IMPACTS AND DETERMINANTS OF PANEL SURVEY ATTRITION: THE CASE OF NORTHERN UGANDA SURVEY 2004-2008

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ABSTRACT

The paper analyses the impact of household attrition in the Northern Uganda Survey panel of 2004 and 2008. These surveys were designed to evaluate the performance of the first phase of the Northern Uganda Social Action Fund (NUSAF). The first survey was conducted in 2004 when the region faced heightened levels or rebel insurgency and the subsequent survey in 2008 when rebel hostilities had ceased. As such, the panel survey was plagued by a high level of attrition—at least 25 percent of the households could not be resurveyed in 2008. The paper examines the impacts of attrition on determinants of household welfare as well as household experience of insecurity shocks. The pattern of attrition is not random with households in urban areas and those that were resident in internally displaced person camps (IDPs) were more likely to be lost during the follow-up survey.

Furthermore, residence in West Nile and Acholi sub-regions were key determinants of household attrition. Within these sub-regions, households with younger heads were more likely to be lost in Acholi while households with teenage children are more likely to be lost in West Nile. Finally, the attrition tests confirm that the regression coefficients differ significantly between households resurveyed and lost during the resurvey.

Keywords: Uganda, attrition, household survey, panel data, Northern Uganda

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ACRONYMS/ABBREVIATIONS

DRC   -   Democratic Republic of Congo

GPS   -   Global Position System

IDP   -   Internally Displaced Person

IFLS   -   Indonesian Family Life Survey

IHS   -   Integrated Household Survey

KHDS   -   Kagera Health and Development Survey

LRA   -   Lord's Resistance Army

NUS   -   Northern Uganda Survey

NUSAF -   Northern Uganda Social Action Fund

PSID   -   Panel Study of Income Dynamics

SSA   -   Sub-Saharan Africa

UBoS   -   Uganda Bureau of Statistics

YOP   -   Youth Opportunities Program

1.0   INTRODUCTION

Panel data provides a number of advantages in analysing economic relationships and as such, a number of countries have undertaken such surveys that follow households or individual over time. Hsiao (2005) lists a number of reasons for the recent proliferation of panel survey datasets. First, panel data aids in controlling for omitted variables given the fact that a single or series of cross sectional surveys cannot capture all aspects that influence human behaviour. Second, such data helps in the analysis of dynamic relationship such as poverty dynamics where it is important to know whether over time a household stayed poor, moved out of poverty, or fell into poverty. Third, having a series of observations on an individual or household can help reduce measurement error. Finally, panel data in developing countries aids the evaluation of whether targeted government interventions reached the intended beneficiaries. Despite the above advantages, only a few panel surveys have been undertaken in developing countries—especially in sub-Saharan Africa (SSA) primarily due to costs. Related to costs, most of the panel surveys in SSA cover specific within country sub-regions and as such very few are nationally representative.[1] Limited representativeness implies that conclusions and policy recommendations cannot be generalised to give a broad perspective.

Uganda is among the few developing countries in SSA with a long history of undertaking panel surveys and majority of the surveys are nationally representative. The first panel survey was undertaken during 1989 and 1991/92. Furthermore, during 1992/93 and 1995/96, Uganda implemented a series of four annual monitoring panel surveys covering 800 households (Lawson *et al.* 2006). The most widely cited panel for Uganda is the 1992/93-1999/00 panel that surveyed 1,398 households. Previous authors using this particular panel show that only 1,309 households of the targeted panel households could be tracked. On the other hand, only 1,103 of the 1,309 panel households had consistent information during the two waves (Lawson *et al.* 2006; Deininger and Okidi 2003). A matching sample of about

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[1] Example of region based panel surveys in Africa include: the 1991 and 1994 Kagera Health and Development Survey by the World Bank in Tanzania; the 1993 and 1998 KwaZulu Natal Income Dynamics Study in South Africa; and the 1998 and 2003/05 Kenyan Life Panel Survey.

3,000 households between the 2005/06 UNHS and 2006 UDHS could also possibly qualify as a panel. Despite the breadth of Uganda's data collection exercise, especially relating to panel surveys, only a few studies have examined the pattern of sample attrition (where some targeted households are not successfully traced) in the above surveys. As noted by previous authors, sample attrition can create new sources of bias in panel data (Maluccio 2004).

The focus of the current paper is the most recent panel survey for Northern Uganda—combining the 2004 Northern Uganda Survey (NUS 2004) and the follow up survey in 2008 (NUS 2008). These datasets were collected as part of the evaluation of the first phase of the Northern Uganda Social Action Fund (NUSAF) project (2003-2008).[2] The 2004 survey collected information from 4,789 households containing 26,505 individuals from the then 18 districts under NUSAF[3]. The follow up survey in 2008 managed to track 3,572 households—yielding an overall attrition rate of about 25 percent. This attrition rate is relatively high compared to other efforts to track households elsewhere due to the conflict situation in Northern Uganda. For example, the 1992/93-1999/00 Uganda National Household Survey panel had an attrition rate of 6 percent. Also, the Kenyan Life Panel Survey (1998-2003) had an attrition rate of only 15 percent (Baird *et al*. 2008).

The plausible explanations for high attrition in NUS panel include: first, the original survey was not designed to be a panel from the onset and this affected the subsequent process of attempting to retrace the same households. Second, the intervening period between the two surveys coincided with unanticipated changes in the geo-political landscape in the region. The 2004 survey was conducted during a period escalating conflict while by 2008, hostilities between the Lord's Resistance Army (LRA) rebels and the Ugandan army had ceased. In particular, the Government of Uganda (GoU) reached a tentative agreement with the LRA and the cessation of armed hostility resulted in the resettlement of formerly displaced households. In this paper, we examine the factors explaining attrition in the NUS panel data and the

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[2] The NUSAF project covers the districts most affected by insecurity (rebel activity and cattle rustling) in Uganda since the mid 1980s.
[3] . The NUSAF sub-regions included: West Nile, Karamoja, Teso, Lango and Acholi.

implications for attrition in multivariate analysis of household outcomes using the panel dataset.

This paper utilises a number of methods in order to investigate the pattern and impacts of attrition in the two wave panel. First, bivariate analysis is undertaken comparing attrition rates across a number of household characteristics. This is further complemented with tests for the difference in means for re-surveyed households and those that dropped out of the survey. Second, we estimate probit models for determinants of panel attrition. Finally, we examine the impact of attrition on key household indicators—specifically, indicators of household welfare status and household experience of rebel shocks. With respect to the key results, we find that the pattern of attrition is not random with households in urban areas and those that were resident in IDP camps more likely to be lost during the follow-up survey. Furthermore, residence in West Nile and Acholi sub-regions are key determinants of household attrition from the NUS surveys during 2004-2008. Finally, multivariate tests confirm that the regression coefficients for the original NUS households and those re-surveyed significantly differ. As such, without adjustments to the sample weighting mechanisms, using the NUS panel in multivariate analysis would be significantly affected by sample attrition bias.

The rest of the paper is organised as follows. In the next sections we provide a brief literature review on the causes and impacts of panel attrition. This is followed by the section that details the NUS surveys and the methods employed in this paper. The results are presented in section four while section five provides the conclusions as well as recommendations for the conduct of future panel surveys.

2.0   LITERATURE REVIEW

In order to accurately examine changes in household welfare status, panel surveys have been extensively undertaken in both developed and developing countries. The Panel Study of Income Dynamics (PSID) in the United States was perhaps the pioneer household panel survey in the developed world that annually surveyed the same households starting in 1968 with 9,000 households. However, by 1989, at least 50 percent of the original sample had been lost (Fitzgerald *et al*, 1998).   Another example of a large scale panel survey, this time in the developing world, is the Indonesian Family Life Survey (IFLS) of 7,224 households undertaken during 1993 and 2007/08 is a series of four waves. The 1997 (IFLS 2) and 1998 (IFLS 2+) panel sub sample of 2,000 households was used to examine the impacts of the Asian financial crisis on Indonesian households (Thomas *et al.* 2001). In SSA, the Kagera Health and Development Survey (KHDS) is the longest running panel survey following 800 households originally surveyed in 1991/92. By 2004, the KHDS had been conducted five times primarily to examine the long term impacts of HIV/AIDS deaths in North-western Tanzania (Beegle *et al.* 2007). The recent reliance on randomised experiments in order to examine development effectiveness has also led to the availability of small panel data surveys—especially in SSA and Latin America (Miguel and Kremer 2004; Hoddinott and Behrman 2005).

As earlier noted, we define sample attrition in a panel survey as a failure to successfully re-interview targeted households/individuals. This can be attributed to mainly the refusal to answer repeat questionnaires or the inability to retrace targeted households. Maluccio (2004) highlights the fact that in developing countries, refusals for re-interview are minimal due to the low opportunity cost of time—with very low levels of full employment, households are not constrained by time. Indeed, it is mainly the high mobility of households/individuals—associated with the process of development that panel surveys fail to resurvey households in developing countries. On the other hand, when the survey is able to trace the same households, the composition may change overtime especially for individuals in their teenage years who are highly mobile (Baird *et al*. 2008).

Due to the above reasons, the rates of sample attrition in panel surveys varies widely especially in developing countries. For example, the IFLS surveys in Indonesia have registered some of the lowest panel attrition rates with a loss of 6 percent of the households over a four year interval (Thomas *et al*. 2001). The KwaZulu-Natal survey in South Africa lost 16 percent of the households over a five year interval (Maluccio, 2004). Surveys in other countries show considerably higher rates of attrition. For example, Foster and Rosenzweig (1995) show that in a panel survey in India, covering the period 1970/71 and 1981/82, at least 33 percent of the sample was lost. Similarly high attrition rate (35 percent) was also recorded in a panel survey in urban Bolivia during 1995/96 and 1998 (Alderman and Behrman 1999). Perhaps one of the largest rates of panel sample attrition ever recorded was in the Philippines where the Cebu Longitudinal Health and Nutrition Survey—re-interviewing expectant women 14 times over the course of two years lost more than 60 percent of the sample (Thomas *et al.* 2001).

One of the reasons for some of the high attrition rates observed above is the fact that some surveys do not make attempts to trace households or individuals who move during the intervening period. Baird *et al* (2008) highlight the benefits and challenges of tracking individuals in panel surveys based on KLPS noted earlier. As part of the analysis of the long term impacts of providing de-worming treatments to school children, the KLPS sought to re-interview 7,500 primary school pupils originally surveyed in 1998. Due to extensive efforts to track individuals that moved—even across national borders, at least 85 percent of the original sample was resurveyed during 2003/05. However, the relatively high success rate was achieved at a considerable cost. In particular, while the unit cost for each pupil re-interviewed was US$54 for pupils who had not moved, the corresponding cost for pupils who had moved and required intensive tracing was more than three times at US$179 per traced pupil.

Nonetheless, not all sample attrition in panel surveys leads automatically to bias when examining any dynamic changes in household status. For example, Alderman *et al.* (2001) who examine the impacts of panel attrition for surveys in three countries (Bolivia, Kenya, and South Africa) finds that although the means of most

variables differ for households that were lost to follow-up and those successfully re-interviewed, the coefficient estimates for determinants of child nutrition, for example, are not affected by attrition. In later study, Baird *et al.* (2008) also show that in Kenya, de-worming treatment does not appear to be significantly related to whether an individual was lost to follow-up or not.

There are also previous studies that examine the pattern of attrition in panel data from Uganda. Lawson *et al.* (2006) was perhaps the first attempt to systematically examine the pattern and impacts of panel sample attrition—using the panel from the Integrated Household Survey (IHS) 1992/93 and the UNHS of 1999/00. As earlier noted, for this panel dataset, out of the targeted 1,398 households, only 1,103 households had consistent information. In terms of impacts of attrition, although the targeted panel households had relatively lower socio-economic status—compared to full 1992/93 sample, the authors find that differences between the matched and attriting households was not statistically significant. Furthermore, in terms of household characteristics, significant differences were observed for only the gender of the household head and the education attainment of the household head's spouse.

A number of small scale panel surveys have been conducted in parts of Northern Uganda notwithstanding the armed hostilities that lasted for about 20 years. For example, studies have examined the impacts of relief support especially school feeding programs on schooling and cognitive development (Alderman *et al.* 2008; Adelman *et al.* 2008); the consequences of child soldiering (Blattman and Annan 2009); and the impacts of vocation training provided by the NUSAF project. In particular, the Survey of War Affected Youth (SWAY) used by Blattman and Annan (2009) followed 741 males resident in Kitgum and Pader districts. On the other hand, between 2005 and 2007, the U.N World Food Programme and UNICEF supported the randomized evaluation of the impacts of school feeding programmes in 31 IDP camps in Lira and Pader districts. This particular panel survey forms the basis for the data used in the analysis by Alderman *et al.* (2008) and Adelman *et al.* (2008). Other on-going panel surveys include the evaluation of the vocational training provided under the Youth Opportunities Program (YOP) component of the NUSAF project. In

2008, a baseline survey of over 2,500 youth from 522 youth groups was undertaken with the re-survey expected in 2010.

Despite the above studies being relatively small and with restricted geographical coverage, they nonetheless have had to deal with challenge of sample attrition. According to Blattman and Annan (2009), the SWAY was able to trace 93 percent of the targeted 1,100 households as listed on the UN World Food programme database in 2002. The authors attribute the loss of some of the targeted households to both migration and mortality. Indeed, other studies show that households—especially resident in IDP camps are highly mobile. For example Alderman *et al.,* (2008) report that between 2005 and 2007, at least 70 percent of the previously surveyed households in IDP camps (in Pader and Lira) had changed location. This major shift in camp populations was partly attributed to the peace negotiations between the LRA and the Government of Uganda that started in July 2006. The authors cite the fact that all IDPs in Lira had left the former camp locations by March 2007. Nonetheless, the authors were able to re-survey at least 81 percent of the original sample. Overall, in comparison to the NUS panel, most of the above surveys cover relatively small areas of Northern Uganda. The subsequent section describes the NUS datasets.

3.0 BACKGROUND TO THE NORTHERN UGANDA SURVEYS AND METHODS

3.1 Background

The NUS 2004 was undertaken by the Uganda Bureau of Statistics (UBoS) primarily as a baseline survey for the World Bank funded the NUSAF project. The NUSAF protect sought to improve the livelihoods of households affected by insecurity through four major components, namely: the community development rehabilitation; increasing incomes through vulnerable groups support; youth opportunities programme which provided new skills to young adults; and finally, through the community reconciliation and conflict management. The survey, conducted between July and December 2004 covered 18 districts in Northern and Eastern Uganda that were greatly affected by insecurity at the time. As mentioned earlier, the 2004 survey was large comprising of 4,786 households comprising 26,500 individuals. The survey employed a two stage stratified random sampling procedure in which the enumeration areas (EAs) were the principal sampling unit while 10 households were randomly selected from each of the selected EAs. The survey was representative at both the sub-region level as well as at the district level. Furthermore, the survey for the first time captured households resident in IDP camps. Apart from the regular socio-economic indicators, the NUS 2004 captured extensive information of household experience of shock and shock responses. Further details about the coverage and content of this particular survey can be found in earlier report by Ssewanyana *et al.* (2006) as well as the official NUS 2004 survey report (UBoS 2006).

The NUS of 2008 was undertaken during August 2008 and January 2009 in a bid to re-interview all the 4,783 households surveyed in 2004. Efforts were made by UBoS to visit the households at the period as in 2004. In addition, to the socio-economic and community modules undertaken during the NUS 2004, the 2008 survey included a qualitative module. The latter module focussed on the qualitative evaluation of the four NUSAF project components. The 2004 and 2008 maintained the same set of questions; however, a number of new questions were introduced in the 2008

community module in order to capture additional information on: access to community projects implemented by NUSAF and other partners; community social capital; and governance indicators. Nonetheless, the decision to conduct a panel survey was undertaken during the planning of the 2008 survey (UBoS, 2009); as such, this may have ultimately affected the success of the re-interview process. The main method of tracking households surveyed in 2004 was to use the Global Positioning System (GPS) indicators captured in 2004 and to track households that moved—in cases where their new destination could be ascertained. Further details of the coverage, content as well as the reasons for limited success in re-tracing some households are contained in the official evaluation report (UBoS 2009).

3.2   Methods

A household is considered to have attrited if it is lost during follow up in the 2008 NUS survey. Following the approach of Alderman *et al*. (2001), this paper undertakes a series of tests to examine the causes and effects of attrition in the NUS 2004 and 2008 surveys. First, the means of a number of variables for households that were re-interviewed and those lost to follow-up based on 2004 characteristics are compared. The significance of the difference in means is examined using t-test statistics. Second, the determinants of attrition between 2004 and 2008 through estimating a probit model are investigated. In this case, the significance of the main variables of interest (welfare and experience of rebels) is examined through a series of probit regressions. Finally, the standard attrition tests also known as the Becketti, Gould, Lillard and Welch (1988) test or the BGLW test are performed. Specifically, based on regressions for determinants of household welfare status and household experience of insecurity shocks, the paper examines the differences in coefficients for the full NUS 2004 sample and the panel 2008 sample. Two types of tests are undertaken for the different regressions—tests for equality on all coefficients except the constant and tests of equality on all coefficients including the constant.

In the analysis, we utilise the standard household characteristics relating to: the demographic composition of the household, the highest education attainment of household head, the migration history of the household head, the marital status of

the head, the ownership of household assets, household access to public goods (notably water and sanitation), and spatial location of the household as well as community characteristics. Furthermore, we adopt two primary outcome variables in our regression analysis—household consumption per adult equivalent and household experience of rebel shocks. Consumption per adult equivalent is a standard proxy for income in countries with large subsistence sectors. On the other hand, the choice of rebel's shocks is guided by the fact that vast areas of northern Uganda have experienced episodes of armed conflict since the mid-1980s. In the 2004 survey, households were asked the most severe shock experienced in the past 12 months prior to the survey. The responses included: rebels, agricultural shocks, death or illness in the household, and theft. The "rebels" outcome is defined as the dummy equal to one if the household reported rebels as the most severe shock experienced. The next section presents results for the various attrition tests. However, the description of the pattern of attrition in the NUS surveys is presented prior to an in-depth analysis.

4.0 RESULTS

4.1 Bivariate analysis of attrition in the NUS

As a precursor to the multivariate analysis, we investigate the bivariate relationships with regard to attrition. In particular, we examine how attrition varies with previous migration history, geographical location as well as household poverty status. Table 1 shows the rates of sample attrition between the NUS 2004 and the re-interview in 2008. At least 25 percent of the households were lost to follow up. The table also shows that attrition rates vary widely across geographical location and socio economic characteristics. Acholi sub-region registered the largest proportion of lost households—36 percent while Teso sub-region had the least (of 16 percent). This is not surprising since Acholi sub-region was the epicentre of the LRA rebel insurgence and had the largest population of IDPs. Given that urban households are characterised by high mobility, an issue discussed in the literature review, it is not surprising that urban households had the largest proportion of lost households (45 percent). Again, this does not come as surprise as most IDP camps in 2004 were located in urban areas. For some sub-regions e.g. Lango, more than half of the urban sample was lost.

Another issue examined in the table is residence in an IDP camp. In the 2004 survey, at least 10 percent of the households in the overall sample were resident in IDP camps; however, these were only located in the sub-regions of Acholi, Lango, and Teso. As share of the total IDP sample, 88 percent were resident in Acholi, 23 percent in Lango, and 5 percent in Teso sub-region. The contribution to total IDP population reflects the intensity of the LRA conflict—having started and concentrated in Acholi sub-region but later moved to neighbouring sub-regions. While about 30 percent of the IDP population was lost during the resurvey, most of the lost IDPs were in Acholi sub-region. At least 35 percent of the IDPs re-surveyed were traced despite having moved location (not indicated in the table). Furthermore, older households were less likely to have attrited. For instance, for the whole sample, 35.5 percent of households established during 2000-2004 were lost compared to only 18 percent for households formed in the 1970s and prior.

It is important to establish whether it is poor households in region that are more likely to move and subsequently cannot be traced. This is because, a decline in poverty indices, of the nature registered in Northern Uganda during 2004 and 2008 (UBoS, 2009) could be a result of relatively poorer households dropping out of the sample. As such, the paper also investigates how the pattern of attrition varies by household welfare status—specifically using consumption expenditure per adult equivalent quintiles.

Table 1 shows that the rate of attrition increases dramatically after the middle quintile. Indeed, it is the relatively well-to-do households that are most likely to be lost in the follow-up with households from the top quintile exhibiting the highest rates of attrition—33 percent. This particular result suggests that it is well off households that are able and can afford the costs of migration and re-establishments in new communities. As such, the registered declines in poverty based on the NUS panel data cannot be attributed to attrition out of the sample by poorer households.

Table 1: Rates of attrition between NUS 2004 and 2008, %

| | All | | Sub-region | | | | | | ## Households |
			West Nile	Acholi	Lango	Teso	Karamoja		
All NUSAF	25.1		31.3	36.2	22.1	16.1	21.3		4,887
Urban	45.6		42.5	42.3	59.5	42.1	34.4		920
Rural	20.7		26.1	33.6	17.6	11.1	16.5		3,867
IDP Camps	29.8		-	33.0	21.8	13.6	-		901
Household established during:									
2000-2004	35.5		39.3	43.6	32.4	29.5	29.3		796
1995-1999	26.2		30.1	35.1	28.5	14.4	23.0		803
1990-1994	24.9		34.4	47.8	17.4	11.1	13.1		677
1985-1989	20.9		20.9	44.0	17.1	9.1	23.7		681
1980-1984	15.6		22.4	22.5	13.2	7.6	11.7		516
1970s and earlier	18.1		22.8	24.6	19.1	10.6	10.1		1,311
Expenditure quintiles:									
Poorest 20%	21.3		30.2	25.9	26.3	6.7	13.9		957
Q2	20.0		23.1	29.5	25.0	7.3	15.4		956
Q3	17.8		18.4	38.2	11.9	10.1	14.0		957
Q4	25.5		29.9	38.7	18.3	15.1	27.6		956
Richest 20%	33.3		37.7	45.4	31.8	26.1	30.9		956
Districts:									
Adjumani			34.0						220
Arua			24.4						360
Moyo			41.8						220
Nebbi			25.5						300
Yumbe			29.9						197
Gulu				28.2					300
Kitgum				37.6					240
Pader				45.7					300
Apac					15.4				240
Lira					28.3				360
Katakwi						11.1			220
Kumi						8.3			240
Pallisa						9.4			300
Soroti						26.7			320
Kaberamaido						13.2			200
Kotido							18.8		300
Moroto							19.0		300
Nakapiripiriti							13.3		170

Source: Author's calculations based on NUS 2004 and 2008.

Given the fact that the surveys were representative at the district level, we also examine the pattern of attrition by the district from which the households appeared in 2004. Within West Nile, Moyo has the highest rates of attrition—42 percent. This is followed by Adjumani district with 34 percent attrition. These two district lies at the top end of the Ugandan map bordering—Moyo bordering Southern Sudan and Adjumani bordering the Democratic Republic of Congo (DRC), the observed pattern of attrition may be explained by cross-border migration (an issue examined further in the next table). In Acholi sub-region, the highest attrition is registered in Pader district; however, unlike Moyo and Adjumani, Pader district does not share a common border with any of Uganda's neighbours. Nonetheless, in the 2004 survey, all the population in Pader was in IDP camps and this could partly explain the subsequently high attrition rates in 2008. In Teso sub-region, Soroti district registered the highest attrition rate (26 percent) despite hardly having any IDPs; however, Soroti district is relatively urbanised which may partly explain the low success in re-tracing households from this particular district. Finally, Karamoja sub-region presents the most nearly uniform attrition rates across districts. In the next table, we profile the reasons for sample attrition.

Table 2 abridged from the UBoS impact evaluation report shows the reasons why so many households were not re-surveyed. A number of issues emerge from the distribution of the sources of attrition. First, the reasons for attrition appear to be location specific. For example, while the movement to another village is the predominant cause of attrition for the whole sample, it appears to be most important for West Nile (43 percent) and Teso (38 percent) sub-regions. Given that attempts were made by UBoS to track households that moved, the failure to capture this particular set of households despite knowledge of their transition could be attributed to weak community links coupled with the general lack of communication facilities in the region. Second, the reasons for attrition in Acholi sub-region (the region worst affected by war and displacement) highlight the challenges of attempting to resurvey non-permanent households. In particular, 31 percent of the households lost in Acholi were not known by the current residents of the enumeration areas or communities in 2008. Other sub-regions with substantial

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proportion of un-known households include Lango (15 percent)—a sub-region with a previously large IDP population and Karamoja (5 percent)—a sub-region characterised by nomadic pastoralism. Given the constant movements due to threat of insecurity, it is entirely feasible that the 2008 residents are also new to the area. Also worth noting is the fact that in Acholi sub-region, at least 10 percent of the attrition sample had moved to another IDP camp by the time of the re-interview.

Another sub-regional specific issue as a cause of sample attrition is with regards to migration in search of food. This reason is only important in Karamoja where 14 percent of the lost sample is attributed to food scarcity and subsequent migration. Given the pastoralists nature of households in Karamoja, without adequate planning for a panel re-survey (e.g. collecting telephone contacts of either household heads or community chiefs), so many households were likely to be lost for this reason alone. Also worth noting is the fact when a household head is deceased, most households disintegrate without trace. For example, at least 16 percent of households in Karamoja could not be traced due to death of the head and this sub-region is followed closely by Teso at 14 percent.

Table 2: Attrition rates and reasons for attrition, %

| | All | | Sub-region | | | | |
			West Nile	Acholi	Lango	Teso	Karamoja
% attrition rate	25.1		31.3	36.2	22.1	16.1	21.3
Reasons for attrition:							
Moved to another Village	29.7		43.2	18.1	20.0	38.3	30.4
Shifted to unknown location	15.2		8.8	20.8	21.7	10.0	14.3
H/H not known	12.4		1.4	31.2	15.7	0.6	7.5
Deceased	12.4		12.2	8.6	11.3	14.4	16.1
HH/ Disintegrated	7.8		10.8	6.3	8.7	13.3	0.0
Resettled from the camp	6.8		0.0	3.6	16.5	11.7	5.0
Moved to neighbouring country	5.5		21.6	0.0	0.0	1.1	6.8
Not at home for extended period	3.0		0.0	0.5	5.2	7.2	3.1
Moved to another camp	2.9		0.0	10.0	0.0	1.1	0.0
Shifted in search for food	2.8		0.0	0.0	0.0	0.0	14.3
Other*	1.7		2.1	0.9	0.9	2.2	2.4
Column Total	*100.0*		*100.0*	*100.0*	*100.0*	*100.0*	*100.0*
For households re-interviewed:							
% households found in the same location	81.9		97.1	48.1	69.6	88.1	88.2

Source: UBoS (2009)

It was noted earlier that the intervening period between the two waves coincided with the period in which some of the formerly displaced households returned to their former homesteads. In Table 2, it is indicated that most of returning IDPs lost were in Lango (16 percent) and Teso (11 percent) sub-regions. Given the fact Acholi sub-region has the largest population of IDPs; it is conceivable that some of the lost households that were classified as "un known" in Acholi could actually be resettled IDPs. Finally, there is a sizable sample lost due to migration to the neighbouring countries—especially in West Nile and to a limited extent in Karamoja. In West Nile, at least 21 percent of the households lost had moved to the neighbouring countries—notably Southern Sudan and Democratic Republic of Congo (DRC).

Again, the intervening periods between the surveys coincided with significant changes in the geo-political structure of countries bordering Northern Uganda. Apart from IDPs returning due to the cessation of hostilities between the LRA and the Uganda army noted earlier, the period is also characterised by the signing of the peace deal in South Sudan. This cessation of hostilities in Southern Sudan opened up new trade opportunities for Ugandans (Government of Uganda 2008) and it is conceivable that the populations nearest to the neighbours were the first to move in order to take advantage of such opportunities.

Finally, the 2008 survey made a decent attempt to track households that moved—in cases where the new destination could be established and within the national borders. The lower part of Table 2 shows that at least 18 percent of the resurveyed households had changed location since the 2004 survey. The largest proportion of traced households was in Acholi where more than 50 percent of the resurveyed sample was not at the original location. Without such efforts to track moved households, the attrition rate in Acholi sub-region would have been catastrophically high. It was noted earlier that some previous surveys have been successful in tracing households that moved across borders (Baird *et al*, 2008).

However, apart from the cost of such an exercise, circumventing the legal and regulatory framework of more than one country is challenging. Furthermore, unlike Eastern Uganda (where the re-tracing of the Kenya migrants was undertaken), South

Sudan and Eastern DRC are still characterised by an environment of insecurity and this could ultimately affect the whole interview process.

4.2 Tests for difference in means of key household characteristics

Next, differences in means of key household characteristics in 2004—for re-surveyed households and those lost are examined. Table 3 shows the results for the significance tests and it is indicated that households lost in the resurvey were relatively the well-to-do. For example, the headcount poverty index for the re-interviewed households was 64 percent compared to 51 percent for the lost households. Apart from direct welfare outcomes, the households lost were also significantly more likely to suffer insecurity shocks as measured by experience of rebel activity.

The attrition households are also significantly more likely to be female headed, have younger household heads and generally the household head have a higher education attainment. Although, the two sub-samples also significantly differ by the marital status of the household head (with the exception of widowhood), the differences are nonetheless much smaller compared to actual welfare outcomes. In terms of ownership of key household assets, re-surveyed households only have significantly higher values of livestock holdings while the differences in the mean values for agricultural equipment and land are not significantly different from zero.

Most households lost to resurveying are located in communities that can be considered relatively remote. For example, attriting households are, on average, far away from agricultural markets and feeder roads compared to re-surveyed households. On the other hand, attriting households are resident in communities with better access to public goods (e.g. safe water and electricity) as well as access to relief institutions and major sources of employment. It is also evident that between 2004 and 2008, households with smaller number of children as well as adults were least likely to be re-interviewed.

By contrast, we find no significant difference in means based on the number of years since the household last migrated. On average, both re-interviewed and lost

households who had ever migrated have spent about 6 years in the current location in 2004. Similarly, there are no significant differences in access to public water sources—notably use of bore holes and protect springs (together these two sources account about 70 percent of the household water sources). Finally, there are no significant differences based on household use of uncovered pit latrines as toilets and community access to health facilities for the two samples.

Table 3: Means in NUS 2004 for households re-interviewed and not re-interviewed

Characteristic	Re-interviewed		Not re-interviewed			T-test for differences in means
	Mean	sd	Mean	sd		
Welfare status :						
Consumption per adult equivalent	23,669	38,744	31,214	44,763		[-5.62]***
Poor in 2004	0.64	0.48	0.51	0.5		[8.14]***
HH most severe shock rebels	0.43	0.5	0.51	0.5		[-4.71]***
Background household variables						
Household head characteristics:						
Female headed	0.295	0.456	0.356	0.479		[-3.96]**
Migrating (Yrs since the last move)	6.7	12	6.3	10.1		[1.05]
Age in yrs	42.7	14.7	38.5	14.7		[8.60]**
Highest education attainment, yrs	4.5	4.1	5.2	4.7		[-5.00]***
Marital status:						
Married, monogamously	0.52	0.5	0.48	0.5		[2.72]**
Married, polygamous	0.26	0.44	0.2	0.4		[4.20]**
Divorced or separated	0.04	0.21	0.08	0.27		[-4.74]**
Widowed	0.15	0.35	0.16	0.36		[-0.87]
Demographic composition:						
<= 5 years	1.24	1.12	1.03	1.04		[5.73]**
6 - 12 years	2.08	0.02	1.96	0.04		[2.87]**
13 - 17 years	0.71	0.16	0.52	0.02		[6.18]**
>=18 years - Females	1.23	0.68	1.04	0.63		[8.94]**
>=18 Years - Males	1.02	0.82	0.86	0.73		[6.19]**
Value of assets(Shs):						
Livestock	86,332	154,324	51,555	147,391		[6.86]***
Agricultural equipment	82,845	555,462	71,227	389,079		[0.67]
Log. of Land	298,521	3,553,343	247,737	1,008,219		[0.49]
Household water source:						
Tap water	0.04	0.19	0.1	0.08		[-8.28]**
Borehole	0.57	0.49	0.57	0.49		[0.06]
Protected wells/springs	0.13	0.33	0.11	0.32		[0.94]
Open water source	0.24	0.42	0.19	0.39		[3.54]*
Other water sources	0.02	0.13	0.01	0.12		[0.54]
Household access to toilet:						
Private covered pit latrine	0.17	0.37	0.1	0.3		[5.63]**
Pit latrine	0.34	0.47	0.52	0.49		[-11.36]**
VIP latrine	0.02	0.13	0.03	0.17		[-2.78]**
Uncovered pit latrine	0.11	0.31	0.09	0.29		[1.65]
Flush toilet	0.01	0.08	0.02	0.14		[-3.69]**
Bush	0.35	0.47	0.23	0.42		[8.02]***
Community characteristics						
Distance in kms to:						
Agricultural product market	7.8	14.8	9.1	21.2		[-2.32]*
Feeder roads	2.7	11.4	3.6	14.3		[-2.19]*
Health centre	6	14.7	5.6	15.5		[0.69]
Proportion with access to in 2004:						
Safe drinking water w/in 1 km	0.71	0.45	0.8	0.4		[-6.23]***
Electricity w/in 5 km	0.22	0.42	0.3	0.46		[-5.81]***
Major employer w/in 10 km	0.23	0.42	0.33	0.47		[-7.10]***
Presence of WFP or NGO w/in 5 km	0.18	0.39	0.29	0.45		[-7.55]**

Notes: *indicates significant at the 10%, ** significance at 5% and *** significance at 1%
Source: Author's calculations based on NUS 2004

Overall, based on the tests for differences in means, the attrition and re-surveyed samples are significantly different on most indicators. In particular, a substantial proportion of well-to-do households were lost in re-survey. However, the significance of the tests of the difference in means does not imply automatic bias unless the regression coefficients differ between the two samples in any multivariate analysis—an issue of discussion in the next sub-section.

4.3   Regression analysis: determinants and impacts of attrition

The results for determinants of attrition are presented in Table 4. First, only one outcome variable is included and subsequently, both outcome variables and other household and community characteristics are included. When household income is considered as the only explanatory variable (Model I), significant differences between the re-interviewed and sample lost to follow up are observed. In particular, attriting households on average have significantly higher levels of household consumption expenditure. This also holds even after including the second outcome variable (Model II). However, controlling for other household and community characteristics, household consumption expenditure becomes insignificant although experience of rebels remains significant but with reduced magnitudes (Model III). In addition, separate analysis for West Nile and Acholi sub-regions were estimated since these two sub-regions had the highest rates of attrition.

Based on the characteristics of the household head, it is evident that gender and education attainment of the household head do not have significant effects on attrition for the whole sample. However, in Acholi sub-region, increased education attainment of the head is significantly associated with attrition. Similarly, marital dissolution either through divorce, separation or widowhood has no significant effects on loss due to follow-up. By extension, most indicators of household access to public goods (notably water and toilet facilities) are insignificant. On the other hand, migration and age of the household head have a significant effect. In particular, households with younger heads were more likely to be lost and the again the coefficient is greatest for Acholi sub-region. Related, larger households were

significantly more likely to be lost to follow up—especially households that had more teenage children and adult women. Of the two sub-regions of interest, the effect of teenage children is only significant in West Nile. The effect on adult men is only weakly significant at the 10 percent level. With regard to asset holdings, households with livestock are more likely to be lost during follow up and again the effect is only significant in Acholi sub-region. On the other hand, the value of household land has no significant effect. Given the fact that in 2004, a large proportion of the Northern Ugandan population were faced with insecurity, the value of land in such situation is more likely than not to be negligible.

Most of the community indicators do not significantly explain the pattern of attrition between 2004 and 2008. It is only community access to safe water in 2004 that significantly affects attrition with more households lost in communities with safe water. The effect of community access to electricity is only weakly significant. The other community indicators such as access to agricultural markets and proximity to WFP or NGO are all insignificant. In terms of location variables, after controlling for household residence in urban areas, it is only residence in West Nile and Acholi sub-regions that significant affects attrition. In particular, compared to Lango, households in West Nile and Acholi were more likely to be lost in the follow-up survey. On the other hand, a household's residence in an IDP camp does not significantly affect attrition after controlling for sub-region location.

It is possible that in the model, the indicator for Acholi sub-region is picking up all the effects of IDP status given the fact that the sub-region accounted for 85 percent of the IDP population in 2004 survey. For the separate sub-region regressions, we find that it was mainly households in Arua that were lost from West Nile while in Acholi, residence in Pader district is significantly associated with panel attrition.

Table 4: Probit regressions for whether the household was lost in the NUS 2008 panel, by sub-regions

	All Sub-regions				West Nile sub-region				Acholi sub-region		
	[I]	[II]	[III]		[I]	[II]	[III]		[I]	[II]	[III]
Log of per adult household expenditure	0.211	0.23	0.094		0.14	0.127	-0.014		0.262	0.257	0.166
	[5.67]**	[5.90]**	[1.82]		[2.02]*	[1.69]	[0.14]		[2.41]*	[2.34]*	[1.25]
Household most severe shock was rebel attacks		0.267	0.194			0.211	0.111			0.019	0.045
		[5.11]**	[3.05]**			[1.83]	[0.86]			[0.10]	[0.23]
Gender of household head is female			-0.002				-0.021				-0.402
			[0.02]				[0.12]				[1.51]
Log of years since the last move			0.087				0.082				0.133
			[3.78]**				[2.07]*				[1.49]
Log of age of the household head, years			-0.319				-0.237				-0.846
			[3.20]**				[1.28]				[3.39]**
Highest education of the household head, years			0.002				0.015				-0.06
			[0.21]				[1.01]				[2.49]*
Household head marital status (cf: unmarried):											
Married monogamously			-0.346				-0.121				-0.132
			[2.24]*				[0.37]				[0.27]
Married, polygamously			-0.473				-0.285				-0.416
			[2.92]**				[0.84]				[0.85]
Divorced or separated			0.041				0.336				0.084
			[0.22]				[0.93]				[0.15]
Widowed			-0.226				-0.019				0.554
			[1.30]				[0.05]				[1.12]
Household composition by age group (in numbers)											
Children <=5 years			-0.014				-0.042				0.007
			[0.47]				[0.75]				[0.09]
Children aged 6-12 years			0.001				0.005				0.009
			[0.02]				[0.11]				[0.17]
Children aged 13-17 years			-0.113				-0.218				-0.08
			[3.26]**				[3.61]**				[0.93]
Female adults			-0.176				-0.094				-0.236
			[3.06]**				[1.11]				[1.47]
Male adults			-0.061				-0.054				-0.32

	All Sub-regions				West Nile sub-region				Acholi sub-region		
	[I]	[II]	[III]		[I]	[II]	[III]		[I]	[II]	[III]
			[1.18]				[0.68]				[2.21]*
Log of value of household assets, Ushs:											
Livestock			-0.018				-0.001				-0.044
			[2.56]*				[0.07]				[2.69]**
Agriculture equipment			-0.019				-0.013				0.026
			[1.73]				[0.63]				[1.05]
Land			-0.006				-0.012				-0.019
			[0.95]				[0.91]				[1.23]
Household access to drinking water (cf:)											
Tap water			0.238				0.371				-0.402
			[1.68]				[0.80]				[1.18]
Bore hole			0.028				-0.164				-0.517
			[0.40]				[1.23]				[2.34]*
Protected Well/Spring			-0.127				-0.087				-0.984
			[1.33]				[0.58]				[3.29]**
Other water sources			-0.033				-1.349				-1.396
			[0.13]				[2.90]**				[2.02]*
Household toilet facilities (cf.)											
Private covered pit latrine			-0.179				-0.093				0.56
			[1.72]				[0.51]				[1.48]
Shared covered pit latrine			0.153				0.063				0.67
			[1.91]				[0.42]				[2.29]*
Covered VIP latrine			0.236				0.78				0.821
			[1.14]				[1.58]				[1.19]
Uncovered pit latrine			0.081				-0.044				-0.421
			[0.74]				[0.27]				[0.79]
Flush toilet			0.574				-0.594				-0.234
			[1.75]				[1.36]				[1.10]
Log of distance to agriculture product market, kms			0.036				-0.031				-0.088
			[1.31]				[0.44]				[1.42]
Log of distance to feeder road, kms			0.029				-0.007				0.08
			[0.95]				[0.08]				[1.23]
Log of distance to health centre, kms			0.008				0.036				0.189

	All Sub-regions				West Nile sub-region				Acholi sub-region		
	[I]	[II]	[III]		[I]	[II]	[III]		[I]	[II]	[III]
			[0.26]				[0.50]				[0.89]
Safe water within 1 km, 2004			0.086				-0.056				0.43
			[1.30]				[0.45]				[1.54]
Electricity within 5 km, 2004			0.192				-0.09				0.119
			[2.37]*				[0.49]				[0.47]
Major employer within 10 km, 2004			0.1				0.111				-0.076
			[1.22]				[0.67]				[0.40]
Presence of WFP or NGO within 5 km, 2004			-0.044				-0.01				-0.655
			[0.55]				[0.06]				[1.79]
Sub-region dummies (cf: Lira)											
West Nile			0.304								
			[3.11]**								
Acholi			0.255								
			[2.07]*								
Teso			-0.256								
			[2.67]**								
Karamoja			-0.034								
			[0.28]								
Does the household reside in an IDP camp?			-0.07								
			[0.58]								
Urban			0.273				0.296				-0.128
			[2.84]**				[1.83]				[0.38]
District dummy (cf:)											
Arua							-0.398				
							[2.32]*				
Moyo							0.248				
							[1.38]				
Nebbi							-0.314				
							[1.71]				
Yumbe							-0.144				
							[0.79]				
Kitgum											0.204
											[1.11]

		All Sub-regions				West Nile sub-region				Acholi sub-region		
	[I]	**[II]**	**[III]**		**[I]**	**[II]**	**[III]**		**[I]**	**[II]**	**[III]**
Pader											2.167
											[2.30]*
Constant	-2.803	-3.115	-0.022		-1.965	-1.885	1.191		-2.954	-2.914	2.086
	[7.62]**	[8.06]**	[0.04]		[2.89]**	[2.56]*	[0.97]		[2.77]**	[2.69]**	[1.30]
Observations	4,782	4,506	4,414		1,296	1,183	1,183		777	765	675

Absolute value of z statistics in brackets * significant at 5%; ** significant at 1%

In summary, the comparison of the means presented in Table 3 showed significant differences in the means of variables for the re-surveyed and attriting sample and this has also been confirmed to some extent in the multivariate analysis. After controlling for other variables, a number of household characteristics remain significant contributors to attrition. The results in Table 4 indicate there is selective attrition with regard to location variables. However, the results for the most important indicator of household welfare status are weakly significant.

As earlier mentioned, we undertake BGLW test in which the outcome variable (household income and experience of rebel attacks) is regressed on standard household controls from the 2004 survey—for the full sample and re-interviewed sample. The objective is to examine whether the coefficients from the two samples are significantly different. In particular, the paper tests for (1) the joint effect of attrition on all coefficient estimates including the constant and (2) joint effect of attrition on all coefficient estimates but not the constant. Two types of estimation are done—OLS regressions for determinants of household consumption expenditure per adult equivalent and probit regressions for determinants of experience of rebel attacks. The right side variables are standard controls for: gender and education attainment of the household head, marital status, migration history, household demographic composition, household assets, access to public goods and location variables. The results are presented in Table 5 and at the bottom of each column is the F or chi-square tests for the above tests. The F tests for determinants of household welfare status and the probit regressions for experience of rebel attacks in 2004 are statistically significant with a p-value of $p < 0.0000$. This suggests that the coefficient estimates are significantly affected by attrition. This confirms the earlier tests for differences in means indicated in Table 3 and determinants of attrition presented in Table 4. Consequently, the use of the panel sample in a multivariate analysis may result in panel attrition bias.

Table 5: Testing the impact of attrition between the two waves on coefficient estimates

Variable	Consumption per adult equivalent (OLS regression)			Household most severe shock is rebels (Probit regression)	
	Full sample 2004	Panel 2008		Full sample 2004	Panel 2008
Household head characteristics:					
Female head	0.092	0.107		-0.105	-0.006
	[2.32]*	[2.11]*		[1.10]	[0.05]
Log of years since the last move	0.013	0.012		0.062	0.048
	[1.42]	[1.02]		[2.87]**	[1.87]
Log of age, years	-0.019	-0.014		0.132	0.18
	[0.48]	[0.30]		[1.34]	[1.53]
Highest education attained, years	0.046	0.043		-0.007	0
	[13.95]**	[10.57]**		[0.94]	[0.04]
Marital status: (ref: unmarried)					
Married, monogamously	-0.055	-0.135		-0.078	-0.262
	[0.81]	[1.01]		[0.38]	[1.16]
Married, polygamous	0.04	-0.063		-0.2	-0.394
	[0.56]	[0.46]		[0.94]	[1.72]
Divorced or separated	0.123	-0.005		-0.272	-0.497
	[1.50]	[0.04]		[1.13]	[1.83]
Widowed	-0.008	-0.139		-0.32	-0.579
	[0.11]	[0.99]		[1.40]	[2.37]*
Demographic composition: (ref: 6-11 years)					
<= 5 yrs	-0.122	-0.117		0.032	0.017
	[11.49]**	[8.15]**		[1.27]	[0.56]
12 – 17 years	-0.133	-0.134		0.009	0.023
	[10.37]**	[8.78]**		[0.31]	[0.66]
Female >=18 yrs	-0.054	-0.006		0.013	-0.016
	[2.73]**	[0.28]		[0.29]	[0.26]
Males >=18 yrs	-0.041	-0.025		-0.023	-0.021
	[2.07]*	[0.97]		[0.50]	[0.39]
Value of assets (Shs):					
Log of livestock	0.003	0		-0.005	0
	[0.98]	[0.11]		[0.77]	[0.03]
Log of agriculture equipment	0.02	0.028		0.022	0.037
	[4.66]**	[4.84]**		[2.02]*	[2.62]**
Log of value land	0.005	0.008		-0.018	-0.03
	[2.10]*	[2.38]*		[2.97]**	[4.40]**
Community water sources: (cf: Open source)					
Tap water	0.102	0.141		-0.041	-0.113
	[1.62]	[1.45]		[0.28]	[0.64]
Bore hole	0.04	0.06		-0.145	-0.156
	[1.51]	[1.94]		[2.23]*	[2.06]*
Protected Well/Spring	-0.049	-0.053		-0.137	-0.171
	[1.46]	[1.29]		[1.51]	[1.65]
Other water sources	0.031	-0.077		-0.767	-0.652
	[0.40]	[1.03]		[3.79]**	[2.96]**
Toilet type: (cf: Bush)					
Private covered pit latrine	0.207	0.167		-0.55	-0.605
	[5.72]**	[3.77]**		[6.12]**	[5.89]**
Shared covered pit latrine	0.114	0.096		-0.055	-0.134

Variable	Consumption per adult equivalent (OLS regression)			Household most severe shock is rebels (Probit regression)	
	Full sample 2004	Panel 2008		Full sample 2004	Panel 2008
	[3.89]**	[2.69]**		[0.73]	[1.47]
Covered VIP latrine	0.254	0.28		0.289	0.463
	[2.50]*	[1.73]		[1.45]	[1.81]
Uncovered pit latrine	0.044	0.026		-0.341	-0.398
	[1.15]	[0.61]		[3.65]**	[3.35]**
Flush toilet	0.45	0.557		-0.387	0.073
	[2.67]**	[2.09]*		[1.40]	[0.22]
Community distances to: (km)					
Log. Distance to agriculture product market	-0.005	-0.004		0.012	0.036
	[0.46]	[0.33]		[0.38]	[0.97]
Log of distance to feeder road, kms	-0.013	-0.02		-0.039	-0.06
	[1.19]	[1.40]		[1.21]	[1.50]
Log of distance to health centre, kms	-0.036	-0.025		-0.026	0.019
	[3.24]**	[2.00]*		[0.75]	[0.50]
Community characteristics in 2004:					
Safe drinking water w/in 1 km dummy	0.056	0.06		0.184	0.217
	[2.30]*	[2.07]*		[2.99]**	[3.03]**
Electricity w/in 5 km dummy	0.033	0.05		-0.528	-0.546
	[1.09]	[1.17]		[7.63]**	[6.48]**
Major employer w/in 10 km dummy	0.058	0.04		0.042	-0.04
	[1.79]	[0.97]		[0.55]	[0.45]
Presence of WFP or NGO w/in 5 km dummy	0.062	0.081		0.303	0.36
	[1.86]	[2.13]*		[3.54]**	[3.71]**
Sub-region dummies: (cf. Teso)					
West Nile	-0.014	-0.031		-1.129	-0.898
	[0.41]	[0.70]		[13.19]**	[8.53]**
Acholi	-0.067	-0.002		0.158	0.319
	[1.33]	[0.03]		[1.30]	[2.19]*
Teso	0.131	0.08		-0.406	-0.322
	[3.81]**	[1.84]		[5.08]**	[3.55]**
Karamoja	-0.124	-0.174		-0.31	-0.233
	[2.68]**	[3.27]**		[2.86]**	[1.92]
Resident in IDP camp dummy	-0.024	-0.127		0.989	1.068
	[0.49]	[1.79]		[8.22]**	[7.69]**
Urban dummy	0.308	0.386		0.362	0.301
	[7.36]**	[5.38]**		[3.55]**	[2.34]*
Constant	9.558	9.496		-0.175	-0.393
	[60.85]**	[45.60]**		[0.41]	[0.84]
Observations	*4,690*	*3,524*		*4,414*	*3,345*
R-squared	0.27	0.29			
F Tests for attrition [probability > F]					
1. Joint effect of attrition on constant and all estimates		31.08			8.09
prob>chi2		[0.000]			[0.000]
2. Joint effect of attrition on all coefficients estimates but not on constant		36.78			8.4
prob>chi2		[0.000]			[0.000]

Notes: **indicates significance at 1% level and * significance at 5% level
Values of t-tests for regression and z-tests for probits are in parentheses beneath point estimates

5.   CONCLUSIONS

Using the NUS 2004 and 2008 panel survey, which registered an unusually high level of household attrition, this paper examines causes and impacts of sample attrition. We find that households in urban areas, in the West Nile and Acholi sub-regions were most likely to be lost during follow-up. Within these sub-regions, households with younger heads are more likely to be lost in Acholi while households with teenage children are more likely to be lost in West Nile. Furthermore, the standard household characteristics differ between the re-surveyed households and those lost—resurveyed households had mature household heads, were more engaged in agricultural activities and had lower levels of experience of rebel based attacks. As such, the pattern of attrition is not random and this has implications for the comparison of, for example, poverty indicators in the two surveys.

The loss of about one quarter of the original sample should be analysed in context. The survey was trying to follow some households affected by war and a number of changes happened in the region during 2004 and 2008 which had profound consequences for households affected by conflict. We have shown that the intervening period was characterised by the relative cessation of armed hostilities and this affected many former IDPs. Also, changes in geo-political environment of the countries bordering Northern Uganda ushered in previously unavailable economic opportunities. As such, re-tracing households in areas affected by conflict will ultimately turn out to be an odious task even if the panel survey was planned before the baseline.

Consequently, a panel survey may not be the best tool for evaluation in a conflict situation. The high level of attrition also highlights the importance of planning for a panel survey before undertaking a baseline survey. In particular, apart from the GPS coordinates, it is important to collect a number of telephone contacts for household members. Furthermore, if possible, such contact information should be collected for all household members, in order to minimise losing of households from any re-interview exercise if the demise of the household head occurs during the intervening period. All the above processes point to the fact that significant resources are required, even at the planning stage of the baseline survey, if a successful re-survey is to be achieved.

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