.54	4.59	
% Increase in Land Area	33.7%	18.5%	47.5%	91.4%	15.4%	-3.4%	39.3%	80.5%	48.1%	36.7%	65.7%	
Chickens												
Number of Chicken at 1992	1.96	1.87	1.61	1.57	1.64	1.16	1.73	1.73	1.30	1.72	1.66	
Number of Chicken at 1999	2.44	2.93	2.63	5.41	1.10	1.75	3.21	4.80	2.26	2.62	4.34	
% Increase in Chicken Numbers	24.5%	56.7%	63.6%	244.6%	-32.9%	50.5%	85.5%	177.5%	73.3%	52.3%	161.4%	
Cows												
Number of Cows at 1992	0.41	0.91	1.17	0.99	1.39	0.89	1.27	0.98	0.93	1.13	0.97	
Number of Cows at 1999	0.15	0.78	0.45	1.13	1.36	0.70	1.21	1.62	1.01	0.88	1.22	
% Increase in Cows Numbers	-63.6%	-14.3%	-61.5%	14.0%	-2.4%	-20.6%	-4.7%	65.6%	9.4%	-22.1%	26.3%	

In summary, therefore the descriptive data indicates that initial health status of the household head, is linked to whether households subsequently move into poverty. The interconnected nature of health and poverty has already been well highlighted and such findings may not come as much of a surprise. However, the descriptive statistics have also indicated that a combination of demographic, activity and asset based factors also appear to be associated with a household poverty status. Perhaps most striking is the result that households headed by a sick individual, if chronically poor or moving into poverty, appear to experience relatively larger reductions in working age individuals. Such findings are further investigated in the econometrics section that follows.

5. Econometric Findings

A relatively clear way of showing if ill health is associated with different states of poverty is through a multinomial logit approach, which adopts the four states of poverty (previously outlined). As we can see from Table A7, in the appendix, the model itself fits the data relatively well. The explanatory variables are jointly very significant in explaining the observed distribution across groups, and a comparison of predicted groups with actual groups shows that approximately 51% of households are predicted into the correct groups. Despite this being a relatively imprecise measure of fit, it does provide some assurance and we can see that the two extreme cases, the never and the always poor, are more accurately predicted.

In support of the descriptive data, results in Table 4 show that if a household head is sick as at 1992 then this is statistically significant in increasing the probability of households moving into poverty (by 3.5 percentage points) and significant in reducing the probability of never being poor (6.7 percentage points).^{xiv} Although the results are not significant for the chronically poor, the direction of influence for the sickness variables is, reassuringly, of the expected positive direction.^{xv}

In addition, we also find that the association between households having a sick head in 1992 and moving into poverty is furthered when we look at the bottom portion of Table A9 and focus on the sickness interaction terms. As with the descriptive data, households headed by females who are ill face a higher probability of moving into

poverty, than households headed by ill men.^{xvi} In fact, households headed by women and suffering from (long term) sickness are up to (15) 7 percentage points more likely to fall into poverty than similarly defined male headed households [(Table 5) Table A9).

Table 4: Poverty Status - Multinomial Logit Marginal Effects 1992/99 Panel

Variable	Not Poor (1)	Chronic Poverty (2)	Moving Out of Poverty (3)	Moving Into Poverty (4)
Constant	0.3954 (2.229)**	-0.2868 (-2.135)**	-0.0175 (-0.108)	-0.0912 (-1.145)
Age of Head	-0.0084 (-1.133)	0.0056 (1.008)	0.0023 (0.351)	0.0004 (0.124)
Age of Head Squared	0.0001 (1.036)	-0.0001 (-1.096)	0.0000 (-0.169)	0.0000 (-0.152)
Female Household Head	-0.0198 (-0.301)	0.0356 (0.658)	-0.0184 (-0.3)	0.0026 (0.087)
Household Size	-0.0213 (-2.803)***	0.0161 (3.386)***	0.0056 (0.865)	-0.0005 (-0.127)
Head Was sick in 1992	-0.0659 (-1.975)**	0.1223 (1.472)	-0.0921 (-1.371)	0.0357 (2.186)**
Dependency rate	-0.1493 (-1.592)	0.0823 (1.156)	0.0228 (0.262)	0.0441 (1.077)
Education				
Primary	0.0240 (2.877)***	-0.0076 (-1.482)	-0.0203 (-2.649)***	0.0039 (1.267)
Secondary	0.0389 (2.255)**	-0.0287 (-2.02)**	0.0111 (0.676)	-0.0213 (-2.313)**
Spouse Primary	0.0226 (2.632)***	-0.0200 (-3.501)***	-0.0009 (-0.112)	-0.0017 (-0.542)
Assets				
Land	0.0075 (0.632)	0.0021 (0.239)	0.0045 (0.408)	-0.0141 (-2.558)**
Chickens	0.0033 (0.401)	0.0084 (1.454)	-0.0030 (-0.388)	-0.0087 (-2.089)**
Cows	0.0146 (1.737)*	-0.0158 (-2.354)**	0.0027 (0.324)	-0.0015 (-0.356)
Region				
Urban Central	0.0858 (1.004)	-0.0171 (-0.239)	-0.0012 (-0.015)	-0.0675 (-1.201)
Rural Central	-0.0313 (-0.682)	-0.0027 (-0.078)	0.0409 (0.941)	-0.0069 (-0.309)
Rural East	-0.1491 (-2.847)***	0.0314 (0.855)	0.1053 (2.255)**	0.0124 (0.534)
Urban East	-0.0260 (-0.233)	0.0094 (0.099)	0.0816 (0.772)	-0.0650 (-0.847)
Urban West	0.1265 (1.174)	-0.1251 (-1.152)	0.0546 (0.529)	-0.0560 (-0.753)
Urban North	-0.0536 (-0.467)	-0.0042 (-0.046)	0.0657 (0.621)	-0.0079 (-0.132)
Rural North	-0.3528 (-4.699)***	0.2349 (5.817)***	0.0489 (0.766)	0.0690 (2.675)***
Type of Work				
Agricultural Own Account	-0.0428 (-0.824)	0.0394 (0.966)	-0.0072 (-0.149)	0.0106 (0.424)
Agricultural Wage	-0.0179 (-0.146)	0.0537 (0.593)	0.0313 (0.276)	-0.0671 (-0.874)
Other	-0.1182 (-1.171)	0.0868 (1.216)	0.0205 (0.231)	0.0109 (0.241)
Non Agricultural Own Account	0.1919 (2.531)**	0.0129 (0.204)	-0.1275 (-1.647)*	-0.0901 (-1.734)*
Change Variables				
Change in Household Size	-0.0047 (-0.615)	0.0142 (2.942)***	-0.0212 (-2.896)***	0.0117 (4.146)***
Change number of 5 year olds	-0.0130 (-0.301)	-0.0306 (-1.103)	0.0366 (0.974)	0.0070 (0.349)
Change number of 6-14 year olds	0.0209 (0.499)	-0.0165 (-0.614)	-0.0126 (-0.348)	0.0082 (0.422)
Change number work aged	0.0061 (0.152)	-0.0208 (-0.796)	0.0133 (0.375)	0.0014 (0.074)

* Significant at 10% level

** Significant at 5% level

*** Significant at 1% level

Defaults – Missed Education (for head and spouse), Urban West, Non Agricultural Wage Employment; Obs 1005

Regarding type of employment we note that households whose main economic activity is non-agricultural own account work are significantly more likely never to

have been poor over this period (Okidi and Kempaka 2002). However, upon examining health interactions with such variables, we reveal that sick subsistence agricultural workers are also associated with moving into poverty and long term sick agricultural workers are associated with being chronically poor (Table 5). For example, if the main occupation is agricultural and the head is suffering from long term sickness, the household is almost 20 percentage points more likely of being persistently poor than similar heads who are healthy.

Intuitively such findings may seem logical, given the labour intensive nature of subsistence agriculture relative to the other work categories. However, they are in direct contradiction to some of the recent work done by Mwabu and O'Connell (2001) for Kenya. Here it was found that workers in formal wage employment became sick less often than agricultural workers because the cost of sickness is higher and urban wage workers could not easily shift to less intensive work, compared to agricultural workers.^{xvii} Therefore, formal workers face limitations in being able to adapt their work patterns if they fall sick. They are subsequently more likely to lose their main income source, especially if prolonged sickness occurs. Of the other research which focuses on health, Pitt and Rosenweig (1986), for Indonesia, found sickness to have relatively minor influence on farm profits.

Interestingly, the strongest effects of physical assets on poverty are associated with households moving into poverty. Households with lower initial levels of both land and chickens are statistically associated with moving into poverty (Baulch and McCulloch 1998).^{xviii} Of the non health human capital assets, we find primary and secondary education of the head and primary education of the spouse all have strong positive influences on the likelihood that a household is never poor. Seven of the 12 education coefficients are significantly different from zero at the 5% level or above.^{xix} The spouse having been educated to primary level or the head to secondary level both have strong negative influences on the likelihood that the household is chronically poor. Such results correspond strongly with prior expectations, and education is very likely to be a strong causal influence on a household's poverty status (McCulloch and Baulch 1999; Gaiha 1988). The negative effect of the head having primary education on the probability of a household escaping poverty may seem counterintuitive, but this is probably picking up the effect that households whose head had completed primary

school in 1992 were less likely to be poor to start with. Primary education of the spouse appears equally as important, with each additional year reducing the probability being in chronic poverty by two percentage points.^{xx}

Table 5: Poverty Status - Multinomial Logit Marginal Effects 1992/99 Panel with Long Term Sick Interaction terms

Variable	Not Poor (1)	Chronic Poverty (2)	Moving Out of Poverty (3)	Moving Into Poverty (4)
Constant	0.2623 (1.472)	-0.1201 (-0.941)	-0.0628 (-0.384)	-0.0794 (-1.033)
Age of Head	-0.0069 (-0.968)	0.0045 (0.897)	0.0024 (0.367)	0.0001 (0.036)
Age of Head Squared	0.0001 (0.695)	0.0000 (-0.869)	0.0000 (-0.092)	0.0000 (-0.044)
Female Household Head	0.1150 (2.256)**	-0.0499 (-1.468)	-0.0498 (-1.081)	-0.0152 (-0.646)
Dependency Rate	-0.1398 (-1.706)*	0.0792 (1.316)	0.0342 (0.457)	0.0264 (0.732)
Long Term Sickness	-0.1277 (-1.341)	0.0425 (0.456)	-0.0861 (-0.589)	0.1713 (1.136)
Household Size	-0.0134 (-1.709)*	0.0089 (1.814)*	0.0034 (0.5)	0.0011 (0.285)
Education				
Primary	0.0184 (2.309)**	-0.0062 (-1.198)	-0.0168 (-2.325)**	0.0047 (1.317)
Secondary	0.0426 (2.502)**	-0.0278 (-1.921)*	0.0145 (0.911)	-0.0293 (-2.66)***
Spouse Primary	0.0199 (2.565)**	-0.0181 (-3.235)***	0.0004 (0.049)	-0.0022 (-0.626)
Assets				
Rural Land	0.0129 (0.445)	-0.0189 (-0.769)	0.0243 (0.866)	-0.0183 (-0.923)
Land	-0.0102 (-0.395)	0.0188 (0.817)	-0.0124 (-0.489)	0.0038 (0.197)
Chickens	0.0008 (0.099)	0.0077 (1.393)	-0.0011 (-0.14)	-0.0074 (-1.816)*
Cows	0.0108 (1.197)	-0.0123 (-1.905)*	0.0024 (0.292)	-0.0009 (-0.218)
Goats	0.0142 (1.741)*	-0.0055 (-1.009)	-0.0033 (-0.438)	-0.0054 (-1.413)
Region				
Urban Central	0.1465 (1.312)	-0.0775 (-0.827)	0.0595 (0.552)	-0.1285 (-1.676)*
Rural Central	-0.0136 (-0.297)	-0.0204 (-0.619)	0.0377 (0.866)	-0.0037 (-0.17)
Rural East	-0.1194 (-2.244)**	-0.0167 (-0.472)	0.1151 (2.416)**	0.0210 (0.898)
Urban East	0.0377 (0.292)	-0.0936 (-0.892)	0.1470 (1.193)	-0.0911 (-1.045)
Urban West	0.1974 (1.493)	-0.2137 (-1.677)*	0.1151 (0.897)	-0.0988 (-1.086)
Urban North	-0.0302 (-0.242)	-0.0419 (-0.461)	0.0983 (0.855)	-0.0261 (-0.421)
Rural North	-0.3214 (-4.216)***	0.1806 (4.533)***	0.0640 (0.973)	0.0768 (2.944)***
Type of Work				
Agricultural Own Account	-0.0524 (-0.996)	0.0542 (1.376)	-0.0139 (-0.284)	0.0121 (0.486)
Agricultural Wage	-0.0233 (-0.189)	0.0461 (0.537)	0.0386 (0.34)	-0.0614 (-0.813)
Other	-0.1108 (-1.082)	0.0708 (1.014)	0.0076 (0.084)	0.0324 (0.704)
Non Agricultural Own Account	0.1912 (2.53)**	0.0257 (0.431)	-0.1461 (-1.871)*	-0.0708 (-1.318)
Interaction and Change Variables				
Change in Household Size	-0.0091 (-1.249)	0.0109 (2.32)**	-0.0174 (-2.571)**	0.0156 (5.045)***
Long Term Sickness* Female Head	-0.1764 (-1.162)	-0.0647 (-0.6)	0.0894 (0.636)	0.1517 (2.257)**
Long Term Sickness*Agricultural Own Account	-0.0525 (-0.322)	0.1882 (1.765)*	-0.0716 (-0.443)	-0.0640 (-0.711)

* Significant at 10% level

** Significant at 5% level

*** Significant at 1% level

Defaults – Missed Education (for head and spouse), Urban West, Non Agricultural Wage Employment; Obs 1005

Of the other important factors influencing poverty dynamics there appear to be a number of strong associations between poverty status and locality of residence, thus highlighting important geographic differentials, this time with the rural Northern region having the strongest effects.^{xxi} *Ceteris paribus*, households in this locality are significantly less likely to be never poor and significantly more likely to be chronically poor or have moved into poverty over this period. Such trends are consistent with the geographic pattern of poverty reduction over this period (Appleton, 2001). Finally, households with higher numbers of individuals living in the house (Jalan and Ravallion 2000) and those that experience greater increases in household size are statistically significantly associated with being chronically poor. Increases in household size are also strongly associated with moving into poverty (Gaiha and Imai 2003).

Considering the second part of the poverty analysis, and complementing the aforementioned we can now look at the factors that influence changes in household welfare. Regressing the change in the logarithm of the welfare measure over the period on the initial level and many of the other explanatory variables, considered above, identifies many of the same factors as being important, but also some additional ones. Table 6 outlines such factors via three alternative models which vary by the explanatory variables used for sickness. The first adopts the health status of the household head in 1992, the second uses a health state change and the third uses a predicted sickness measure, reflecting the potential endogeneity issues between health and poverty.

The results for the first part of the analysis use the actual measure for sickness of the head at 1992 and largely confirm the findings of Deininger (2001) that higher sickness levels have a negative effect on growth.^{xxii} In effect having a healthy household head is associated with an increase in expenditure per adult equivalent of 2,811 Ugandan Shillings (p.a), or 6.91 per cent. Testing the predicted health measure, we find that there are valid instruments for this measure (see Table A6) with the Sargan test being passed at the 5% level. The Hausman statistical test also passes at the 5% level, thus rejecting the null that the sickness variable is endogenous and therefore validating the results focus on the actual sickness measure as opposed to the predicted measure.

Table 6: Continuous Dependant Variable Results – Change in Log welfare (1992-1999)

Variable	Change Log welfare with health status 1992 (1)	Change Log welfare with health change (2)	Change Log welfare with predicted health state 1992 (3)
Constant	7.0595 (22.408)***	7.0897 (21.788)***	7.0974 (22.51)***
Age of Head	0.0000 (0.004)	-0.0003 (-0.05)	-0.0004 (-0.065)
Age of Head Squared	0.0000 (-0.002)	0.0000 (0.014)	0.0000 (0.032)
Female Household Head	0.0342 (0.767)	0.0312 (0.696)	0.0308 (0.686)
Dependency Rate	-0.1441 (-1.661)*	-0.1359 (-1.566)	-0.1356 (-1.561)
Household Size	-0.0172 (-2.5)**	-0.0169 (-2.289)**	-0.0172 (-2.486)**
Education			
Primary	0.0006 (0.082)	0.0009 (0.123)	0.0009 (0.124)
Secondary	0.0588 (3.854)***	0.0594 (3.872)***	0.0593 (3.879)***
Spouse Primary	0.0120 (1.654)*	0.0123 (1.693)*	0.0123 (1.689)*
Assets			
Rural Land	0.0452 (1.751)*	0.0465 (1.774)*	0.0469 (1.814)*
Land	-0.0109 (-0.478)	-0.0117 (-0.511)	-0.0119 (-0.521)
Chickens	-0.0036 (-0.464)	-0.0041 (-0.53)	-0.0041 (-0.527)
Cows	0.0119 (1.418)	0.0117 (1.383)	0.0116 (1.378)
Goats	0.0056 (0.772)	0.0055 (0.747)	0.0054 (0.742)
Region			
Urban Central	0.5068 (5.011)***	0.5135 (5.006)***	0.5151 (5.086)***
Rural Central	0.0775 (1.766)*	0.0725 (1.652)*	0.0722 (1.623)
Rural East	-0.0733 (-1.483)	-0.0802 (-1.604)	-0.0795 (-1.588)
Urban East	0.3713 (3.118)***	0.3682 (3.043)***	0.3699 (3.096)***
Urban West	0.3866 (3.391)***	0.3883 (3.395)***	0.3889 (3.405)***
Urban North	-0.0096 (-0.082)	-0.0094 (-0.08)	-0.0091 (-0.078)
Rural North	-0.4476 (-7.673)***	-0.4502 (-7.689)***	-0.4506 (-7.7)**
Type of Work			
Agricultural Own Account	-0.1419 (-2.925)***	-0.1438 (-2.96)***	-0.1438 (-2.955)***
Agricultural Wage	-0.1962 (-1.681)*	-0.1981 (-1.695)*	-0.1979 (-1.693)*
Other	-0.0930 (-0.995)	-0.1032 (-1.105)	-0.1034 (-1.099)
Non Agricultural Own Account	0.0265 (0.394)	0.0258 (0.382)	0.0261 (0.388)
Income	-0.7579 (-24.953)***	-0.7621 (-24.985)***	-0.7624 (-25.104)***
Sickness			
Sick92	-0.0691 (-1.654)*	-	-
Health Change	-	0.0089 (0.089)	-
Predicted Sickness	-	-	0.0013 (0.013)
Change Variables			
Change in Household Size	-0.0910 (-2.543)**	-0.0911 (-2.526)**	-0.0907 (-2.529)**
Change number of 5 year olds	0.0496 (1.287)	0.0494 (1.24)	0.0485 (1.256)
Change number of 6-14 year olds	0.0135 (0.362)	0.0134 (0.353)	0.0128 (0.341)
Change number work aged	0.0570 (1.57)	0.0572 (1.559)	0.0567 (1.559)

* Significant at 10% level

** Significant at 5% level

*** Significant at 1% level

Defaults – Missed Education (for head and spouse), Urban West, Non Agricultural Wage Employment; Obs 1005

Across the three models, we can see that the initial level of the logarithm of income to have strongly negative coefficients, so that *ceteris paribus* growth rates are higher for households that were poorer to start with.^{xxiii} As with the multinomial logit, education levels of the household head and spouse appear to be of major influence. This is in

line with other growth evidence such as that from Woolard and Klassen (2003) for South Africa where education was found to have a positive effect on growth. We are able to be a little more specific for our results, as we find that growth rates of the welfare measure are faster for households where the head has secondary education and when the spouse has primary education.^{xxiv}

There are also strong regional effects influencing the results, with growth rates being higher in urban areas of all regions except the Northern region, and lower in the rural areas of the Northern region. Again this is consistent with the evidence on changing living conditions and poverty over this period (Appleton, 2001). Of the physical assets, welfare growth is faster for rural households that have more land. Further confirming the importance of physical assets and that smallholders are more vulnerable to economic decline (Grootaert, Kanbur and Oh 1997), with an additional acre of land associated with a 4.5 per cent higher gain in welfare. Households engaged in own account agriculture and experiencing increases in household size over the period also have a negative influence on the growth of well being.

Many of the aforementioned factors, of course, favour richer households relative to poorer households, offsetting the potential convergence suggested by the negative coefficient on the initial income level.^{xxv} Several findings are also supportive of the earlier hypothesis regarding the importance of health and assets on poverty, and a families capacity to escape poverty, and raise further issues for investigation. From a policy perspective it would be very useful to know with greater certainty, for example, more about causality and the exact processes underlying the relationship between ill health and poverty. For example, further investigations could be through combining quantitative and qualitative investigations or usage of panel data with more than two waves.

6. Conclusion

Despite Uganda's excellent poverty reduction over the last decade there appears to be a core of Ugandan households that have not benefited from economic reforms resulting in a number of households being in persistent poverty and some households moving back into poverty. As one might expect, given the Ugandan governments

focus on creating an enabling environment which economic agents can exploit by utilising their initial capabilities and that HIV/AIDS prevalence has been as high as 25% in the last decade and a half, health status appears to play a major role in poverty dynamics.

In particular, sickness was found to be associated with households moving into poverty over the period 1992 to 1999. However a combination of demographic, activity and asset based factors also appear to be associated with a households poverty status, and are accentuated with sickness. One possible interpretation could be that the negative effect of a household losing the most productive aged labour is also being compounded by increases in the proportion of young people in the household. The loss of working age labour and the increase in young dependants are then confining the chronically poor households, or those moving into poverty, to agricultural own account employment. This in turn then leads to lower returns, as the most productively aged labour no longer work the land.

The decrease in enterprise livestock and other assets also suggests a particular distinction between the way sick and non sick households cope in either avoiding transient or permanent poverty. Asset decreases for all households headed by the sick are distinctly larger than the decreases for the non-sick households and suggests an accentuated depletion of assets during the process of immiseration. This is likely to be partly reflective of the relatively large increases in the sick moving to 'other' categories of activity which represent generally lower return activities states, such as unemployment.

In conclusion therefore, the paper has found ill health to be particularly associated with households moving into poverty, but also provides support for previous literature which suggest demographic factors to be important in determining poverty. However, there appear to be quite distinct differences in coping mechanisms of the sick and non sick households during the process of immiseration, particularly in relation to assets. Such issues deserve further investigation, possible through the use of further multiple wave panels or via a combined quantitative/qualitative approach, both approaches of which will provide a more rounded understanding of the issues underlying the dynamics and interconnected nature of health and poverty.

7. Appendices

Table A1: Descriptive Data Comparison for 1992, Full Panel and Reduced Panel after Matching

	IHS Sample		Full Panel		Diff	Matched Panel		Attrited Sample		Diff
	Mean	s.d	Mean	s.d		Mean	s.d	Mean	s.d	
Change in Income	-	-	0.35	0.70	-	0.34	0.69	0.37	0.73	-0.03
Age of head	40.17	15.25	43.04	15.42	-2.86***	43.40	15.50	46.44	16.24	-3.04***
Female head	0.27	0.44	0.24	0.42	0.03	0.21	0.41	0.28	0.46	-0.07
Education										
Missed	0.28	0.45	0.20	0.40	0.07	0.25	0.43	0.33	0.49	-0.08
Primary	3.93	2.87	3.73	2.81	0.20	3.97	2.77	3.78	2.83	0.19
Secondary	0.68	1.48	0.47	1.20	-0.21*	0.51	1.22	0.35	1.10	0.16
Spouse Missed	0.40	0.49	0.29	0.45	0.11	0.30	0.46	0.29	0.45	0.00
Spouse Primary	3.14	2.93	1.87	2.65	1.27***	2.07	2.72	1.53	2.52	0.54***
Spouse Secondary	0.35	1.05	0.11	0.58	-0.24**	0.12	0.61	0.13	0.64	-0.01
Dependant ratio	0.47	0.27	0.51	0.25	-0.04	0.51	0.24	0.52	0.26	-0.02
Household size	5.07	3.39	5.62	3.29	-0.54**	5.77	3.34	5.56	3.36	0.21
Rooms pae	0.72	0.58	0.74	0.56	-0.02	0.74	0.56	0.73	0.55	0.01
Region										
Central	0.15	0.36	0.16	0.35	-0.02	0.17	0.35	0.16	0.33	0.01
East	0.14	0.35	0.12	0.30	0.01	0.12	0.30	0.14	0.31	-0.02
West	0.08	0.28	0.03	0.18	0.046***	0.03	0.18	0.03	0.16	0.00
North	0.11	0.32	0.07	0.23	0.039**	0.08	0.25	0.09	0.23	-0.01
Type of Work										
Agricultural Own Account	0.53	0.50	0.67	0.47	-0.13***	0.67	0.47	0.66	0.47	0.01
Agricultural Wage	0.03	0.18	0.02	0.15	0.01	0.02	0.15	0.03	0.17	-0.01
Other	0.06	0.24	0.06	0.23	0.01	0.05	0.22	0.09	0.29	-0.04
Non Agricultural Own Account	0.14	0.35	0.09	0.28	0.05*	0.10	0.29	0.09	0.28	0.01
Non Agricultural Wage	0.22	0.42	0.16	0.37	0.06*	0.17	0.38	0.13	0.34	0.05
Income	8.79	0.69	8.68	0.59	0.11	8.69	0.59	8.64	0.59	0.05
Sick	0.19	0.39	0.17	0.38	0.02	0.16	0.36	0.18	0.39	-0.02
Assets										
Land	-	-	2.56	1.65		2.72	1.56	2.11	1.77	0.62
Chickens	-	-	1.63	2.17		1.69	2.16	1.50	2.18	0.19
Cows	-	-	0.89	1.91		0.97	1.98	0.61	1.60	0.36

Table A2: Probit Regression - Whether Household Is In the Full Panel?

Variable	In Full Panel (No/Yes)	In Matched Panel (No/Yes) (compared with 'full' panel)
Constant	-1.6703 (-10.255)***	-0.0285 (-0.039)
Sex of head	-0.0578 (-0.981)	-0.1712 (-1.299)
Age of head	0.0043 (3.104)***	-0.0040 (-1.201)
Household size	0.0164 (1.357)	0.0497 (1.602)
Head is Married	-0.0520 (-0.77)	-0.0754 (-0.463)
Number of Males less than 5 years old	0.0356 (1.362)	0.0070 (0.105)
Number of Females less than 5 years old	0.0378 (1.474)	-0.0838 (-1.304)
Number of Males between 6 and 14 years old	0.0043 (0.183)	-0.0664 (-1.175)
Number of Females between 6 and 14 years old	0.0357 (1.485)	-0.0308 (-0.515)
Days Ill	0.0005 (0.458)	-0.0050 (-0.647)
Fallsick	-0.0005 (-0.523)	0.0055 (0.714)
Household Public Goods		
Flush Toilet	0.1723 (1.403)	0.6295 (1.768)*
Latrine Toilet	0.1843 (3.531)***	0.3624 (1.134)
Other type of Toilet	0.0965 (0.588)	0.5630 (1.25)
Piped Water	-0.5779 (-3.811)***	-0.2144 (-0.489)
Public Tab	-0.3627 (-1.694)*	-0.1431 (-0.635)
Protected Water Source	-0.1340 (-0.978)	-0.2273 (-0.708)
Unprotected Water Source	0.0277 (0.723)	0.0750 (0.837)
Rain as Water Source	-0.8061 (-1.763)*	-
Vendor	-	-0.3406 (-0.7)
Education (yrs.)		
Head Missed	0.0629 (0.836)	0.0484 (1.51)
Head Primary	0.0082 (-0.488)	0.0305 (0.657)
Head Secondary	-0.0033 (-0.199)	-1.2002 (-1.222)
Spouse Missed	-0.0419 (-0.466)	0.0987 (1.39)
Spouse Primary	-0.0333 (-2.529)**	0.0404 (1.481)
Spouse Secondary	-0.1737 (-1.485)	-
Type of Work		
Agricultural Own Account	0.1415 (2.228)***	0.0627 (0.475)
Agricultural Wage	-0.1274 (-1.07)	-0.2527 (-0.907)
Other	-0.0668 (-0.731)	-0.0248 (-0.114)
Non Agricultural Own Account	-0.1037 (-1.006)	-0.1661 (-0.944)
Region		
Central	-0.0114 (-0.242)	0.1397 (1.69)*
North	-0.1877 (-2.196)**	0.0705 (0.673)
East	-0.0101 (-0.199)	-0.0796 (-0.958)
Income		
	0.0015 (0.293)	0.0433 (0.556)

* Significant at 10% level

** Significant at 5% level

*** Significant at 1% level

Defaults: Missed Education (for head and spouse), Bush toilet, River Water, West, Non Agricultural Wage Employment; Obs 1005

Table A3: Multinomial Logit Marginal Effects 1992/99 Full Panel Regression with Attrition Dummy

	Not Poor	Chronic Poverty	Moving Out of Poverty	Moving Into Poverty
Variable	(1)	(2)	(3)	(4)
Constant	0.3009 (2.086)**	-0.1165 (-1.058)	0.0559 (0.41)	-0.2403 (-3.057)***
Age of head	-0.0057 (-0.933)	0.0010 (0.211)	-0.0017 (-0.294)	0.0064 (1.87)*
Age of head squared	0.0001 (0.875)	0.0000 (-0.559)	0.0000 (0.48)	-0.0001 (-1.604)
Female Head	0.0035 (0.081)	0.0548 (1.603)	-0.0576 (-1.422)	-0.0007 (-0.031)
Sick Head	-0.0357 (-1.182)	0.0572 (1.475)	-0.0559 (-1.494)	0.0344 (1.844)*
Dependant rate	-0.2127 (-2.874)***	0.1574 (2.605)***	0.0608 (0.851)	-0.0056 (-0.153)
Household size	-0.0158 (-2.727)***	0.0070 (1.723)*	0.0078 (1.522)	0.0010 (0.324)
Education				
Primary	0.0178 (2.554)**	-0.0072 (-1.485)	-0.0123 (-1.885)*	0.0017 (0.479)
Secondary	0.0157 (1.368)	-0.0026 (-0.286)	0.0067 (0.614)	-0.0198 (-2.896)***
Spouse Primary	0.0263 (3.89)***	-0.0212 (-4.24)***	-0.0056 (-0.857)	0.0004 (0.121)
Assets				
Land	0.0165 (1.725)*	-0.0064 (-0.879)	0.0036 (0.399)	-0.0137 (-2.757)***
Chickens	-0.0024 (-0.35)	0.0074 (1.516)	-0.0019 (-0.295)	-0.0031 (-0.849)
Cows	0.0114 (1.507)	-0.0071 (-1.252)	0.0001 (0.013)	-0.0044 (-1.051)
Region				
Urban Central	0.1135 (0.666)	-0.1546 (-0.919)	0.0993 (0.615)	-0.0582 (-0.744)
Rural Central	0.1578 (1.264)	-0.0443 (-0.48)	0.0599 (0.496)	-0.1733 (-2.661)***
Urban East	0.2179 (1.303)	0.0844 (1.298)	-0.4348 (-1.346)	0.1326 (1.821*)
Rural East	0.0390 (0.316)	-0.1374 (-1.443)	0.1712 (1.473)	-0.0727 (-1.338)
Urban West	-0.0644 (-0.397)	0.0874 (0.567)	-0.0089 (-0.05)	-0.0141 (-0.397)
Rural West	0.0487 (0.397)	-0.1451 (-1.569)	0.1633 (1.409)	-0.0668 (-1.243)
Rural North	-0.1559 (-1.052)	0.1519 (1.693)*	-0.0004 (-0.003)	0.0044 (0.08)
Type of Work				
Agricultural Own Account	-0.1079 (-1.344)	0.0664 (0.875)	0.0054 (0.129)	0.0361 (1.478)
Agricultural Wage	-0.0737 (-0.741)	0.0409 (0.512)	0.0172 (0.183)	0.0156 (0.282)
Other	-0.0733 (-0.971)	0.1175 (2.105)**	-0.0588 (-0.813)	0.0147 (0.353)
Non Agricultural Own Account	0.0953 (1.587)	0.0087 (0.162)	-0.0607 (-0.963)	-0.0433 (-1.09)
Change Variables				
Hsize Change	0.0050 (0.172)	0.0356 (1.76)*	-0.0212 (-0.825)	-0.0194 (-1.301)
Change number of 5 year olds	-0.0253 (-0.815)	-0.0375 (-1.72)*	0.0241 (0.872)	0.0387 (2.445)**
Change number of 6-14 year olds	-0.0002 (-0.006)	-0.0300 (-1.418)	-0.0108 (-0.406)	0.0410 (2.634)***
Change number work aged	-0.0029 (-0.098)	-0.0309 (-1.464)	0.0035 (0.13)	0.0303 (1.98)**
Attrition Dummy	-0.1781 (-1.353)	0.0351 (0.449)	0.0302 (0.287)	0.1127 (1.48)

* Significant at 10% level

** Significant at 5% level

*** Significant at 1% level

Defaults: Missed Education (for head and spouse), Urban West, Non Agricultural Wage Employment; Obs 1005

Table A4: Household Head Health Status and Activity at 1992 and Poverty Status

Activity of Household Head at 1992	Chronic Poor		Moving out of Poverty		Moving into Poverty		Never In Poverty		Long Sickness Periods of Sick (> 10 days) (9)	All	
	Sick (1)	Not Sick (2)	Sick (3)	Not Sick (4)	Sick (5)	Not Sick (6)	Sick (7)	Not Sick (8)		Sick (10)	Not Sick (11)
Agriculture - wage	0.0%	2.5%	0.0%	2.8%	0.0%	1.4%	3.8%	2.1%	1.4%	1.7%	2.3%
Agriculture own account/employer	77.8%	76.2%	73.9%	69.1%	85.7%	73.2%	62.0%	56.8%	73.9%	71.1%	66.2%
Non Agriculture - wage	14.8%	11.0%	10.9%	18.5%	7.1%	16.9%	13.9%	23.2%	10.1%	12.2%	18.8%
Non Agriculture – own account/employer	0.0%	6.1%	2.2%	5.6%	0.0%	4.2%	18.9%	15.9%	4.3%	8.9%	9.8%
Other	7.4%	4.2%	13.0%	4.0%	7.1%	4.2%	5.1%	2.9%	10.1%	7.8%	3.8%

Table A5: Household Head Health Status and Change in Activity Status at 1992 and Poverty Status

Main Economic Activity Across The two waves	Chronic Poor		Moving out of Poverty		Moving into Poverty		Never In Poverty		Long Sickness Periods of Sick (> 10 days) (9)	All	
	Sick (1)	Not Sick (2)	Sick (3)	Not Sick (4)	Sick (5)	Not Sick (6)	Sick (7)	Not Sick (8)		Sick (10)	Not Sick (11)
Stayed in same activity											
Agriculture – own account/employer	64.9%	68.3%	62.2%	63.7%	75.0%	56.9%	52.9%	50.0%	58.9%	60.7%	58.3%
Agriculture - wage	0.0%	1.2%	0.0%	0.0%	0.0%	0.0%	2.4%	0.2%	0.7%	0.1%	0.3%
Non Agriculture – own account/employer	0.0%	1.2%	0.0%	2.0%	0.0%	0.0%	9.4%	9.9%	5.0%	4.0%	4.9%
Non Agriculture - wage	2.7%	3.0%	11.2%	12.3%	3.6%	5.6%	9.4%	10.5%	6.6%	7.0%	8.7%
Changed Activity											
Agriculture own ac to agricult wage	0.0%	0.6%	2.0%	0.4%	3.6%	5.6%	2.4%	0.3%	2.1%	2.0%	0.8%
other to ag wage	0.0%	0.6%	2.0%	1.2%	0.0%	1.3%	0.0%	2.0%	0.0%	0.5%	1.8%
Ag wage to ag own ac	0.0%	0.6%	0.0%	2.4%	0.0%	0.0%	1.1%	1.5%	0.7%	0.5%	1.8%
other to ag own ac	16.9%	9.7%	10.2%	7.6%	10.7%	13.9%	15.3%	12.5%	14.2%	13.8%	10.7%
to non ag wage	2.7%	5.4%	0.0%	2.0%	0.0%	1.7%	3.5%	3.2%	3.5%	2.9%	3.2%
to non ag own ac	0.0%	3.0%	6.1%	4.3%	0.0%	4.1%	3.6%	6.8%	4.2%	3.9%	4.7%
to Other (unemployed, disabled etc.)	12.8%	6.4%	6.1%	4.0%	7.1%	11.1%	0.0%	3.2%	4.2%	4.5%	4.6%

Table A6: Results on Predicted Health Measures on Predicted Consumption

	Predicted Health
Overidentification Test	6.21 (df=8) (pass)
Hausman Test on log of expenditure	p=0.0392
Instruments (9)	Flush toilet, latrine, Other toilet, public tap, piped water, protected water, unprotected water, Rain, Cost of medical services (consultancy price)

Table A7 :Comparisons Between Predicted and Actual Groups Based on the Multinomial Logit Model

Frequencies of actual & predicted outcomes
 Predicted outcome has maximum probability.

Predicted					
Actual	0	1	2	3	Total
0	318	23	70	10	421
1	62	70	54	4	190
2	145	35	111	4	295
3	49	15	20	15	99
Total	574	143	255	33	1005

Table A8: OLS Regression to Obtain Predicted Values for Health

	Obs. 1005	
	R-squared .236944	
	Log likelihood -308.7843	
Constant	0.0950	(0.936)
Female head	0.0236	(0.811)
Age of head	0.0024	(0.548)
Age of head squared	0.0000	(-0.065)
Household size	-0.0055	(-1.393)
Education		
Primary	-0.0004	(-0.091)
Secondary	-0.0035	(-0.341)
Spouse Primary	-0.0032	(-0.664)
Toilet Type		
Flush Toilet	-0.0423	(-0.501)
Latrine	-0.0819	(-2.424)**
Other Toiler	0.0282	(0.271)
Source Of Water		
Public Tap	-0.0418	(1.658)*
Piped	-0.1765	(-1.659)*
Protected	0.0687	(0.812)
Unprotected	0.0568	(2.437)**
Rain	-0.1045	(-1.311)
Consultancy Price	0.0001	(14.995)***
Assets		
Land	-0.0053	(-0.729)
Chickens	0.0074	(1.458)
Cows	0.0075	(1.374)
Goats	0.0056	(0.832)
Region		
Urban Central	-0.0209	(-0.39)
Rural Central	0.0465	(1.577)
Rural East	0.0603	(1.85)*
Urban East	0.0476	(0.656)
Urban West	0.0401	(0.625)
Urban North	-0.0031	(-0.043)
Rural North	0.0257	(0.639)
Type of Work		
Agricultural Wage	0.0123	(0.166)
Other	0.1109	(2.001)**
Agricultural Own	-0.0142	(-0.341)
Account		

* Significant at 10% level

** Significant at 5% level

*** Significant at 1% level

Table A9: Poverty Status - Multinomial Logit Marginal Effects 1992/99 Panel with Sick92 Interaction terms

Variable	Not Poor (1)	Chronic Poverty (2)	Moving Out of Poverty (3)	Moving Into Poverty (4)
Constant	0.2636 (1.483)	-0.1280 (-0.996)	-0.0641 (-0.393)	-0.0715 (-0.928)
Agehed	-0.0064 (-0.894)	0.0046 (0.911)	0.0026 (0.403)	-0.0008 (-0.248)
Agehedsq	0.0000 (0.636)	0.0000 (-0.856)	0.0000 (-0.115)	0.0000 (0.135)
Sexhed	0.1172 (2.194)**	-0.0539 (-1.495)	-0.0421 (-0.871)	-0.0211 (-0.798)
Deprate	-0.1304 (-1.586)	0.0737 (1.206)	0.0227 (0.302)	0.0340 (0.939)
Sick92	-0.1615 (-1.754)*	0.0750 (0.977)	0.0739 (0.79)	0.0126 (0.264)
Hsize92	-0.0147 (-1.87)*	0.0098 (2.002)**	0.0031 (0.458)	0.0017 (0.46)
Education				
Primary	0.0185 (2.324)**	-0.0066 (-1.258)	-0.0171 (-2.368)**	0.0052 (1.467)
Secondary	0.0429 (2.52)**	-0.0296 (-2.019)**	0.0156 (0.981)	-0.0290 (-2.642)***
Spouse Primary	0.0194 (2.494)**	-0.0181 (-3.214)***	0.0007 (0.102)	-0.0019 (-0.548)
Assets				
Land (rural)	0.0137 (0.473)	-0.0186 (-0.749)	0.0229 (0.816)	-0.0180 (-0.907)
Land	-0.0093 (-0.361)	0.0188 (0.808)	-0.0128 (-0.507)	0.0033 (0.173)
Chickens	-0.0002 (-0.019)	0.0080 (1.428)	-0.0005 (-0.062)	-0.0074 (-1.793)*
Cows	0.0112 (1.244)	-0.0134 (-2.051)**	0.0031 (0.379)	-0.0009 (-0.225)
Goats	0.0084 (0.985)	-0.0026 (-0.461)	-0.0027 (-0.349)	-0.0031 (-0.758)
Region				
Urban Central	0.1359 (1.219)	-0.0790 (-0.833)	0.0583 (0.542)	-0.1153 (-1.521)
Rural Central	-0.0165 (-0.362)	-0.0134 (-0.406)	0.0378 (0.873)	-0.0078 (-0.36)
Rural East	-0.1269 (-2.383)**	-0.0118 (-0.328)	0.1200 (2.52)**	0.0187 (0.802)
Urban East	0.0396 (0.307)	-0.0894 (-0.843)	0.1502 (1.222)	-0.1004 (-1.14)
Urban West	0.1851 (1.405)	-0.1894 (-1.497)	0.1001 (0.784)	-0.0957 (-1.046)
Urban North	-0.0341 (-0.274)	-0.0406 (-0.44)	0.0975 (0.851)	-0.0229 (-0.374)
Rural North	-0.3229 (-4.248)***	0.1855 (4.616)***	0.0629 (0.961)	0.0746 (2.858)***
Type of Work				
Agricultural Own Account	-0.0581 (-1.102)	0.0508 (1.289)	0.0019 (0.04)	0.0053 (0.214)
Agricultural Wage	-0.0215 (-0.176)	0.0419 (0.481)	0.0403 (0.356)	-0.0607 (-0.807)
Other	-0.0980 (-0.963)	0.0686 (0.983)	0.0030 (0.033)	0.0264 (0.59)
Non Agricultural Own Account	0.1946 (2.578)***	0.0243 (0.404)	-0.1450 (-1.864)*	-0.0739 (-1.382)
Interaction and Change Variables				
Hsize Change	-0.0088 (-1.209)	0.0111 (2.348)**	-0.0172 (-2.544)**	0.0149 (4.856)***
Sick*Female Head	-0.1154 (-1.119)	0.0167 (0.234)	0.0295 (0.311)	0.0692 (1.715)*
Sick*Goats	0.0178 (0.97)	0.0021 (0.157)	-0.0103 (-0.578)	-0.0095 (-1.074)
Sick*Agricultural Own Account Worker	0.0811 (1.14)	-0.0592 (-1.197)	-0.0702 (-1.062)	0.0484 (1.762)*

* Significant at 10% level

** Significant at 5% level

*** Significant at 1% level

Defaults: As in main text

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- ⁱ 2002 Poverty figures show a slight increase in headcount poverty to 38.9%.
- ⁱⁱ AIDS prevalence figures fell between 1992 and 1997 (and 2000), however the number of individuals in the advanced stages of aids (i.e. the stages that would more frequently result in sickness) actually increased. However the increase in morbidity is also partly explained by the fall in the effectiveness of chloroquine in the treatment of malaria.
- ⁱⁱⁱ McCulloch and Baulch (1999) argue that there is a natural ordering of the chronically, transitorily or never poor. Whilst the ordered logit approach is good for understanding the relative influence of different household characteristics on its poverty status, the more widely used multinomial logit approach enables the identification of the characteristics that are more prevalent within each category (McCulloch and Baulch, 1999, p.13).
- ^{iv} 'Transient poverty levels decline with levels of household head education, while the proportion of poverty that is transient varies little with the education of the head', (Jalan and Ravallion, 1998 p 346).
- ^v These accepted poverty lines are based on expenditure required to obtain the minimum calorific requirement, as set by WHO, and non-food requirements.
- ^{vi} Because of the there being only two waves of data this makes the spells approach the most appropriate in this instance.
- ^{vii} Change over the period can reasonably be considered to be exogenous for purposes of this model.
- ^{viii} An acceptable error range for the age matching was considered appropriate. In this instance an error range of plus 7 and minus 8 years was allowed – in line with what appeared to be a natural structural break in a frequency distribution of age differences, between the two periods.
- ^{ix} Although panel households are more likely to have latrines and flush toilets, these variables are not of interest in this analysis, and therefore of no concern.
- ^x Even for the variables which are of significance in the matched panel (i.e. flush toilet), such variables are only significant at the 10% level.
- ^{xi} Lawson, McKay and Okidi (2003) found similar patterns of chronic and transient poverty across all two, three and four wave panels for Uganda.
- ^{xii} 'Sick head' is used to refer to the household head having reported sickness within the 30 period preceding interview. The focus on a household heads health status as at 1992, as opposed to 1999, is based on preliminary descriptive data which indicated the influence of health in 1992 to be of more importance than health status in 1999. Thus supporting the hypothesis that there is a dynamic effect of sickness that occurs after the sickness period. Descriptive data of this nature can be seen in Lawson (2003).
- ^{xiii} Unless otherwise stated 'long term sickness' refers to individuals being sick/ill for 10 or more days in every 30 day period.
- ^{xiv} All significant results are at or below the 5% level.
- ^{xv} Jalan and Ravallion (1998) found the health of the household members to be associated with chronic poverty but not transient poverty.
- ^{xvi} Significant at the 10% level for sick regressions and at the 5% level for long term sickness results.
- ^{xvii} "For example, a rural worker suffering from mild attack of malaria can shift from harvesting to lighter work such as scaring crop predator... However person with a job that provides social security may be more likely to take days disabled than individuals who are self-employed and uncovered by social security" (Mwabu and O'Connell 2001, p 1-2).
- ^{xviii} Numbers of chickens, at 1992, was significant at the 5% level. Sickness/asset interaction terms for the regression results in Table A9 were not statistically significant, neither were different combinations of assets and health status which were tested in preliminary regressions. An interaction with rural land was not significant for the regressions in Table 4 and was therefore excluded.
- ^{xix} A dummy variable representing missing spouse observations was included in preliminary regressions. This was not significant and was therefore excluded from the final results tables.
- ^{xx} Relative to the default of having no education.
- ^{xxi} However, correlation of this nature are unfortunate as they mean that the model (or available data) has been unable to capture the more fundamental factors underlying for instance the greater poverty of the rural North.
- ^{xxii} Sickness is significant at the 10% level. Deininger (2001) found that a higher incidence of malaria related health problems reduced overall growth and is particularly harmful to the poor.
- ^{xxiii} However, Barro and Sala-i-Martin (1990) show that there is an overestimation bias with OLS estimates of such coefficients.
- ^{xxiv} Significant at the 10% level.
- ^{xxv} Although it should be noted that there are limits to what can be said about convergence with a 2 wave panel.