PRELIMINARY DRAFT: DO NOT CITE

Orphanhood and the long-run impact on children [1]

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1. Introduction

Childhood orphanhood is considered a major risk factor for poverty in adulthood, through, among other channels, shortfalls in human capital investments in children. In sub-Saharan Africa, the prevalence of orphanhood among children has been greatly exacerbated by the HIV/AIDS pandemic. While there are other, more prevalent diseases in Africa, the characteristics of HIV/AIDS suggest that its economic and demographic impact will be profound. Because HIV in Africa is transmitted primarily through heterosexual contact, the epidemic is having a major effect on the mortality of men and women in their prime childbearing and earning years; consequently, mortality rates have risen and life expectancies have fallen dramatically in Africa. As a consequence, orphanhood rates are increasing and putting a larger share of children at risk.

The available evidence of the impact of this trend typically relates to the impact of orphanhood from HIV/AIDS and other causes in the short-run, often by examining a sample of school-age children in cross-sectional survey data. A small number of studies use longitudinal data over a short-run (perhaps 1-2 years), periods in which household coping strategies may manage to mitigate impact. Studies of long-run impacts and outcomes are rare. Certainly, understanding short-run outcomes is important, but short-

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run effects may not in fact translate into worse welfare outcomes in the long-run (that is, in adulthood). If the shock of an adult death (either a parent or other household member) is transitory, outcomes may be affected around the time of illness or during a period of funeral/mourning, but may recover over time. On the other hand, the lack of any short-run effects is not evidence that long-run impacts do not exist. Understanding these long-run impacts is critical for intergenerational models of the macroeconomic impact of AIDS which take into account the impact on human capital formation and its transmission between generations. Both Bell *et al.* (2003) and Corrigan *et al.* (2004) make assumptions about the magnitude of the impact of orphanhood without reference to any empirical studies of this link.

Studies of the consequences of orphanhood usually focus on measuring the impact on education. The findings of the impact of orphanhood on schooling are mixed.[2] To the extent that orphans are found in relatively better off households that also have higher demand for schooling, simple cross-sectional comparisons of enrollment rates between orphans and non-orphans may underestimate the true impact (for example, see Ainsworth and Semali, 1998, and Hargreaves and Glynn, 2002). On the other hand, in some settings, an orphan's household may be poorer prior to death, thus over-estimating the impact of orphanhood.

Several studies use large cross-sectional household survey data with controls for concurrent household characteristics to identify the impact of orphanhood. Ainsworth and Filmer (2002) find considerable diversity in the orphan/non-orphan differential across countries and conclude that generalizations about whether orphans are disadvantaged are not possible.[3] Case *et al*. (2004) use similar data but find that orphans are disadvantaged relative to other children *within* the same household. Although, if orphans are strategically placed in better-off households within the extended family, then the orphans in a household fixed-effects framework are compared to a non-random sample of non-orphan co-

[2] Even estimates of the *number* of orphans is debated, with some research showing that the most cited statistics from the UN may be seriously over-estimating the number of orphans (Bennell, 2005).

[3] Also using Demographic and Health Survey data, Bicego *et al.* (2003) combine household data across countries for West Africa and East Africa whereas Ainsworth and Filmer do not merge data sets across countries. In West Africa, they find evidence of a significant impact of among paternal orphans (6-14 years) and two-parent orphans (6-10 years). For East Africa, the findings are significant among maternal and two-parent orphans ages 11-14 years.

residents. It would be difficult then to interpret this result as evidence that orphanhood reduces schooling rather than the proposition that orphans are placed with better-off relatives.

Chatterji *et al*. (2005) examines outcomes for orphans and non-orphans, including school attendance and health indicators in Rwanda and Zambia. Their sample of children is divided into three categories: orphans (single or double), children with chronically ill caregivers and other children. The study finds that of the children 6-12 years old at the time of the survey orphans have a higher probability of being in school than other children, although the difference is not statistically significant. In the age category 13-19 years old, orphans are less likely to be in school, but the difference is small in size and statistically insignificant. The authors are careful not to overinterpret these results, but it is useful to restate some of the difficulties of this analysis. In addition to concerns of omitted variables and endogeneity in a bivariate analysis based on a cross section, one should be prudent in the interpretation of these results for other reasons. There could potentially be spurious positive correlation between orphan rates and school enrolment, as both are strongly positively correlated with age. Consider that late primary school enrolment is common in Africa and orphan rates typically rise quite dramatically with age. One can then easily see that the lower age categories in the sample are likely to have a lower probability of being orphan and are less likely to be found in school, thus causing a spurious positive correlation between orphan status and schooling.

Evidence of other outcomes for orphans beyond schooling is much more scant but here, too, the evidence is mixed. Crampin *et al.* (2003) examine a cross-section of data from Malawi on child health linked with information on the HIV/AIDS status of parents measured 10 years prior.[4] They conclude that surviving children are not discriminated against as a result of parents having been ill or having died from HIV/AIDS. Lindblade *et al.* (2003) find that the health status of surviving orphans younger than 6 years is similar to their non-orphan counterparts in western Kenya.

[4] Of the 2,250 offspring identified from the 593 individuals for whom they have HIV/AIDS status at baseline, they were able to trace 1,141. Of these, 761 were alive and interviewed, 167 were alive but left the district and not traced, and 213 were deceased. It unclear what the implications of this sample selection are on the measured impacts.

Chatterji *et al.* (2005), noted above, also evaluate other human development indicators beyond schooling, including: number of meals the child had the day prior to the interview, immunization status, self-reported health status, and occurrence of illness. Depending on the country and the indicator the authors find some significant differences between orphans, children with chronically ill caregivers and other children. For example, in Zambia a lower proportion of orphans and children living with chronically ill caregivers were found to report having had three meals in the day prior to the interview, as well as having an immunization card. In both countries, significantly lower proportions of orphans and children with chronically ill caregivers were reported by their caregivers as having good or very good health status.

The studies cited above use cross-sectional datasets which can only examine correlates of outcomes after a parental death, without controls for initial conditions before orphanhood, prior to the death of the parent(s). Depending on assumptions about the mortality patterns of adults, there could be omitted variables which bias results. In their study of children in Kenya, Evans and Miguel (2005) find that the direction of this bias is positive, meaning unobservable characteristics of orphans lead to underestimates of impact. Moreover, these studies only identify who is an orphan and not how recently a parent died or the status of the child prior to being orphaned, it is difficult to know whether the measured differentials are transitory (in which case the child may recover), permanent, or worsening as the orphan ages. This underscores the advantages of panel (longitudinal) data that follow children over time.

Using a 2-3 year panel survey from Tanzania (the baseline for this study, described in Section 2 below), Ainsworth *et al.* (2005) find that adult deaths are associated with delayed enrollment among younger children (7-10 years). Among orphans, younger maternal orphans are held back whereas other orphans are not found to be disadvantaged. Case and Ardington (2004) study schooling outcomes using a 2-3 year panel survey from South Africa. They find evidence of a causal effect of mother's deaths on children's education outcomes, whereas the father's death is not associated with less education. Rather, father's deaths are found to be indicative of the socio-economic conditions of the household prior to the

death, and not causal. Their test for causality is questioned in a latter section of this paper using a much longer panel.

Ainsworth and Semali (2000) use the KHDS 1991/94 data to present random and fixed effects model estimates of adult death on children's height-for-age and weight-for-height. While random effects results show lower height for all maternal orphans and reduced height paternal orphans in poor households, the fixed effects results are not significant possibly due to the small number of children who have any change in their orphan status in between the survey rounds (up to about 21 months from first to last interview). They find no association between orphanhood nor recent adult death in the households and weight-for-height. Overall the authors conclude that policy interventions should target poor households in general, among which the households hardest hit by adult mortality are likely to be found. They identify population-wide policy interventions, like universal availability of ORS at health facilities, measles vaccination and improved physical access to medical care as being most appropriate.

Using unique panel data from Kenya, Evans and Miguel (2005) study a large sample of non-orphans enrolled in grades 1-7 in 1998, and then followed through to 2002. They evaluate the impact of orphanhood transitions on schooling participation (measured as the fraction of visits in the school year in which the child was in school on the day of an unannounced check). Maternal deaths lead to lower participation after the death but also in the 1-2 years before the death. Paternal orphans did not have lower school participation. It is unclear how the measure of school participation translates into completed school years but presumably it implies lower overall attainment.

In this study, we will explore new data collected from Tanzania, which contain a sample of children surveyed in the early 1990s and then re-interviewed in 2004. Using unique features of the data, we try to assess the impact of orphanhood on schooling and health outcomes, with an emphasis on unpacking the dynamics of this process. The age at which children are orphaned and the status of the child when orphaned (with respect to starting school and health status) will be two key areas of focus. This work is part of a larger agenda to understand the impact of orphanhood which encompasses a range of welfare outcomes. Schooling and health are recognized as only two areas among many long-term

welfare outcomes. Other relationships between orphans and long-run outcomes that will be explored using the longitudinal data include: access to networks to gain access to income (employment), inheritance of land, the role of assistance organizations, and the role of remittances from the extended family. In addition, we plan to explore the fertility and marriage patterns of orphans and the nutritional status of the young offspring of our sample of orphans who have reached adulthood.

2. Data

The Kagera Region of Tanzania is located on the western shore of Lake Victoria, bordering Uganda to the north and Rwanda and Burundi to the west. The population (1.3 million in 1988, about 2 million in 2004) is overwhelmingly rural and primarily engaged in producing bananas and coffee in the north and rain-fed annual crops (maize, sorghum, cotton) in the south. This study uses baseline data from the Kagera Health and Development Survey (KHDS), a longitudinal socioeconomic survey conducted from September 1991 to January 1994 covering the entire Kagera region in northwest Tanzania (for details, see World Bank, 2004 and http://www.worldbank.org/lsms/). Because adult mortality of the working age population (15-50) is a relatively rare event and HIV/AIDS was unevenly distributed in Kagera, the KHDS household sample was stratified based on the agro-climatic features of the region, levels of adult mortality from the 1988 Census (including both high and low mortality areas), and household-level indicators thought to be predictive of elevated adult illness or mortality, in order to capture a higher percentage of households with a death while retaining a control group of households without a death. As a result of the sampling scheme, orphan rates in the KHDS 1991-1994 are more than twice as high as would be observed in a non-stratified random sample (Ainsworth *et al.*, 2005).

In 2004, another round of data collection was completed. The KHDS 2004 was supported by funds from DANIDA and the Knowledge for Change Trust Fund at the World Bank. The goal of the KHDS 2004 was to re-interview the sample of about 6,200 respondents from the 1991-1994 survey (which exluces 169 individuals who died over the course of the baseline rounds). In addition to the household survey, the KHDS 2004 included additional community-level surveys as done in the 1991-

1994 rounds. A community questionnaire was administered to collect data on the physical, economic and social infrastructure of the baseline communities. The primary school questionnaire records information on the infrastructure of the primary schools in the community, composition of the student body, and assistance to schools. Finally, up to three price observations are collected in each community from local markets/stalls on a list of commonly purchased food and non-food items. While the questionnaires for the KHDS 2004 were revised to take into account the 10-year retrospective, where possible, comparability is maintained with the baseline KHDS survey instruments. Revisions to the questionnaires were made in order to reflect changes in the region since 1994 (such as, perhaps new community organizations or recent health campaigns). Moreover, the revised questionnaire was redesigned in an effort to capture key transitions that have occurred since the previous interview. These revisions included expanded questions on the circumstances of deaths. For individuals who no longer reside together, there is information on the remittances, loans, bride price payments, social communication and labor transfers between previous members. For all panel respondents, there is a module on the incidence of economic shocks (both positive and negative) in the last 10 years. For respondents who re-located since their interview in 1991-1994, there is information on migration. Lastly, a special module on informal insurance groups was included.

Over the course of 10-13 years, we anticipated that a significant number of individuals would have migrated from the dwelling occupied in 1991-1994. A considerable effort was made to track surviving respondents to their current location, be it in the same village, a nearby village, within the region, or even outside the region. The success of panel surveys is often measured in terms of re-contact of households, rather than individuals therein. By this measure, excluding households in which all previous members are deceased (17 households with 31 people), the KHDS 2004 survey re-contacted 93% of the baseline households (835 out of 895 households). This is an excellent rate of re-contact compared to panel surveys in low-income countries *and* high-income countries. The KHDS panel has an attrition rate that is much lower than that of other well-known panel survey summarized in Alderman *et al*. (2001) in which the rates ranged from 17.5% attrition *per year* to the lowest rate of 1.5%. Most of

these surveys in Alderman *et al* (2001) covered considerably shorter time periods (two to five years). Refusals in the KHDS were quite uncommon; the dominant reason for not tracing an individual was failure to locate that person.

Figure 1 shows preliminary statistics on the relocation of the 1991-1994 households. Because people have moved out of their original household, the new sample in KHDS 2004 consists of over 2,700 households from the baseline 832 which were recontacted. Much of the success in recontacting respondents was due to the effort to track people who had moved out of the baseline villages. One-half of all households interviewed were tracking cases, meaning they did not reside in the baseline communities. Of those households tracked, only 38% were located nearby the baseline community. Overall, 31% of all households were not located near the baseline communities. While tracking is costly, it is an important exercise because migration and dissolution of households are often hypothesized to be important responses to hardship, and this may be most relevant for seriously affected individuals like orphans. Excluding these households in the sample raises obvious concerns regarding the selectivity of attrition. In particular out-migration from the village (for example, due to dissolution of households or marriage), may be responses to adult mortality. The importance of following household members who move out of the original dwelling, especially when economic mobility is of interest, is shown to substantially bias results (See the analysis of other panel data surveys in Beegle, 2000, and Rosenzweig, 2003). At the same time it will provide a unique opportunity to study these coping mechanisms: who uses them, what is the effect, do they get people out of poverty or do they constitute a poverty trap themselves.

The main sample of the work in this paper will be children interviewed at least once in the baseline survey. This sample will have aged 10-13 years, depending on the date of their baseline interview, and will be 11-28 by 2004. Table 1 shows the rate of re-interview of children ages 0-15 at baseline (See Appendix 1 for the re-interview rates for entire sample). Among the surviving children, over 80 percent were located and re-interviewed. Of those, 42 percent were residing outside of the baseline community. Thus, without making an effort to track individuals who left the village, the re-contact rate would have fallen to 47 percent of the surviving 3,068 children. Relying on the location

information reported by other re-contacted household members, movement out of the region appears to be an important factor affecting inability to re-trace children. Among re-interviewed children, less than 10 percent were located outside Kagera. Among their non-traced counterparts, one-third were reported to reside outside Kagera and another 15 percent did not have reliable location information reported from their previous household members. The sample of children who were re-interviewed, 2,497, resided in 735 households during the baseline. By 2004, these children (at least 10 years older) were residing in 1,806 households.[5]

Table 2 takes a closer look at correlates of survival and re-interview. Survivorship is correlated with several baseline characteristics of the sample of children. The youngest (under age 5) were least likely to survive as were maternal orphans. Paternal orphanhood status is not associated with higher mortality. Children in the Ngara district were significantly less likely to survive than their counterparts in Bukoba rural district. Ngara is the district which borders Rwanda and Burundi and experienced massive economic and social upheaval starting in early 1994 with the genocides in those countries and the influx of refugees and operations by donor organizations. Along with Biharamulo, Ngara was the least HIV/AIDS-affected of the six districts in the region.

Among the surviving children, the youngest (0-4 years at baseline) were most likely to be re-interviewed. Children who were living with either parent at baseline were statistically also more likely to be traced. Household wealth indicators and residence in Bukoba urban (the largest urban center and the capital of the region) were associated with lower probabilities of re-interview. Possibly these traits are associated with increased mobility which then results in more difficult successful tracing of the individual.

[5] It is interesting to note that the KHDS 2004 sample is remarkably similar to a random sample of households from Kagera, despite the fact that the baseline sample was not a simple random sample and given the moderate attrition since the baseline. The households in the KHDS 2004 had similar characteristics to the CWIQ survey in 2004 (including characteristics such as: household size, female headship, head's education, head's age, land holdings, livestock holdings, and dwelling characteristics). Among children under 18 years, 14% in the KHDS 2004 are single or double-parent orphans and 63% of children were living with both parents. These numbers are strikingly close to results from the DHS 2003. DHS 2003 survey found that 11% of the children under 18 years old in Kagera had lost one or both parents (a number equal to what they found in the Tanzanian national sample). It further finds that 60% of the children sampled in Kagera who were under 18 years of age live with both parents.

The advantage of panel data is the opportunity to observe the correlates of orphanhood, conditional on initial conditions. Thus, it is important to consider the number of transitions in orphan status to be able to apply this approach. These transitions are presented in Table 3. In the baseline survey, 74 percent of the sample of children 0-15 years had both parents alive; under half of all the re-interviewed children (now 10-13 years older) had both parents alive in 2004. About one-third of children in the sample had some transition in their orphan status. The most common transition was from being a non-orphan to a paternal orphan. This increase in orphanhood, of course, is to be expected since children have aged 10-13 years between interviews. The most prevalent type of orphan was a one-parent orphan whose father was deceased. However, by 2004, after 10-13 years of aging, the differential was significantly smaller between orphan types.

Even when parents are alive, children do not necessarily reside with them. As is the case in other Sub-Saharan countries, the rate of fostering of children is high. In fact, fostering may be associated with orphanhood. In both rounds of the KHDS, one-parent orphans are significantly less likely to be residing with surviving parent than children with both parents alive. In baseline, more than 80 percent of non-orphans were residing with at least one parent. Among one-parent orphans, however, 62-67 percent were residing with the surviving parent. For the 2004 round, when children are between 11-28 years, fewer non-orphans are living with at least one parent (57 percent) but they are still more likely to be living with a parent than one-parent orphans. Among one-parent orphans, paternal orphans are more likely to live with their mother than maternal orphans are to live with their father. For children who became orphaned between survey rounds, we are not necessarily able to identify the living arrangement following the parent's death. This would be known only in cases when orphanhood occurs close to the 2004 survey round. For others, those orphaned in the mid 1990s, we know their living arrangements prior to orphanhood and subsequent arrangements by 2004.

Before modeling the link between human development indicators and orphanhood, we start by looking at the socio-economic status of orphans relative to their non-orphan counterparts. In this case, we consider maternal and paternal orphans separately. In addition, we have two rounds of data and two

groups of orphans: orphans before the baseline survey and those orphaned between survey rounds. The sample is the 2,409 children in Table 3. Since our outcome of interest is schooling and health (anthropometric measures), we will focus on orphanhood before the age of 16. Orphanhood after this age will have much more muted impact on schooling since the prevalence of any post-primary schooling (more than 7 years) is very low. Fewer than 10 percent of the sample of children 0-19 in baseline ever entered secondary school by 2004. Likewise, adult height is expected to be less affected or unaffected in the late teens.

In Table 4, we find that children whose mother died before baseline or in the interim 10-years of the panel survey reside in households with higher socio-economic status, according to two of the three indicators (per capita expenditure in the household and good flooring material). On the other hand, paternal orphans appear to be at a disadvantage by these two measures and a third (years of schooling of the household head).[6] Orphans of either type are more likely to have resided in the major urban center (Bukoba town). Girls are slightly less likely to be orphaned, although this seems to be artifact of lower re-contact rates among girls who are orphaned than boys (possibly higher mobility which lead to lower re-contacts).

3. Health Investments

Similar to schooling, health investments affect long-term economic prospects of children. These investments are often proxied for using anthropometric measures (such as height and weight). Height, for example, has been shown to affect wage-earning capacity as well participation in the labor force for men and women (see: Haddad and Bouis, 1991; Thomas and Strauss, 1997). We model height in a multivariate context as influenced by several factors, including the characteristics of the child (age and sex), genetic background of the family as well as the socio-economic environment in the household which is assumed to influence human development investment. We start with the earlier round of data in order

[6] The finding of lower socio-economic status among paternal orphans is also noted in the panel data examined by Case and Ardington (2003). Their subsequent work concludes that the death of the father does not cause lower socio-economic outcomes but that poverty may have contributed to these deaths.

to demonstrate the complications in trying to assess the impact or effect of current orphanhood on outcomes among a population of children.

Table 5 presents the regressions results of the correlates of height for the sample of panel children 0-15 years in the baseline survey. Controlling for concurrent household characteristics and child sex and age, a simple indicator for being a maternal or paternal orphan shows that there is no associated between orphanhood and height (column 1).

An extension to this specification is to classify non-orphans by their *future* orphan status. That is, we know in later survey rounds which non-orphans in the sample *became* orphans by the time of the next round (for example, by 2004 when they are 11-28 years old). We would expect that future orphanhood status would not be correlated with current height unless orphanhood captures some unobservable characteristics for which we are unable to control or morbidities associated with deaths affect outcomes before becoming an orphan. This approach follows Case and Ardington (2004) who make a casual interpretation of maternal orphanhood in a panel (2001 to 2003/04) by showing no effect of future orphan status on current schooling. Likewise, Evans and Miguel (2005) make note of the same issue in the context of censoring of the last round of their panel data since they include pre-orphan variables which by definition are unknown in the last survey round.

Using the short-run panel, we identify children who will be orphans by the fourth interview. These are children who become orphans from 1991 to 1993/94. In column 2 we find that future orphan status as well as current orphan status are not associated with lower height. However, using the long-run panel (2004 round), we have more complete data on many more "future" orphans. Further, under the assumption that as orphanhood occurs later in life its impact will be smaller, we classify future orphanhood according to the age at which the event occurs. We find that children who will be paternal orphans by age 17 have significantly lower height (Table 5 column 3). Their counterparts who are already paternal orphans have lower height of the same magnitude, though slightly less significant. These results suggest using current orphan status will under-estimate the correlation between orphan status and

height, but only for orphanhood transitions up to age 17. The magnitude of this effect is, on average, equal to about 1 centimeter. After age 17, we find not association.

What do these result suggest with respect to causality? A finding that future orphanhood affects current height does not eliminate causality. Future orphan status could proxy for residing in households with a fatally ill parent which itself leads to less growth for children prior to the death of the parent due to the economic and other stresses of having an ill household member. However, this does not appear to be the case given that we find no effect using the short-run panel where we would most expect to see this. (The average duration of the chronic illnesses associated with prime-age fatalities in the 1991-1994 rounds was under 2 years.)

In terms of assessing whether orphans are worse-off than other children, the miss-classification of future paternal orphans as non-orphans leads to an under-estimate of the correlation. As a targeting criterion, current orphan status will target worse-off children in terms of height, although it will also miss some disadvantaged children, those who will, but have yet, to lose their father by age 17.

One of the short-comings of Table 5 is that we have concurrent height and household characteristics, rather than having background characteristics of children prior to being orphaned. That is, the problem noted above of omitted variable bias and endogeneity exists. Making use of the panel aspect of the KHDS and turning to the long-run effect of orphanhood, we can assess the correlation between transitions in orphan status and the height of 17-28 year olds. These results are presented in Table 6. Recall that the classification of the respondents in terms of orphan status will not be a problem here because we know orphan status by age 17, after which we expect no problems of miss-classification. We further identify whether orphanhood occurred between ages 0-6 and 7-16 years. We focus on the sample of non-orphans in the baseline and their subsequent *transition* to maternal or paternal orphan status. Baseline characteristics are included as controls (such as socio-economic status of the household at baseline and foster status of the child). Moreover, we control for height at baseline, which reflects investment in child health before becoming orphaned, thereby further isolating the effect of orphanhood

on height, net of its correlation with unobserved background characteristics of these familes. Our two health outcome measures are height (logged) and body-mass-index (bmi).

Maternal orphanhood is significantly associated with lower height among children who become orphans between the ages of 7 and 16 (Table 6 column 1). On the other hand, children under the age of 7 do not have lower height as adults. Paternal orphanhood is not associated with height. Thus, the lower height observed for paternal orphans in Table 5 dissipates by ages 17-28, such that paternal orphans are not of lower stature than their non-orphaned counterparts. An alternative possibility is that the finding in Table 5 reflects the lower socio-economic background of the households of paternal orphans and not a causal relationship.

A weakness in using height as an indicator of human investment is that it is most affected by investments at very young ages where we observe very few orphans. (This problem also exists using anthropometric indicators from larger household surveys, for example the Demographic and Health Surveys where the prevalence of one or two parent orphans among children under 5 is very small, on the order of 2 percent). In column 2, we examine bmi and find no significant relationship between orphanhood transitions and bmi among the adults in 2004.

4. Schooling

Orphanhood is expected to influence schooling although there are multiple potential pathways of this effect. Obviously, income effects are a strong candidate, but in addition, the conditions of the child's orphanhood play a role, such as the age at which the child is orphaned and the enrollment status when orphaned. These aspects may interact in important ways with living arrangement and whether the orphan stay with her surviving parent or whether she move to another household. If the child moves, then fostering will affect orphans in different ways depending on the circumstances of the child. For example orphans who were already at school when they enter their new homes might have more chance to finish school than orphans who are not. Bhargava (2005) analyzes a sample of orphans only and finds a positive relationship between enrollment prior or orphanhood and subsequent enrollment among orphans. This

may be because of social pressure on the host family not to deprive the orphan in obvious ways. On the other hand, orphans who are fostered from a young age may be more likely to be treated more like the children of the head, if foster children when fostered at young ages display similar bonding with foster parents as biological children. Foster children whose parents are still alive may be better off than those whose parents are not, as parents may pay for schooling or reciprocate for their schooling expenditures (the child may also reciprocate later in life, but his/her parent can reciprocate more immediately). Also, if host households are typically richer than the original households, then this could explain a positive (or insignificant) effect of orphanhood on education. This suggests that evaluating the orphan effect on schooling will require moving beyond simple indicators of orphan status.

For our schooling outcome, we focus on the impact of a transition into orphanhood on additional years of schooling completed between the baseline and 2004. The sample includes children between the ages of 0-15 who were not orphaned in the baseline survey. Thus, children who were orphaned in the first interview, for whom we have no pre-orphanhood background characteristics, are excluded. In our first, parsimonious specification, we consider maternal and paternal orphanhood prior to age 15. Double orphanhood by age 15 (the interaction of paternal and maternal orphanhood) is also included. We also introduce controls for baseline characteristics. The baseline characteristics that are incrementally added as controls are: years of schooling at baseline (an initial condition), foster status, household characteristics, and community controls.

In Table 7, column 1, controlling for only child age and sex, we find a significantly lower additional years of schooling for children whose father died by age 15 since the baseline interview. The impact is about .3 years of schooling. Maternal orphanhood is not associated with a differential in additional schooling. With added controls for initial conditions, prior to orphanhood (columns 3 and 4) for household characteristics and community effects, the coefficients on the orphan variables are not significant. Controlling for having one parent deceased, there does not appear to be an additional impact of double-orphanhood.

The pattern that emerges in columns 1-4 is that orphanhood by age 15 is not associated with fewer years of schooling completed. This pattern changes once we interact orphan status with being in school prior to being an orphan. In column 5, we find that maternal and paternal orphans who were not enrolled in school when orphaned obtain significantly few years of schooling by 2004, nearly one half a year less. The circumstances of the child when they become orphaned matter. Those who were already enrolled when their father or mother dies do not complete fewer years than their non-orphaned counterparts.

In Table 8, we extend this specification by considering the age when orphaned. Specifically, for maternal and paternal orphans we consider whether the child was orphaned before age 6 or between ages 6-15. We choose 6 years as the lower cut-off since, although not common, children can enroll in primary school at age 6. This first category (orphaned when ages 0-5) excludes potential school ages and necessarily captures children not yet in school. In Table 8 column 1, we find that the orphan effect is concentrated among children orphaned between 6 and 15 years and not enrolled in school. Those orphaned when under 6 years do not have less schooling. Separating the sample by gender, among boys, we find this impact only for paternal orphans. On the other hand, paternal orphanhood is associated with significantly less schooling for girls who are orphaned when young. Likewise, children who lose their mother between the ages of 6 and 15 and not yet enrolled in school have significantly fewer additional years of schooling.

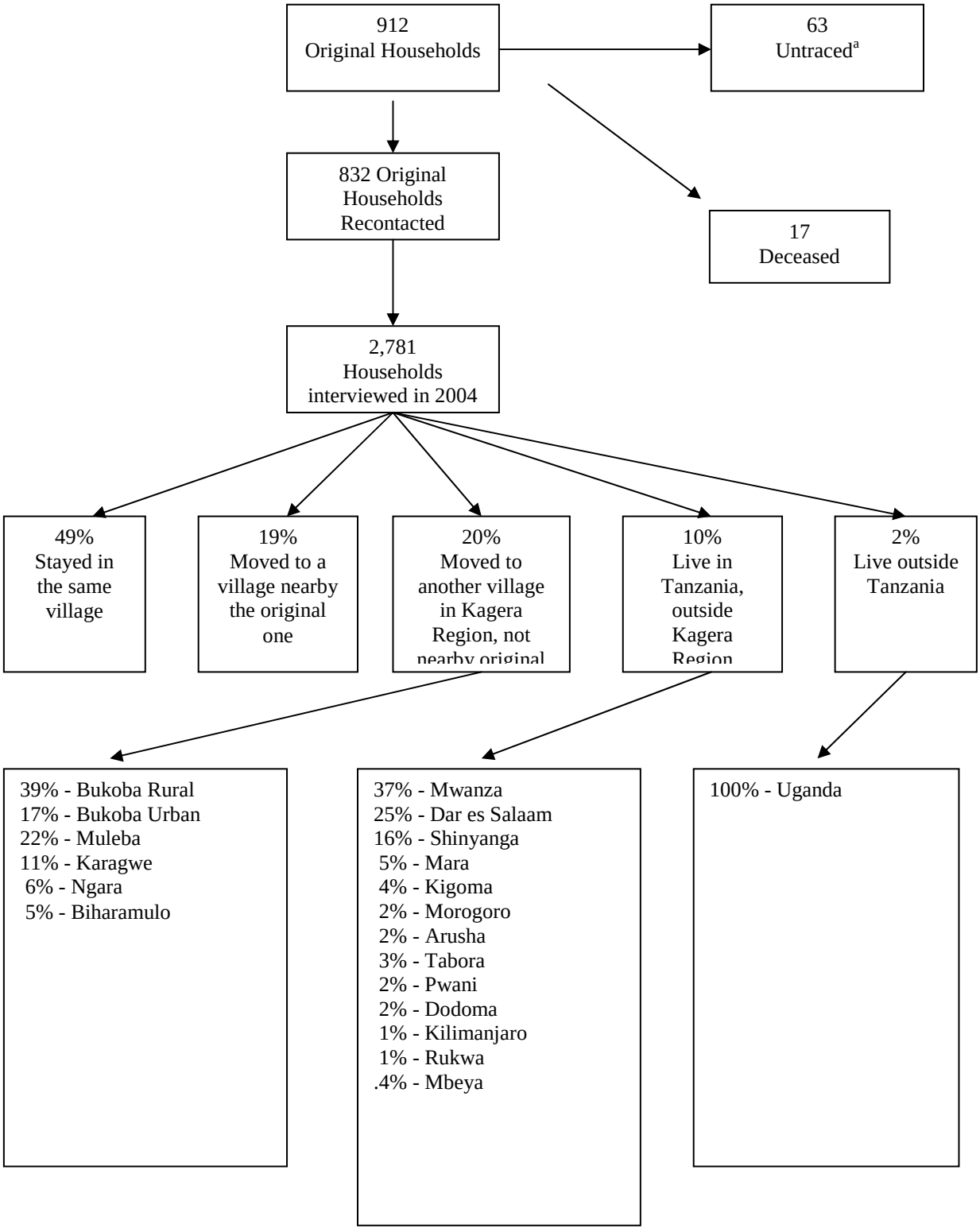
5. Conclusions

Studies of the consequences of the impact of orphanhood on children typically examine cross-sectional data or short-run longitudinal data. Yet, the impacts in the long-run may be quiet different. Using new data from Tanzania, this analysis focuses on two areas of impact: schooling and anthropometric measures. Focusing on a sample of children interviewed in 1991-1994 and then re-interviewed in 2004, simple descriptive statistics showed that paternal orphans have lower socio-economic status than other children.

On the other hand, maternal orphans are in households of higher socio-economic status. When we utilize the panel dimensions of the data, we find that, controlling for initial conditions, orphans have worse health and schooling outcomes than their non-orphan counterparts. However, this effect is nuanced and depends on the circumstances of the child when they become orphaned. Specifically, children who became maternal orphans between the ages 7-16 suffered lower height gains. On the other hand, paternal orphanhood was not associated with worse anthropometric outcomes. Schooling outcomes were most affected for children 6-15 years who were not enrolled at the time they became orphaned. This is true for both paternal and maternal orphans. On the other hand, young girls (under 6 years) who lose their father have almost one full year less schooling.

This work is preliminary and more in-depth analysis must be done to understand it. It may be an income effect where father's death is associated with lower income. Perhaps maternal orphans get better placement with foster families than paternal orphans, explaining the schooling results. Moreover, in a few of the sample communities, there are non-governmental programs which have specifically targeted orphans. Further expanding this work to understand the impact of these programs in another avenue of further research.

Figure 1: KHDS 2004, Recontacting Respondents after 10+ years



a. The locations of the sample of untraced individuals were reported by informants as: Kagera (48%), Dar es Salaam (8%), Mwanza (12%), other region (10%), other country (6%) and unknown (16%).

Table 1: KHDS Re-interview of Children

	Number of Children at baseline		
Baseline sample	3,272		
Re-interviewed	2,497		
	(75.3%)	*Location*	
		Same community	58.3%
		Nearby village	16.0%
		Elsewhere in Kagera	16.4%
		Other region	7.9%
		Other country	1.4%
Untraced	571		
	(14.5%)	*Location*	
		Kagera	48.9%
		Dar es Salaam	11.7%
		Mwanza	12.1%
		Other region	7.9%
		Other country	4.9%
		Don't know	14.5%
Deceased	204		
	(6.2%)	Deceased by last round of 1991-1994 surveys	20.0%
		Deceased after last round and before KHDS 2004	80.0%

Notes: Sample of individuals ages 0-15 in their first KHDS 1991-1994 interview. Location for children untraced is reported by other household members from the baseline survey who were successfully located and interviewed, and able to provide location information on the child.

Table 2: Correlates of Survival and Re-interview

	Survival to 2004	Re-interview in 2004
Mean of dependent variables	0.94	0.81
1991-1994 characteristics of child 0-15		
Male	0.06	0.02
	(0.92)	(0.34)
Age 0-4	-0.48	0.35
	(5.31)***	(4.94)***
Age 5-9	-0.18	0.03
	(1.91)	(0.52)
Living with mother	-0.17	0.15
	(1.55)	(2.01)**
Living with father	0.18	0.31
	(1.94)*	(4.20)***
Mother deceased	-0.28	-0.04
	(1.76)*	(0.32)
Father deceased	-0.02	0.07
	(0.16)	(0.72)
Both deceased	0.18	-0.05
	(0.85)	(0.32)
LN Per capita household expenditure/1000	0.03	-0.04
	(0.42)	(1.24)
Good flooring material	0.12	-0.18
	(1.14)	(2.46)**
Years of education of the household head	0.01	-0.04
	(0.58)	(4.45)***
Bukoba Urban district	0.04	-0.17
	(0.37)	(2.21)**
Ngara district	-0.34	0.02
	(3.06)***	(0.18)
Karagwe district	0.28	0.3
	(2.09)**	(2.99)***
Biharamulo district	0.01	-0.27
	(0.06)	(2.63)***
Muleba district	-0.04	-0.03
	(0.36)	(0.39)
Number of Observations	3,181	2,979

Notes: Probit estimates with robust standard errors. Absolute value of z statistics in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. All variables are binary (0/1) except real per capita expenditure (measured in Tanzania shillings) and years of schooling. Additional indicator for missing education of household head is included. The sample for re-interview is conditional on survival to 2004.

Table 3: Orphan Transitions Among Panel of Children (Percent)

	1991-1994				
2004	Both alive	Paternal orphan	Maternal orphan	Double orphan	Total
Both alive	48.7				48.7
Paternal orphan	14.4	8.7			23.1
Maternal orphan	5.2		4.4		9.7
Double orphan	5.7	4.9	2.9	5.1	18.5
Total	74.0	13.6	7.3	5.1	100.0

Notes: N=2,409. Sample excludes 88 children for whom orphan status at one or both interviews is not known or is inconsistent across interviews.

Table 4: Socio-Economic Characteristics at Baseline, by Orphan Status

	Maternal orphan by age 15 at baseline	Maternal orphan by age 15 between rounds	Not maternal orphan by age 15	Paternal orphan by age 15 at baseline	Paternal orphan by age 15 between rounds	Not paternal orphan by age 15
Male	52.3	54.4	50.3	52.8	49.9	50.7
Age 0-4	9.1	46.1	39.0	18.0	47.4	38.5
Age 5-9	30.9	33.6	27.0	30.1	32.6	26.6
Age 10-15	52.3	19.5	28.4	43.4	18.9	29.5
Living with mother	n/a	71.0	79.8	52.3	66.3	74.4
Living with father	36.9	34.4	63.4	n/a	63.8	71.8
Both parents deceased	40.9	n/a	n/a	27.2	n/a	n/a
Per capita expenditure	262	226	225	207	225	237
Good flooring in dwelling	19.8	19.9	15.5	11.1	15.6	18.2
Years of schooling of household head	4.2	4.6	4.5	3.8	4.1	4.8
Bukoba urban	25.5	24.9	15.7	19.6	19.7	16.9
Number of observations	298	241	1870	449	365	1595

Notes: All characteristics are measured at the first observation from the baseline survey (1991-1994). All variables are binary (0/1) except per capita expenditure (measured in 1,000 Tanzanian shillings, 2004 prices) and years of schooling. n/a indicates that the outcome is not applicable.

Table 5: Determinants of Height (LN ht) at Baseline

	(1)	(2)	(3)
Orphan status at baseline			
Mother deceased	0.005	-0.003	0.008
	(0.76)	(0.21)	(1.27)
Father deceased	-0.007	-0.004	-0.010
	(1.21)	(0.43)	(1.68)*
Future orphan status: short-run panel			
Mother died by last round		0.007	
		(0.58)	
Father died by last round		-0.006	
		(0.77)	
Future orphan status: long-run panel (2004)			
Mother died before age 17			0.002
			(0.43)
Mother died after age 17			0.012
			(1.35)
Father died before age 17			-0.009
			(1.92)**
Father died after age 17			-0.0001
			(0.01)
Number of observations	2,187	1,904	2,168

Notes: Sample of panel respondents ages 0-15 at baseline. OLS estimates with robust standard errors. t statistics in parentheses. ** significant at 5%; * at 10%. Dependent variable is ln(height in centimeters) completed at the first interview. All specifications include controls for: sex and age of the child; residing with mother and residing with father at baseline; household consumption, flooring material, age and sex of the household head, and district; when available mother's height from the baseline is also included.

Table 6: Determinants of Height and BMI in 2004

	(1) ln(ht)	(2) bmi
Mother died between ages 0-6	-0.004	0.715
	(0.18)	-(0.49)
Mother died between ages 7-16	-0.009	0.398
	(2.06)**	-(1.27)
Father died between ages 0-6	0.011	0.178
	(1.23)	(0.30)
Father died between ages 7-16	0.0004	-0.052
	(0.10)	(0.20)
Number of observations	840	840

Notes: Sample of panel respondents not orphaned at baseline and ages 17-28 in 2004. OLS estimates with robust standard errors. t statistics in parentheses. * significant at 10%. Includes controls for baseline characteristics: sex, height, residing with mother and residing with father; household consumption, flooring material, age and sex of the household head, and district; when available mother's height from the baseline is also included.

Table 7: Determinants of Additional Years of Schooling from Baseline to 2004

	(1)	(2)	(3)	(4)	(5)
Mother died before age 15	0.370	0.191	0.119	-0.003	-0.484
	-(1.46)	-(0.72)	-(0.48)	-(0.01)	(2.03)**
Father died before age 15	-0.322	-0.292	-0.256	-0.189	-0.549
	(1.85)*	(1.73)*	-(1.58)	-(1.19)	(3.23)***
Both parents died before age 15	-0.549	-0.410	-0.548	-0.311	0.424
	-(1.35)	-(1.00)	-(1.39)	-(0.84)	-(1.09)
In school prior to being orphaned					0.892
					(6.02)***
Controls for being in school and foster status at baseline	no	yes	yes	yes	yes
Controls for household characteristics at baseline	no	no	yes	yes	yes
Controls for community fixed-effects	no	no	no	yes	yes
Number of observations	1,728	1,728	1,728	1,728	1,728

Notes: OLS estimates with robust standard errors. t statistics in parentheses. *** significant at 1%; ** at 5%; * at 10%. Sample is children 0-15 years and not orphaned in baseline. Dependent variable is additional years of schooling completed since baseline interview. All specifications include controls for sex, age, and years of schooling completed in baseline. Columns 2-5 include indicator variables for being in schooling, residing with mother, and residing with father at baseline. Columns 3-5 include a set of household characteristics at baseline (see Table 2).

Table 8: Determinants of Additional Years of Schooling from Baseline to 2004

	(1) All	(2) Boys	(3) Girls
Mother died between ages 0-5	-0.168	0.249	-0.247
	(0.44)	(0.41)	(0.41)
Mother died between ages 6-15	-0.576	-0.193	-1.324
	(2.29)**	(0.57)	(3.47)***
Father died between ages 0-5	-0.406	-0.085	-0.893
	(1.51)	(0.26)	(2.03)**
Father died between ages 6-15	-0.610	-0.570	-0.562
	(3.13)***	(2.16)**	(1.88)*
Both parents died before age 15	0.381	-0.555	1.627
	(1.03)	(1.05)	(3.07)***
In school prior to being orphaned	0.939	0.632	1.155
	(5.93)***	(3.00)***	(4.60)***
Controls for being in school and foster status at baseline	yes	yes	yes
Controls for household characteristics at baseline	yes	yes	yes
Controls for community fixed-effects	yes	yes	yes
Number of observations	1,728	877	851

Notes: OLS estimates with robust standard errors. t statistics in parentheses*** significant at 1%; ** at 5%; * at 10%. See notes in Table 7.

Appendix Table 1: KHDS Individuals, by Age

Age at baseline 1991-1994	Re-contacted	Deceased	Untraced	Reinterview among survivors
<10 years	1,605 (77.1%)	160 (7.7%)	318 (15.3%)	83.5%
10-19 years	1,406 (73.0%)	104 (5.4%)	415 (21.6%)	77.2%
20-39 years	828 (63.5%)	287 (22.0%)	189 (14.5%)	81.4%
40-59 years	434 (70.1%)	149 (24.1%)	36 (5.8%)	92.3%
60+ years	163 (37.6%)	261 (60.1%)	10 (2.3%)	94.2%
Overall	4,435 (69.7%)	962 (15.1%)	968 (15.2%)	82.1%

Notes: Sample of individuals interviewed at least once in KHDS 1991-1994. Age categories are based on age at first interview. Some deceased individuals died during the KHDS 1991-1994 panel.

Appendix Table 2: Orphan Status and Fostering (column percentages)

1991-1994

	Both alive	Paternal orphan	Maternal orphan	Total
Live with both	62.3			45.0
Mother only	16.1	69.4		21.4
Father only	5.7		62.3	9.0
Neither	16.0	30.6	37.7	24.6
Total	100.0	100.0	100.0	100.0

2004

	Both alive	Paternal orphan	Maternal orphan	Total
Live with both	47.6			23.2
Mother only	10.3	48.5		16.3
Father only	4.4		24.6	4.5
Neither	37.7	51.5	75.4	56.0
Total	100.0	100.0	100.0	100.0

Notes: 1991-1994: N= 3,138 children 0-15 years. 2004: N=2,408 of the 0-15 years old who were re-interviewed, excluding 88 children for whom orphan status at one or both interviews is not known or is inconsistent across interviews.

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