# Orphans in Africa: Parental Death, Poverty and School Enrollment

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## ABSTRACT

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We examine the impact of orphanhood on children's school enrollment in10 Sub-Saharan African countries. Although poorer children in Africa are less likely to attend school, the lower enrollment of orphans is not accounted for solely by their poverty. We find orphans are less likely to be enrolled than are non-orphans with whom they live. Consistent with *Hamilton's Rule*, the theory that the closeness of biological ties governs altruistic behavior, outcomes for orphans depend on the relatedness of orphans to their household heads. The lower enrollment of orphans is largely explained by the greater tendency of orphans to live with distant relatives or unrelated caregivers.

## INTRODUCTION

In a follow-up to the 2001 United Nations General Assembly Special Session on HIV/AIDS, UNAIDS researchers recently noted that nearly 40 percent of countries suffering from a generalized AIDS epidemic lacked a national policy to support children "orphaned or made vulnerable by AIDS," [*Progress Report* 2003, page 12]. This is an important issue in Sub-Saharan Africa, where the death of prime aged adults due to HIV/AIDS has led to pronounced concentrations of orphans. Recent Demographic and Health Surveys (DHS) indicate that in Uganda, Malawi, Mozambique, Zambia and Zimbabwe, nearly 15 percent of all children under the age of 15 have lost one or both parents, and more than 20 percent of 15-year-old children in these countries are orphans.

Are orphans more vulnerable than other poor children in Sub-Saharan Africa? Understanding the risks that orphans face is important for policy: if extended families insure each other, then government policies may not need to target orphans specifically. Households could be singled out for help on the basis of other indicators (income poverty, for example).[1] On the other hand if, holding all else equal, orphans are at risk, then governments may be well advised to target orphans specifically when designing policies to improve such outcomes as school enrollment.

In this paper, we examine the impact of orphanhood on the living arrangements and school enrollment of children in Sub-Saharan Africa, using data from 19 Demographic and Health Surveys (DHS) conducted in 10 countries between 1992 and 2000. We find that orphans

[1]Urassa et al (1997) and Lundberg and Over (2000) argue against targeting based on orphanhood. Urassa et al state that in rural Tanzania many non-orphans live in poorer households than do orphans. Lundberg and Over argue that "indiscriminate provision of assistance [to orphans] is both fiscally irresponsible and socially inefficient" (page 13).

in Africa are significantly less likely than non-orphans to be enrolled in school. We focus on school enrollment for several reasons. Education is crucial to development. Declines in school investments that result from parental death have the potential to reduce the living standards of large numbers of African children throughout their lives, and to further slow African growth. In addition, because school enrollment is child-specific, we sidestep the problems associated with attributing expenditures recorded at the household level to the consumption of particular members (such as orphans). Data on school enrollment allow us to test for differential treatment of orphans and non-orphans living in the same household.

There are several reasons why school enrollment may be lower for orphans than non-orphans. Orphans may be more likely than non-orphans to live in poor households and, in the presence of credit constraints, lower household wealth may result in less schooling investment. Alternatively, orphans may have lower returns to education than non-orphans. In addition, there may be intra-household discrimination against orphans that depresses investment, even controlling for household wealth and the return to education.

The first of these hypotheses—that lower schooling among orphans is the result of poverty—has gained support in recent research. Foster et al (1995) argue that orphans are not at any particular disadvantage over equally poor non-orphans. Lloyd and Blanc (1996) state that, controlling for wealth, "the death of a parent appears to make relatively little difference to children's educational chances" (p.290). Ainsworth and Filmer (2002) conclude that, although generalizations across countries are difficult, gaps in enrollment between orphans and non-orphans are dwarfed by enrollment gaps between poor and non-poor children. A related line of research examines whether orphans are well-insured against the death of their parents through kinship-based child fostering systems (Isiugo-Abanihe 1985). Kamali et al (1996) argue that

orphans in South-West Uganda are "generally well looked after" within the community and by extended family (page 509). Lundberg and Over (2000) point to the role played by the network of family and friends, suggesting that wealth within such networks is used as a form of insurance in times of crisis. In this view, adult death adversely affects resources available to all children in a kinship—non-orphans as well as orphans— but there are no additional effects on investments in orphans.

The second hypothesis—that orphans have lower returns to education than non-orphans—is also plausible, although difficult to test. If adult deaths are concentrated among poorer households, then the children "selected" into orphanhood may on average have experienced more early childhood deprivation or be in worse health than non-orphans. Orphans may also be more likely than non-orphans to have HIV/AIDS due to maternal-child transmission, which could depress schooling. Additionally, the returns to schooling could be reduced by the experiences surrounding the death of a parent, including time lost from school during the parent's illness and death as well as emotional scarring that may compromise the child's ability to learn. Although the effects of orphanhood on returns to education may be important, we know of no existing evidence from Africa that investigates this issue.[2] The lack of longitudinal data on the cognitive ability, health, and education of children who become orphans precludes direct tests of the hypothesis that the children who become orphans are less able.

The third hypothesis posits that there is discrimination within households against orphans. Specifically, we consider the argument that adult caretakers are less likely to invest in children who are more distantly related, holding both household wealth and the returns to schooling fixed. Adults may be willing to invest more in their own children, both because their

[2]See Foster and Rosenzweig (1996) for a discussion of the impact of returns to schooling on educational investment.

affinity to their own children is greater, and because they are more likely to receive transfers from their children later in life. The idea that parents invest more than non-parents is also consistent with arguments from evolutionary biology. Hamilton (1964a, 1964b) hypothesizes that altruistic behavior between any two individuals is an increasing function of the degree of genetic relatedness between them, so that one's own children would be favored over grandchildren, nieces, or nephews, who in turn would be favored over more distant relatives and non-relatives. (See Daly and Wilson 1987 for a review.) These issues are relevant to African orphans since the death of even one parent often results in changes in living arrangements and control of household resources. African children who continue to live with a surviving parent may be absorbed into households in which other adults control the available resources, or may gain a step-parent who does not have the same incentives as the biological parent they lost. The death of a mother may leave children especially vulnerable, even among those who continue to live with their father and who experience no reduction in income. Existing evidence indicates that household expenditure on child-related goods—in particular, on healthy foods—is lower when a child's birth mother is absent (Case, Lin and McLanahan 2000) and that mothers invest more than stepmothers in children's health (Case and Paxson 2001). Other evidence comes from Gertler, Levine and Martinez (2003), which finds that deaths of fathers and especially mothers result in worse education and health outcomes for Indonesian children, and Bishai et al (2003), which finds that biological relatedness is an important predictor of the quality of care offered to Ugandan children.

These different sources of orphan disadvantage are relevant to the related question of whether orphanhood depresses investments more for female than for male orphans. There is a presumption in much of the literature that female orphans are at a disadvantage. A recent report

from the World Bank states that "girls are more likely than boys to be retained at home for domestic work when household income drops due to AIDS deaths or to care for sick relatives" (World Bank 2002:21).[3] Another report states that "one of the more unfortunate responses to a prime-age-adult death in poorer households is that of removing the children (especially girls) from schools (UNAIDS 2002:48-49.) To the extent that female orphans are at a disadvantage, it could be because adult deaths reduce household resources and girls in poorer households are generally less likely to attend school than boys. Or, it could be that foster parents discriminate against girl orphans relative to boys.

In what follows, we examine the impact of orphanhood on school enrollment using data from 19 DHS studies conducted in 10 Sub-Saharan African countries between 1992 and 2000. We first describe the data and present descriptive evidence on prevalence rates of orphanhood and the living arrangements of orphans. We then discuss the ways in which orphanhood could affect school enrollment. We examine (and reject) the hypothesis that the reduced school enrollment of orphans is attributable to lower household wealth. Instead, we find that, controlling for resources, orphans are less likely to be in school than non-orphans, including non-orphans with whom they live. Finally, we test the hypothesis that the lower schooling of orphans can be explained by the degree of relatedness of the orphan to the household head. We find that children living in households headed by non-parental relatives fare systematically worse than those living with parental heads, and those living in households headed by non-relatives fare worse still. Much of the gap between the schooling of orphans and non-orphans is explained by the greater

[3]However, this report is internally inconsistent in its stance on the effects of orphanhood on the school enrollment of girls versus boys, and states elsewhere that "in most cases, the gender gap among double orphans is similar to the gender gap among children living with their parents" (World Bank 2002:18). Other literature finds no evidence that girl orphans are systematically disadvantaged (Ainsworth and Filmer 2002; Lloyd and Blanc 1996).

tendency of orphans to live with more distant relatives or unrelated care givers. Because we have no information on the ability of orphans, either at the time of the survey or when the children first became orphans, we cannot rule out the hypothesis that orphans receive less investment because their returns to education are lower. However, unless orphaned children with lower returns to schooling are systematically placed with less closely-related care givers, the evidence supports the hypothesis that there is within-household discrimination against orphans.

This paper extends earlier research on the effects of orphanhood and schooling in Africa that returned mixed evidence. An important early paper on this topic is Lloyd and Blanc (1996), which uses DHS data from seven African countries. These authors find evidence that orphans in some countries are less likely to be in school than non-orphans (after controlling for a large number of other household characteristics), although the differences in enrollment rates between orphans and non-orphans are often not significant. They use several of the same data sets we use in this paper, but they work with samples that contain only one randomly-selected child from each household. The use of only one child per household results in smaller sample sizes and precludes the examination of whether orphans fare differently than non-orphans living in the same household. In addition, they do not distinguish double orphans from those who have lost one parent. Their regressions include separate indicators of whether the child's mother and father are deceased but do not include interactions of maternal and paternal death, implicitly restricting the effect of double orphanhood to be the sum of the effects of maternal and paternal orphanhood. Our results indicate that the effect of double orphanhood on schooling is typically greater than the sum of the effects of maternal and paternal death. The results in our paper benefit from the use of more, and more recent, data and from techniques that enable us to examine the intrahousehold allocation of educational resources to different types of children.

More recently, Bicego, Rutstein and Johnson (2003) and Ainsworth and Filmer (2002) have used African DHS data to examine the schooling of orphans. Our results are most similar to those of Bicego et al, who use data from 17 countries and find as we do that orphanhood depresses schooling, especially for double orphans. The results in Ainsworth and Filmer (2002) are at odds with those in Bicego et al and this paper. Ainsworth and Filmer argue that there is a great deal of heterogeneity across countries in the effects of orphanhood on schooling, and that in some countries orphans are more likely to be in school than non-orphans. However, their evidence is based on simple comparisons of the fractions of orphans and non-orphans in school. As we discuss below, their lack of adjustment for the child's age—something that is correlated with both orphan status and schooling—results in underestimates of the (negative) effect of orphanhood on schooling. More generally, our research differs from both Bicego et al and Ainsworth and Filmer in that we examine different hypotheses for the source of the disadvantage that orphans face, and specifically test for within-household discrimination against orphans and the role of living arrangements in orphan disadvantage.

Our research is also related to the large literature on child fostering in Africa, which notes high rates of fostering even among non-orphans in Africa. (See Bledsoe and Brandon 1987, and Bledsoe, Ewbank, and Isiugo-Abanihe 1988. More recent literature on fostering is summarized in Akresh 2003.) An important question posed by this research is whether children raised by people other than their parents fare worse. The analysis of this issue is complicated by the fact that living but absent parents may strategically choose to have their children fostered by others to achieve specific objectives. For example, a child may be sent from home for the purpose of work, or alternatively to live in locations where it is possible to attend school. The joint nature of these decisions make it difficult to identify the effects of fostering on child outcomes.

## RATES OF ORPHANHOOD AND LIVING ARRANGEMENTS

### Data and definitions

We use information for children aged 14 and under, collected in 19 Demographic and Health Surveys (DHS) from 10 countries. We selected eight East and Southern African countries because of the high prevalence rates of adult HIV/AIDS in these areas. For purposes of comparison, we added two West African countries—Ghana and and Niger—where HIV/AIDS rates are lower. A complete list of country-years is included in Table 1.[4]

An advantage of using the DHS is that the surveys are largely identical across countries and over time within countries. The surveys collected data on household living arrangements, housing quality and durable goods ownership, years of completed education and current enrollment status for all children in the household, and the vital status of their parents. The sample in each country-year is typically a stratified random sample of all non-institutional households, which allows us to assess the prevalence of orphanhood in non-institution based populations.(In some country-years, sections of countries were excluded due to civil unrest or excessive violence. The DHS website provides details: http://www.measuredhs.com/ .) Because the survey misses children who live in orphanages or on the street, the rates of orphanhood we compute are likely to be too low (although note that some orphans may be reported in error as the

[4]Nigeria has a high rate of AIDS and orphanhood and conducted a DHS in 1999 that contains information on the vital status of children's parents. We do not use this survey because the apparently low quality of these data. The data collection for this survey was not supervised by Macro International, which conducted the other surveys, and we are concerned that the same protocols may not have been used by the data collectors as in other countries. South Africa also conducted a DHS, but we were unable to gain permission to use it at the time we were conducting our analyses. We chose not to include countries such as Chad and C.A.R. despite their relatively high rates of orphanhood because recent civil conflict may have disrupted education systems.

biological children of their adoptive or foster parents.) There are no reliable national estimates of the numbers of African children who live in institutions or are homeless.

The surveys ask a responsible adult to list each household member, and to indicate the vital status of each child's parents (living, deceased or unknown). There is no information on the cause of parental death, so AIDS orphans cannot be separated from others. If a parent is noted to be living, the interviewer finds out whether the parent lives in the household. If so, his or her household identification number is recorded, so the child's record can be linked to that of the parent.

We divide children into four mutually exclusive categories for our analysis: non-orphans, maternal orphans, paternal orphans and double orphans. The use of these mutually exclusive categories allows for easier identification of the impact of the death of one parent, and to separate this from the impact of the loss of both parents. "Non-orphans" are children with two living parents. "Maternal orphans" are children whose mothers are deceased *and whose fathers are known to be living*. Similarly, "paternal orphans" are those whose fathers are deceased and whose mothers are known to be living. Defining "double orphans" is complicated by the fact that some children have parents whose vital status is unknown to the respondent: 1.16% of children have mothers in this category and 1.94% have fathers in this category. We define "double orphans" as children for whom either both parents are deceased, or one parent is deceased and the other parent has unknown vital status, or both parents have unknown vital status. (Children with one living parent and another parent whose vital status is unknown are not classified as orphans or non-orphans: 0.86% of children fall into this category.) We prefer this broad definition of double orphans because, if both parents have unknown vital status, or if one parent is deceased and the

other has unknown vital status, it is unlikely that these parents (even if alive) exert any influence on their children's care.

**Rates of orphanhood**

The countries we use are mapped in Figure 1. Altogether, these 10 countries account for approximately 27% of the children living in Sub-Saharan Africa, and 50% of the AIDS orphans.[5] Seven of the 10 countries—Uganda, Kenya, Tanzania, Malwai, Mozambique, Zambia and Zimbabwe—are in the "AIDS belt" that extends from East into Southern Africa. All of these countries have orphan rates in excess of 9 percent, with Uganda (2000), Zambia (1996) and Zimbabwe (1999) in excess of 12 percent. In the countries we analyze where the fraction of orphans is lowest—the West African countries of Niger and Ghana—the adult AIDS rates are relatively low.

Figure 2 shows orphan rates, by the age of the child, in each of the survey years we examine. A common characteristics across all countries is that orphan rates increase with age, so that school-age children are at higher risk of orphanhood than are younger children. In Mozambique (1997), Uganda (2000), Zambia (1996), and Zimbabwe (1999), a quarter or more of 14-year-olds had lost one or both parents. Interpretation of the graphs requires care, since they necessarily confound age and cohort effects. In countries in which AIDS rates are climbing, orphan rates among older children may be higher in 10 years than the rates shown on the graphs.

[5]The fraction of AIDS orphans living in the 10 countries is based on data from the UNAIDS (2000), which provides a measure of "cumulative orphans" for each country. "Cumulative orphans" are defined as the estimated number of children who lost their mother or both parents to AIDS by age 15, from the epidemic's onset through to the end of 1999.

Countries differ in how orphan rates have changed over time. For example, although estimates of orphanhood in Uganda are quite high in both 1995 and 2000, the estimated rates have remained stable. Uganda may have reached a saturation point in the spread of the disease. However, these results are also consistent with reports on the success of Ugandan prevention programs and the diminution of HIV prevalence rates there. (See www.unaids.org/fact_sheets/files/Africa_Eng.html for discussion.) Ghana, Niger and Tanzania have also maintained steady orphan rates, while in Kenya, Malawi and, especially, Zambia and Zimbabwe, the fraction of children of each age who are orphans grew over the 1990's.

Table 1 shows statistics on the fractions of children who are maternal, paternal, and double orphans. A (non-population weighted) average over all country-years indicates that 2.4 percent of children aged 14 or younger are maternal orphans and more than twice that percentage (5.7) are paternal orphans.[6] Roughly two percent of children have lost both parents (either deceased or vital status unknown), and 10 percent of children have lost one or both parents. The fractions of children who are maternal, paternal, or double orphans at each age, for the most recent year of data available, can be seen in Figure 3. In some countries, in particular, Kenya, Namibia, Tanzania, Uganda, Zambia and Zimbabwe, the fractions of children who have lost a father are markedly larger than those who have lost a mother. In other countries, including the two West African countries in which HIV/AIDS rates are thought to be lower (Ghana and Niger), the differential loss of fathers is small.

**Living arrangements**

[6]Throughout the paper we will treat the results for each country-year as one observation, and for this reason we do not population-weight our cross-country summary statistics. However, our results are robust to population weighting. (The statistics reported for each country-year taken individually have been population weighted, to make them nationally representative.)

Children who lose a parent through death often experience additional changes in the set of adults who provide them with care. Many maternal and paternal orphans are "virtual" double orphans, who lost the care of both parents when one died. Traditions of patrilineage may dictate that paternal orphans remain with paternal relatives rather than with their mothers; remarriage and migration among widows and widowers may also result in separation of children from their surviving parents (see Foster 1996, Ntozi and Nakayiwa 1999, and Monk 2000).

Table 2 provides evidence on the importance of "virtual" double orphans. Columns 1 and 2 show the fraction of non-orphans and paternal orphans who live with their mothers, and columns 3 and 4 show the fraction of non-orphans and maternal orphans who live with their fathers. The results highlight the importance of child fostering in Africa: consistent with other research, we find that the fraction of non-orphans who do not live with their mothers ranges from 10 to more than 30 percent (Bledsoe and Brandon 1987). However, orphanhood elevates the risk of living apart from parents. In all of the country-years examined, paternal orphans (who by definition have mothers who are alive) are less likely to live with their mothers than are non-orphans. In many countries these differences are large and have become more pronounced in later years (Tanzania, for example). The relative differences in living arrangements between orphans and non-orphans are even larger for children who have lost a mother (columns 3 and 4). For example, in Zambia, only 41.3 percent of maternal orphans lived with their fathers in 1996, compared with 74.5 percent of non-orphans. In some countries —see Malawi or Tanzania for example—these differences have become larger with time.

## DETERMINANTS OF SCHOOL ENROLLMENT

The impact of a parental death on children's school enrollment will depend upon the ways in which orphanhood affects three determinants of schooling: the children's economic circumstances, their school-readiness, and their relationships to adult decision makers.

The effect of a death on living standards depends on whether the deceased adult was a high earner within his or her household, whether transfers increase in response to the death, whether the household responds by placing children in foster care, and whether households into which orphans are placed are richer or poorer than the household of origin. Although there is great interest in the extent to which investments in children are insured against the death of their parents, models of insurance cannot be tested without longitudinal data on children and their extended families.

Even if households provide equal treatment to all children, it is not the case that orphans and non-orphans in the population will experience the same investment levels. To the extent that adult deaths produce declines in household living standards, orphans will be more likely than non-orphans to experience such declines. However, the living standards of orphans relative to non-orphans will also be affected by the correlation between household income and the adult survival probability across households within the population. Evidence from Africa indicates that, at least early in the AIDS crisis, infection rates may have been higher among richer and better educated individuals (see Ainsworth and Semali 1998). If so, it would not be surprising to find that orphans were on average wealthier than non-orphans. If AIDS is becoming more of a poor person's disease—which could happen if prevention measures are more quickly adopted by the wealthy—we would expect to see the relative living standards of orphans decline over time.

The basic assumption that investments in orphans and non-orphans who live in the same households are identical can be tested. Because many of the children represented in the DHS

surveys live in "blended" households that contain both orphans and non-orphans, we can use household fixed effects models to examine whether orphans are disadvantaged relative to the non-orphans with whom they live. A finding that orphans receive lower schooling investments than non-orphans in the same household provides evidence against the hypothesis that the "orphan disadvantage" is due solely to lower levels of household resources. The results of these tests are presented in the following section.

If the loss of a parent leaves a child less able to benefit from schooling, then even if adult decision makers treated orphans and non-orphans with similar academic promise identically, we should expect to see a smaller fraction of orphans enrolled in school. We cannot rule this out as a factor determining enrollment. Indeed, the DHS data do not contain information on the health or cognitive ability of children, which makes it impossible to construct direct tests of the hypothesis that orphans face lower returns to education. However, we can examine this hypothesis below indirectly, using the pattern of school enrollment we find in our data.

Finally, we note that there may be within-household discrimination against orphans: consistent with *Hamilton's rule*, investments in a child may decrease as the relationship between the child and the decision-making adult in the child's household becomes more distant. However, *Hamilton's rule* yields clear testable predictions on the patterns of investments we should find between orphans and the non-parental adults with whom they live. These predictions are not obvious implications of a model in which investment decisions are driven by differences in returns to education across orphans and non-orphans. We present evidence in support of this hypothesis in the final section of the paper.

## ORPHANS, HOUSEHOLD WEALTH AND SCHOOL ENROLLMENT

### Household wealth

Because schooling may be related to household resources, we begin by documenting differences in household wealth between orphans and non-orphans. The DHS surveys do not contain information on income or financial wealth, but they do collect information on the number of household durables, which serves as a proxy for household wealth. The measure of durables we use is constructed from information on ownership of up to seven durable goods, including items such as refrigerators, radios and bicycles.[7]

For each country-year, we regress the durable goods index on an indicator that the child is an orphan and indicators for the child's age and gender. Because in subsequent sections we will focus on school-aged children, we estimate these regressions using samples of children aged 6-14. The regression equation is expressed as:

$$D_{ih} = \alpha_0 + \alpha_1 I(female) + \sum_{j=7}^{14} \beta_j I(age = j) + \delta I(orphan) + \epsilon_{ih}, \quad (1)$$

where $D_{ih}$ is the durables index for child $i$ in household $h$, the coefficient $\alpha_1$ measures the difference in durables between female and male children, and the coefficients $\beta_j$ measure the difference in durables between children of age $j$ and age 6. The age indicators are important to include because age is positively related to orphanhood and may also be related to wealth. Equation (1) is estimated by ordinary least squares (OLS), with each observation weighted by the

[7]The list of durables varies slightly across surveys. In most cases, information is obtained on 6 durables, including a radio, television, refrigerator, bicycle, motorcycle, and a car. The index of durables is simply the sum of the number of kinds of durables the household owns. An alternative approach is taken by Filmer and Pritchett (1999) and Ainsworth and Filmer (2002), who use the first principal component of an index created from the DHS household durables and characteristics of housing. We prefer to use the count of household durables, because the units are clearly defined, which makes comparison of results across countries possible.

sampling weight provided in the DHS surveys. Standard errors are corrected for heteroske-dasticity within clusters.[8]

The parameter of interest here is the coefficient on the orphan indicator, $\delta$, which measures the difference between orphans and non-orphans in household durables, holding the age and gender of the child fixed. Estimates of $\delta$, together with confidence intervals (at the 90% level), are graphed in the top left-hand panel of Figure 4. The results are summarized in the top panel of Table 3, which shows the average value of $\delta$ and its associated standard error over all country-years. On average, orphans live in poorer households than non-orphans of the same age and gender. With the exception of Niger in 1998, the coefficient on the orphan indicator is significantly less than zero in every country. Its mean value of –0.170 implies that, controlling for age and sex, orphans live in households with 0.17 fewer durables on average than non-orphans.

Although orphans as a group live in poorer household than non-orphans, this is not true of all types of orphans. The remaining three panels of Figure 4 separate orphans by type. The top right hand panel shows regression results using samples of children who are either non-orphans or maternal orphans, with paternal and double orphans excluded. For each country-year in the top right panel, estimates of $\delta$ reveals whether, on average, children with living fathers and deceased mothers live in households with significantly fewer durables than do children with two living parents. The lower left-hand panel repeats this exercise for paternal orphans, and the lower right panel, for double orphans. These panels reveal that lower living standards of orphans' households can be attributed primarily to paternal orphans. For maternal and double orphans, there is no systematic difference in the age- and gender-adjusted number of household durables for orphans

[8]Results are similar if the data are not weighted. The heteroskedasticity-corrected standard errors are approximately 40% larger than those with no correction.

and non-orphans. However, in every country-year except Niger in 1998 and Mozambique in 1997 (both of which have estimates of $\delta$ that are negative but not statistically significant), children whose fathers have died live in households with significantly fewer durables.

Although on average orphans live in poorer households than non-orphans, we find no evidence of a systematic deterioration or improvement over time in the living standards of households containing orphans. For example, the number of durables in the households of paternal orphans in Ghana, Uganda and Zimbabwe fell (although not significantly), whereas the number of durables rose for paternal orphans in Kenya, Niger and Zambia (again, not significantly). Among double orphans, who by definition have been absorbed into households that do not contain their parents, we find no systematic change in the durable goods ownership of the households that absorb such orphans between rounds of the surveys.

In summary, we find that orphans–in particular paternal orphans–on average live in poorer households than non-orphans. Whether orphans' schooling suffers, and whether that is due to orphans' living arrangements, their relative poverty, or both, will be the focus of the next sections.

**School enrollment**

We use current school enrollment as our measure of investments in schooling. In Africa, enrolling children in school is costly. In addition to the foregone income of the child, schooling entails expenditures on school uniforms, supplies, and (often) school fees. We analyze school enrollment rather than educational attainment, because the former reflects current investments in a child, whereas attainment reflects the history of enrollment over the child's life. It is possible that children who are orphans moved through school more slowly in the years prior to becoming

orphaned—for example, while a parent was dying—and that their attainment does not reflect investments made by current caregivers.

To begin, we estimate equations of the following form for each country-year:

$$S_{ih} = \alpha_0 + \alpha_1 I(female) + \sum_{j=7}^{14} \beta_j I(age = j) + \zeta I(orphan) + \epsilon_{ih}, \quad (2)$$

where $S_{ih}$ is an indicator that child $i$ in household $h$ is enrolled in school. We estimate (2) using weighted OLS and compute standard errors that are corrected for cluster-level heteroscedasticity.[9] Estimates of $\zeta$, the coefficient on the orphan indicator, are presented in Figure 5 and summarized in the second panel of Table 3. For all but three cases (Mozambique in 1997 for maternal orphans, and Namibia in 1992 and Tanzania in 1996 for paternal orphans), estimates of $\zeta$ are negative, indicating that orphans are less likely to be in school than non-orphans of the same age and sex. The importance of age adjustment should be highlighted. Age is positively correlated with both orphanhood and schooling in all country-years we examine, so omitting age indicators from the regression is likely to yield estimates of the effects of orphanhood on schooling that are biased upwards.[10] For example, when we estimate (2) excluding both age and gender indicators, we find *positive* effects of orphanhood on schooling in 8 of 19 country-years for paternal orphans, in 5 of 19 country-years for maternal orphans, and in 7 of 19 country-years for double orphans. These positive coefficients reflect the fact that orphans are on average older, and older children are more likely to be in school.

[9] We also estimated probit models to see if these differ from results of the linear probability models presented here. The marginal effects of orphanhood on schooling from probit models are nearly identical to those shown in Figure 5. We prefer the use of the linear probability models because the inclusion of household fixed effects (discussed below) is more straightforward.

[10] The main education results in Ainsworth and Filmer (2002) are based on comparisons of fractions of orphans and non-orphans who are enrolled in school. This is equivalent to estimating (2) without controls for either age or gender.

It is interesting to note that paternal orphans, who were shown above to live in the poorest households, are not the group least likely to be in school. Rather, the largest negative values of $\zeta$ are observed for double orphans, who do not live in systematically poorer households than non-orphans. This comparison suggests that it is unlikely that lower school enrollment among orphans is driven by wealth.

We examine the school enrollment of orphans relative to non-orphans in more detail by regressing an indicator of school enrollment on a complete set of age indicators, a sex indicator, and a set of indicators for whether the child is an orphan in a "blended" household (one containing both orphans and non-orphans), an orphan in a non-blended household (one containing no non-orphans aged 6-15), or a non-orphan in a blended household. The excluded category is non-orphans who live in non-blended households, i.e. with no orphans aged 6-15. Pooling all surveys, 36.4% of orphans and 8.8% of non-orphans live in blended households. All regressions include indicators for urbanization (capital or large city, small city, town, countryside), the number of persons in the household, the fraction of household members who are children less than age 14, the fraction of household members who are adults aged 55 and above, and the age, education (in years) and sex of the household head. We show results only for the most recent year of data available for each country. Results for other country-years are available from the authors upon request.

The results, shown in Table 4, indicate that orphans are less likely to be enrolled in school even controlling for household characteristics and regardless of whether they are members of blended households. There is no systematic difference in the enrollment rates of orphans in non-

blended and blended households.[11] For two countries (Ghana 1998 and Namibia 1992) orphans in non-blended households are significantly less likely to be in school than orphans in blended households, and in one country (Kenya 1998) they are significantly more likely to be in school, and for the rest of the country-years the difference is not significant. (*F*-tests of equality of these coefficients are presented in column 4.) The presence of orphans also appears to make little difference to whether non-orphans are in school. The difference between non-orphans in blended and non-blended households is significantly different from 0 in only a handful of countries (this can be read from the coefficients and associated standard errors in column 3) and, in these cases, non-orphans in blended households have *higher* school enrollment than non-orphans in non-blended households.

For children living in blended households, we can push our comparison further, by estimating versions of (2) that include household-level fixed effects.[12] The estimates of $\zeta$ and associated confidence intervals are graphed in Figure 6, and their averages are presented in the third panel of Table 3. When household fixed effects are included, the estimates of $\zeta$ measure the difference in the probability of school enrollment between orphans and non-orphans living in the same household, controlling for age and gender. For example, an estimate of $\zeta$ of –0.10 would imply that, controlling for age and gender, orphans are 10 percentage points less likely to be enrolled in school than non-orphans from the same household. Because orphans are being

[11]These results are broadly consistent with some of the existing research based on case studies from small regions in Africa. Data from the Masaka district of Uganda and from rural Tanzania find lower school attendance among orphans, but only at older ages (Kamali et al 1996, and Urassa et.al 1997).

[12] These regressions are weighted using sampling weights provided by DHS. Because household fixed effects are included, it is not necessary to adjust standard errors for within-cluster heteroskedasticity.

compared to children with whom they live, any orphan disadvantage in schooling that we estimate cannot be attributed to lower household wealth.

The results indicate that orphans of any type are less likely to be in school than are the non-orphans with whom they live. All estimates of $\zeta$ shown in the top left-hand panel of Figure 6 are negative, 13 of 19 are significant, and the average estimate is –0.067. These effects are large, given that school enrollment is low in many of these countries. Overall, 66 percent of children aged 6-14 in these country-years are enrolled in school, so that a 6.7 percentage point decline in school enrollment is equivalent to a 10% reduction in the chance of being in school.

The estimates for maternal and paternal orphans, shown in the top right and bottom left panels, are also generally negative, with average values of –0.038 for maternal orphans and –0.049 for paternal orphans. However, these effects are not precisely estimated, and are significantly different from zero in only 10 of the 19 country-years for paternal orphans and in 7 country-years for maternal orphans. The largest effects are for double orphans. In all but two cases (Niger 1992 and Zambia 1992), double orphans are significantly less likely to go to school than the children with whom they live. For the majority of countries, double orphans are estimated to be between 10 and 30 percentage points less likely to be in school. The average value of these coefficients across country-years is –0.152.

**Discussion**

Overall, the results in Tables 3 and 4 and in Figure 6 provide evidence that orphans are at significant risk for lower school enrollment, and that this risk is not due solely to their relative poverty. Orphans are less likely than non-orphans to be enrolled, whether we consider non-orphans as a group and control for household characteristics (as in Table 4), or whether we compare orphans with the non-orphans with whom they live using household fixed effects. The

effects of orphanhood on schooling are largest for double orphans. Before turning to possible explanations for the lower school enrollment of orphans, we use our data and framework to address outstanding questions on the school enrollment of orphans.

**Are girls at special disadvantage?** In contrast to statements made by the World Bank (2002) and UNAIDS (2002), we find that lower school enrollment for orphans is equally severe for boys and girls. For each country-year, we estimated a fixed effects model of school enrollment that included indicators for children's ages and sex, an indicator that the child is an orphan, and an interaction term between indicators that the child is an orphan and the child is female. If female orphans are at a special disadvantage, the coefficient on this interaction term should be negative. In several country-years, girls are at significantly greater risk for not being enrolled in school (true for Ghana 1993 and 1998, Malawi 1992 and 2000, Mozambique 1997, Niger 1992 and 1998, Uganda 1995). However, with two exceptions (Kenya in 1998 and Mozambique 1997), girls who are orphans are at no greater risk of not being enrolled than are boys who are orphans. In roughly half the cases (8 of 19 country-years), the interaction between orphanhood and being female is not negative but positive (although significantly different from zero in only one case, Tanzania in 1999). Neither do we find increased discrimination among orphaned girls when we limit our analysis to older children aged 11-14. Estimates of fixed effect models for samples of older children reveal only one country-year in which the orphan-female interaction is negative and (marginally) significant. In two cases (Tanzania 1999 and Uganda 2000), older girls who were orphans were significantly more likely to be enrolled relative to older boy orphans.

**Are younger orphans at greater disadvantage?** We have also analyzed the impact of orphanhood on school enrollment separately for children aged 6 to 8, 9 to 11, and 12 to14. As

above, we included in each regression a complete set of age indicators, an indicator for the child's gender, and a set of household fixed effects. The effects of orphanhood on education increase with age. Estimates of $\zeta$ for 6 to 8-year-olds are negative and significant in only 8 of 19 country-years, with an average value across country-years of –0.040. The number of country-years with negative and significant values of $\zeta$ rises to 13 of 19 (with an average value of –0.063) for 9 to 11-year-olds, and to 16 of 19 (with an average value of –0.088) for 12 to 14-year-olds. Most of this effect for older children is driven by double orphans, who are on average 18.3 percentage points less likely to be enrolled than are the non-orphaned children with whom they live.

These results are in direct contrast to those found in Northern Tanzania by Ainsworth, Beegle and Koda (2002), who argue that Tanzanian households cope with adult deaths by delaying the enrollment of younger children, while protecting the enrollment of older children. We find the opposite pattern, both in the results averaged over all the country-years presented here, and in the Tanzania 1999 DHS, where the fixed effect estimate of the effect of orphanhood on school enrollment is 0.6 percentage points for 6 to 8-year-olds, 9.1 percentage points for 9 to 11-year-olds, and 13.8 percentage points for 12 to 14-year-olds, with the latter two estimates significantly different from zero.[13]

These findings are also not consistent with the hypothesis that orphans with pediatric HIV/AIDS due to maternal-child transmission are withheld from school because of their own illness. Evidence suggests that the majority of African children with HIV/AIDS die before the age of 5 (Spira et al 1999). However, if those who survive longer are kept out of school, we

[13]We estimates similar models using educational attainment rather than current school enrollment, and find that the gap between orphans and non-orphans in years of completed education increases with age.

would expect to see the largest school enrollment gaps between orphans and non-orphans to appear among the youngest school-age children, when more children born with HIV/AIDS are still alive. The finding that the enrollment gap increases with age runs counter to this hypothesis.

**Does poverty leave orphans at greater disadvantage?** Although poverty may not be the sole cause of reduced enrollment among orphans, it may be that discrimination against orphans within households is exacerbated by poverty. We have examined whether the gap in enrollment between non-orphans and orphans is larger among poorer households, where wealth is measured by the number of household durables. We estimated models with household fixed effects identical to those presented above, but with the addition of the "orphan" indicator interacted with the durable goods index. (The durable goods index itself does not vary across children in a household, and its effect is absorbed in the household fixed effect.) If wealthier households are less likely to discriminate against orphans relative to non-orphans, or if more capable orphans are placed with wealthier families, then the coefficient on the orphan/durable goods interaction will be positive. However, the results indicate that the within-household gap in enrollment between orphans and non-orphans does not decrease with wealth. For orphans of any type, the coefficient on the interaction between the durables index and the orphan indicator is significant in only 5 if 19 cases, and is *positive* and significant in only 1 of 19. The average value of the coefficient on the interaction is –0.012 (with a standard error of 0.028). Results are similar for orphans of specific types.

It is indeed the case that children in wealthier households are more likely to go to school. We estimated cross-sectional regressions that include a set of household controls (listed in the note to Table 4), the durable goods index, an orphan indicator, and an interaction of the orphan indicator and the durables index. The results for orphans of any type indicate that higher durables

are significantly associated with higher school enrollment in 17 of the 19 country-years. However, consistent with the fixed-effects estimates, the gap in enrollment between orphans and non-orphans does not become smaller as the durable goods index rises.

We take this as additional evidence that, although poverty does result in lower school enrollment, orphans face an additional risk of non-enrollment that is not accounted for by household wealth. In the section that follows, we explore the extent to which the risk orphans face is related to their relationships to their adult caregivers.

## *HAMILTON'S RULE* AND THE ROLE OF CAREGIVERS

The living arrangements of children who have lost one or both parents differ from those of children with two living parents. Table 5 shows that nearly 80 percent of children with two living parents are the child of the household head, and less than 1 percent of non-orphans live in households headed by a non-relative. In contrast, only 50 percent of maternal and paternal orphans are the child of the household head. These children are twice as likely as non-orphans to live in households headed by a grandparent, and three times as likely to be living in households headed by "other relatives." The living arrangements of double orphans differ even more from those of children with two parents. Roughly 30 percent of double orphans are living in households headed by other relatives, and over 4 percent in households headed by non-relatives. About 25 percent of double orphans are adopted or foster children of the household head, that is, they are classified as a son or daughter of the head rather than as an "other relative" or "non-relative," which may signal a greater degree of caring or expectation of permanence of the child in the home.

That the relationship of the child to the household head accounts for the lower schooling enrollment of orphans can be seen in Table 6, which shows results of regressions that include an orphan indicator, together with indicators for the relationship between the child and the head of the household. These regressions control for age and gender and include household fixed effects, so the effects of relationship to the head are identified by within-household variation. Panel A shows the coefficients on an orphan indicator when no indicators for the relationship to the head are included. These are identical to those graphed in Figure 6, and are repeated here for purposes of comparison with the results in Panel B, which include relationship indicators.

Adding controls for the relationship to the household head dramatically reduce the coefficients on the orphan indicators. In Kenya 1998, for example, the "effect" of being an orphan declines from –0.100 to –0.005 when the relationship indicators are included. In other countries, for example Tanzania, Uganda, Zambia and Zimbabwe, the relationship indicators account for between 30% and 60% of the lower school enrollment of orphans.

As a general pattern, the probability of school enrollment is inversely proportional to the degree of relatedness of the child to the household head —whether the child is an orphan or not. Children listed as grandchildren or as adopted/foster children are generally at the smallest disadvantage. Children who live in household headed by an "other relative" are less likely to be enrolled than are children living with parents or grandparents, and children with the lowest rates of school enrollment are those who live in households headed by non-relatives. In many cases, the level of disadvantage associated with having a non-relative for a household head is very close in absolute terms to the average school enrollment rate in the country. For example, 87.5 percent of all Kenyan children are enrolled in school, and Kenyan children who live with non-relatives are estimated to be 79.0 percentage points less likely than others to be enrolled.

We provide more formal tests, at the bottom of Table 6, of whether the child's relationship to the household head correlates with school enrollment in the way predicted by *Hamilton's rule*. Children living with "other relatives" are less likely to be enrolled than children living with a parental head of household, a difference that is statistically significant at the 10 percent level for all but one country-year. And, children living with "other relatives" are less likely to be enrolled than are those living with grandparent head. In six of the ten country-years presented, the difference between living with a grandparent and with "other relatives" is significant at the 10 percent level. Moreover, children who live with non-relative heads are even less likely to be enrolled in school. With the exception of Namibia in 1992, children living with "non-relative" heads are less likely to be enrolled than are children living with "other relative" heads.

Although the finding that children who live with non-relatives are most at risk of low enrollment is consistent with *Hamilton's rule*, we have no direct evidence against the hypothesis that investment decisions are based on the children's returns to education. The type of caregiver chosen for an orphan could be systematically related to the child's return to schooling, with grandparents selected for the most able children, other relatives for less able children, and non-relatives for the least able children. Alternatively, children whose grandparents are alive and able to care for them may be healthier on average. Although possible, we have no reason to think that these specific selection patterns are likely.

Our results indicate that lower school enrollment of orphans can be explained in part by their greater tendency to live with less-closely-related care givers. However, they do not provide information on whether orphans fare worse than non-orphans who are fostered by the same types of non-parental caregivers. Non-orphaned foster children may receive better treatment if their

living (albeit absent) parents provide financial support for their schooling, choose "better" foster care givers, or monitor the activities of foster care givers. In addition, foster children may in some cases be fostered out specifically for the purpose of attending school.

To examine this issue, we selected (for each of the country-years shown in Table 6) a sample of children who either were double orphans or were non-orphans living apart from both parents. We regressed school enrollment on a complete set of interactions between indicators for the type of child (orphan or non-orphan foster child) and indicators for the relationship between the child and the head of the household.[14] The results provide support for the hypothesis that orphans are less likely to be enrolled in school than non-orphaned children with the same living arrangements. In 9 of the 10 country-years we examined, orphans living with grandparents were less likely to be in school than non-orphaned children living with grandparents. In 4 cases, this difference was statistically significant. Similar results were found for children living with "other relatives" and non-relatives. Among children living with "other relatives", orphans were less likely to be in school than non-orphans in 9 of 10 countries (in 4 cases significantly so). Among children living with non-relatives, orphans were less likely to be in school than non-orphans in 7 of 10 countries (in 6 cases significantly so), and significantly more likely to be in school in only 1 country. Coefficient averages across the 10 countries indicate that orphans living either with grandparents or "other relatives" were 11 percentage points less likely to be in school than non-orphans with the same living arrangements. Orphans living with non-relatives were 16.5 percentage points less likely to be in school than non-orphans living with non-relatives. Although

[14]Regressions also include age and gender indicators. Because few household contain both double orphans and foster children with living parents, we did not include household fixed effects in these regressions, but instead included the set of household characteristics listed in the note to Table 4. All regressions were weighted and standard errors were corrected with cluster-level heteroscedasticity.

these results do not provide evidence on the selection processes through which orphans and non-orphans are placed in different types of living arrangements, they do indicate that orphans and foster children with living parents often have different school enrollment patterns.

## CONCLUSIONS

In at least one important dimension—school enrollment—orphans are significantly disadvantaged. The results presented in this paper indicate that, although poorer children in Africa are less likely to attend school, the lower enrollment of orphans is not accounted for solely by their lower wealth. Furthermore, contrary to existing literature, we do not find that female orphans are disadvantaged relative to males. Instead, our results suggest that the special disadvantage orphans face is primarily due to their living arrangements. Across a large number of sub-Saharan African countries we find, consistent with *Hamilton's rule*, that the degree of relatedness between orphans and their adult caregivers is highly predictive of children's outcomes. The reduced enrollment of orphans will have long run consequences both for these children's lives, and for the long-run prospects for the countries in which they are being raised.

These results are different from some existing evidence on this topic, and have very different implications for policies designed to increase the living standards and educational attainment of children in areas where orphanhood is prevalent  One issue under active debate is whether policies should specifically target orphans, or whether policies should instead be targeted toward poor children. Recent work argues that the disadvantage that orphans face is driven by poverty, and there is no rationale for directing resources towards orphans in favor of equally poor non-orphans (Lundberg and Over 2000, Ainsworth and Filmer 2002).

Our findings, that orphans are less likely to be in school than non-orphans with whom they live, and that the lower within-household enrollment of orphans does not decline as

household wealth rises, call for a more nuanced approach. If the goal of policy is to increase educational investments in poor children—either on equity grounds or because it is thought that credit constraints preclude poor families from making optimal investments—then targeting policies towards poor families makes sense. At the same time, if there is intra-household discrimination against orphans, policies that result in optimal investment levels in non-orphans will leave orphans at less-than-optimal investment levels. Correcting any bias against orphans requires policies that are directed towards orphans. Furthermore, policies that provide income support to households that contain orphans may do little to increase investments in orphans. Instead, policies aimed at reducing the bias against orphans should operate by reducing the price of investments in orphans relative to non-orphans, for example through educational subsidies or non-transferable vouchers for schooling that are earmarked for orphans.

Our finding that investments are higher among orphans that are cared for by "closer" relatives might suggest that policies aimed at keeping orphans with close kin may be beneficial. However, we currently know too little about the processes that determine orphans' living arrangements to draw firm conclusions on this issue.

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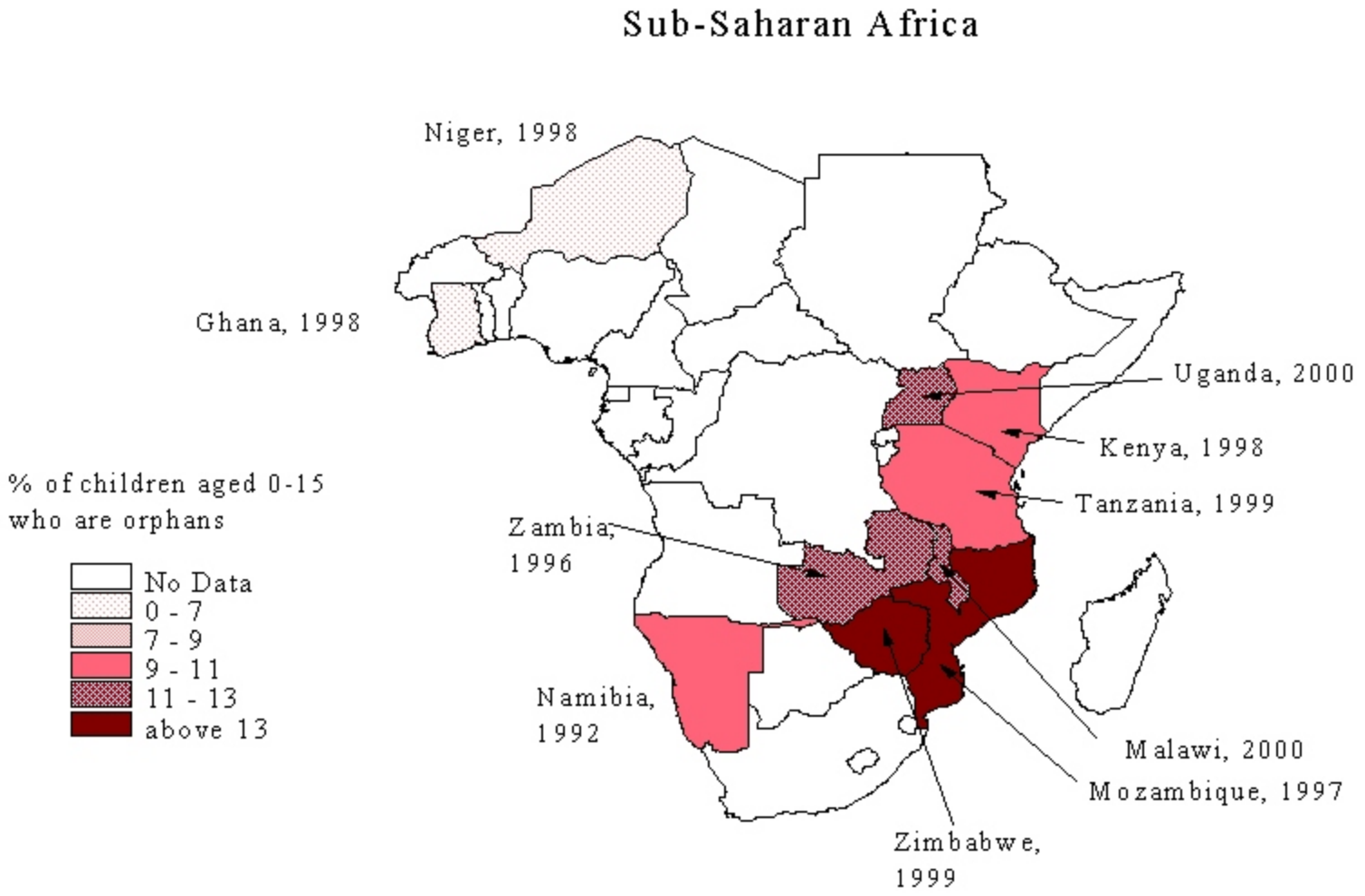


**Figure 1**: Rate of orphanhood, DHS data

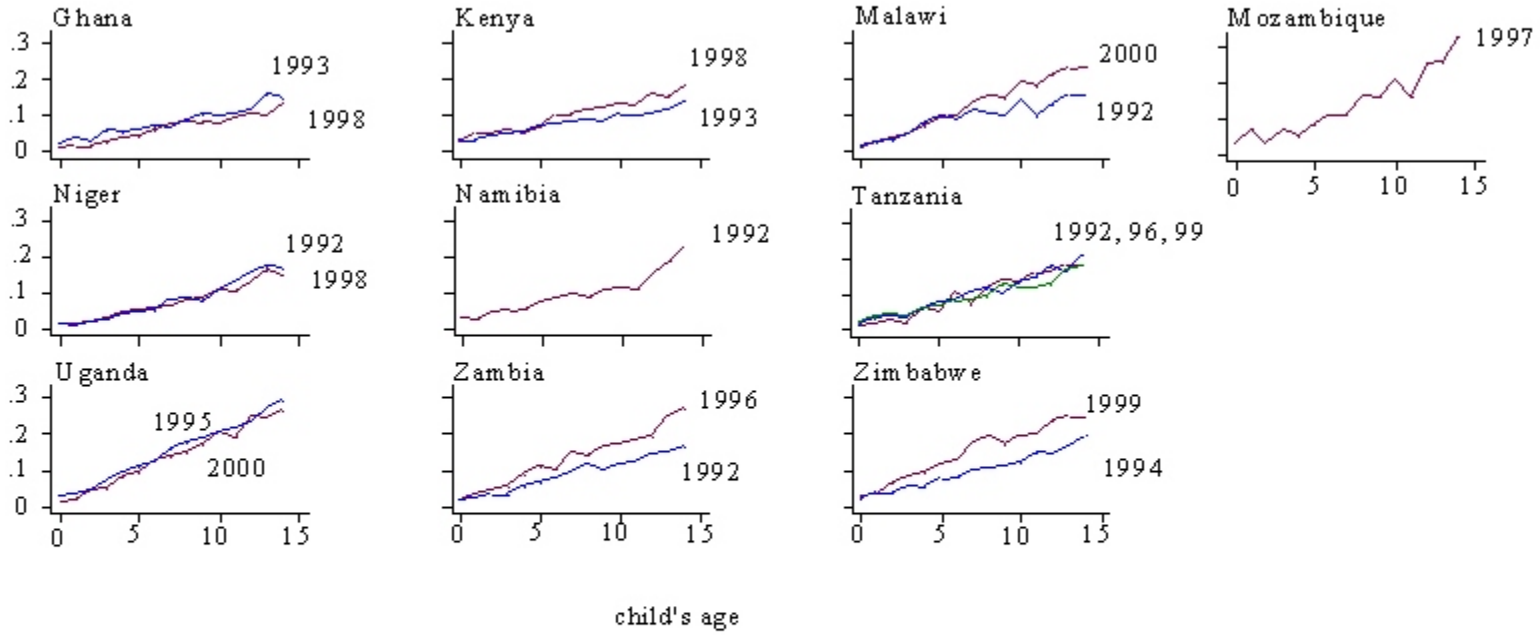


**Figure 2**: Rates of orphanhood by child's age and year, DHS data

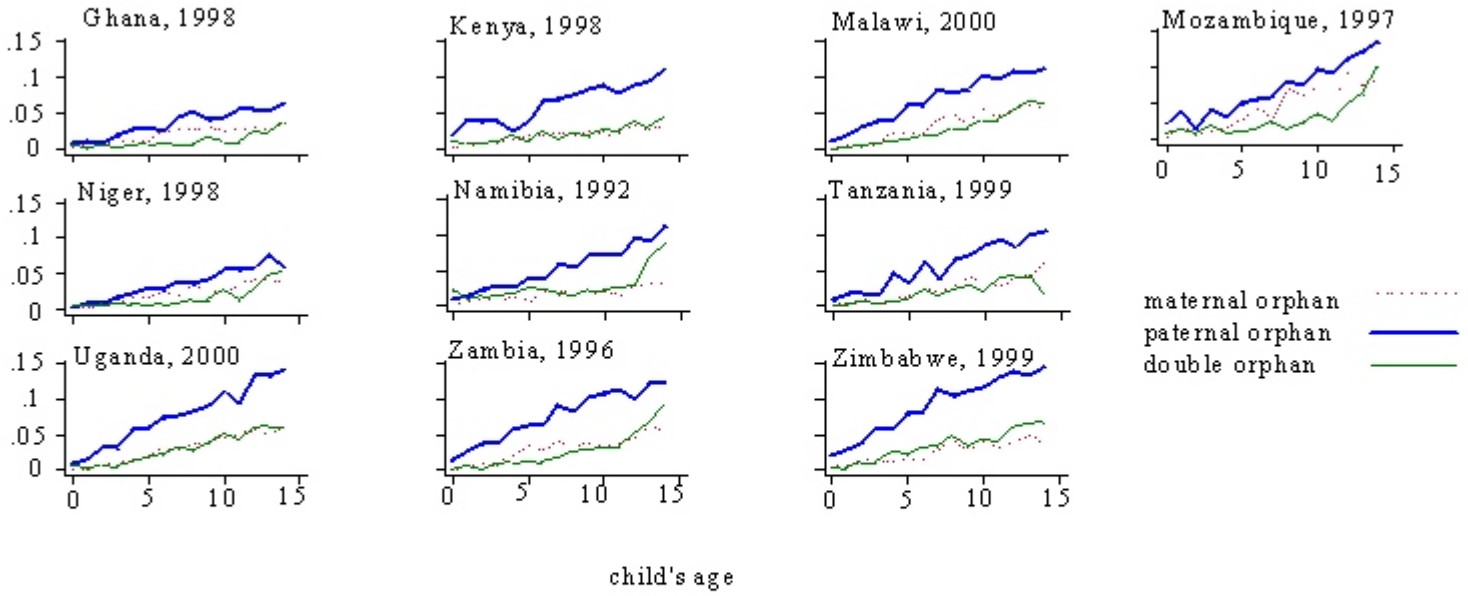


**Figure 3**: Rates of paternal, maternal and double orphans, by child's age

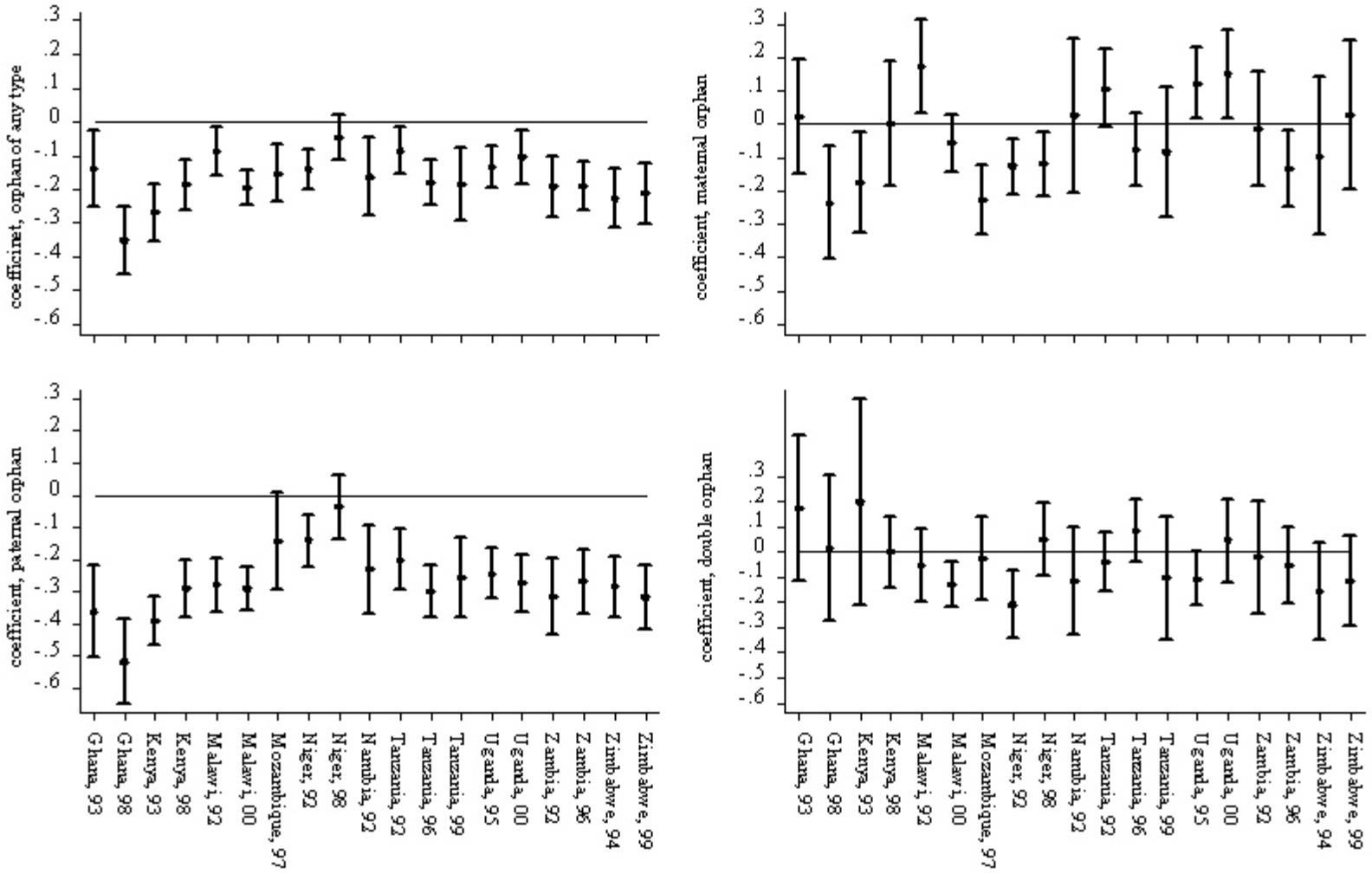


**Figure 4**: Coefficient estimates and confidence intervals. Regressions of household durables on orphan indicators and indicators for child's age and sex. See Table III for details.

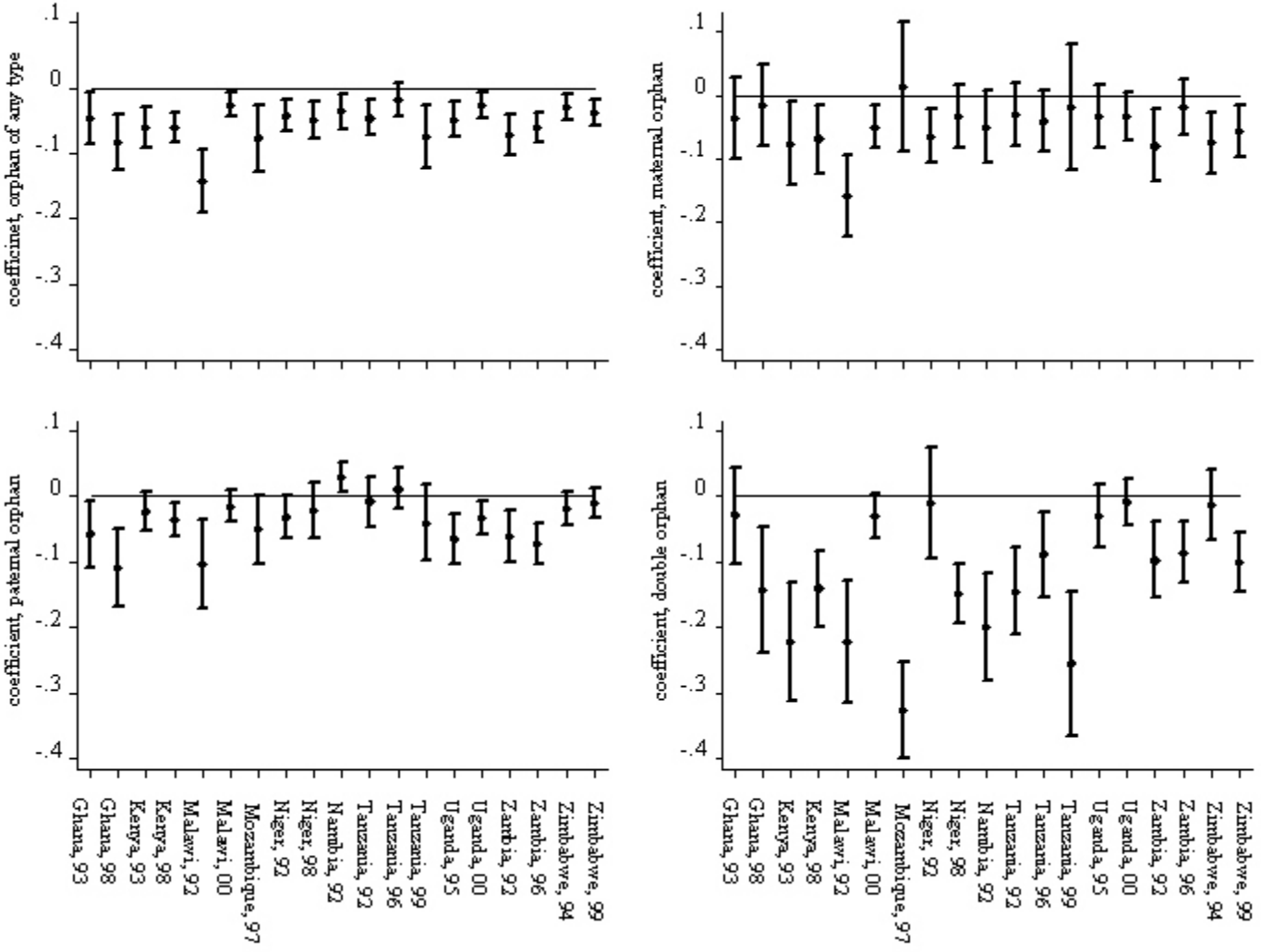


**Figure 5**: Coefficient estimates and confidence intervals. Regressions of indicators of school enrollment on orphan indicators and indicators for child's age and sex. See Table III for details.

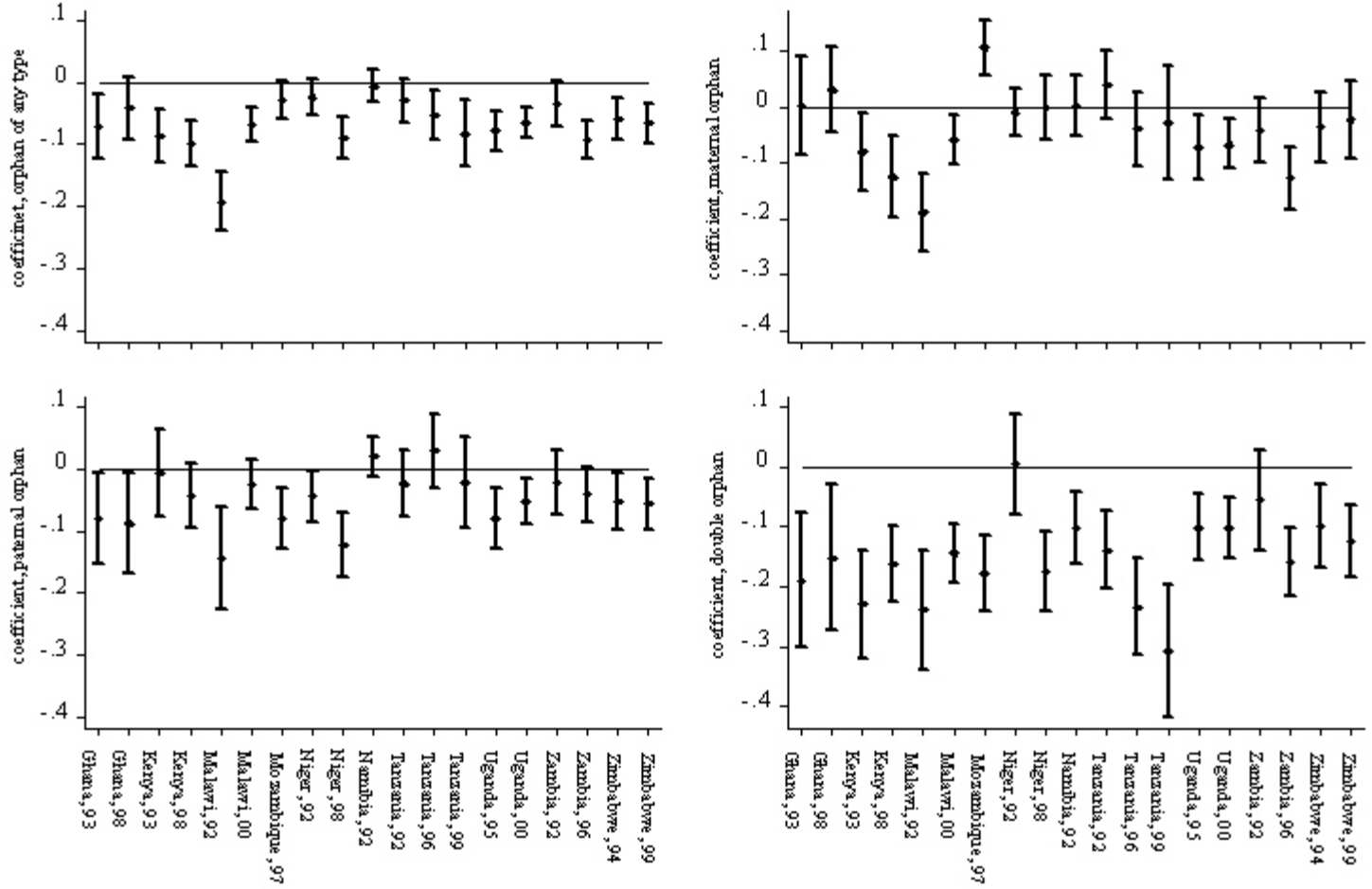


**Figure 6**: Coefficient estimates and confidence intervals. Regressions of indicators for school enrollment on orphan indicators, indicators for child's age and sex, and household fixed effects. See Table III for details.

Table 1. Rates of orphanhood, DHS data

| | Number of children | maternal orphan | paternal orphan | double orphan | orphan of any type |
|---|---|---|---|---|---|
| Ghana 1993 | 10,395 | 0.017 | 0.042 | 0.018 | 0.077 |
| Ghana 1998 | 9,783 | 0.019 | 0.036 | 0.008 | 0.063 |
| Kenya 1993 | 18,420 | 0.014 | 0.051 | 0.014 | 0.080 |
| Kenya 1998 | 16,881 | 0.018 | 0.065 | 0.019 | 0.102 |
| Malawi 1992 | 11,172 | 0.030 | 0.046 | 0.017 | 0.092 |
| Malawi 2000 | 28,888 | 0.029 | 0.065 | 0.023 | 0.117 |
| Mozambique 1997 | 19,891 | 0.042 | 0.067 | 0.025 | 0.135 |
| Namibia 1992 | 11,123 | 0.015 | 0.050 | 0.030 | 0.095 |
| Niger 1992 | 16,061 | 0.027 | 0.037 | 0.007 | 0.071 |
| Niger 1998 | 17,701 | 0.020 | 0.033 | 0.013 | 0.066 |
| Tanzania 1992 | 20,851 | 0.019 | 0.046 | 0.023 | 0.088 |
| Tanzania 1996 | 17,930 | 0.023 | 0.055 | 0.017 | 0.095 |
| Tanzania 1999 | 8,339 | 0.022 | 0.053 | 0.016 | 0.091 |
| Uganda 1995 | 17,618 | 0.030 | 0.080 | 0.028 | 0.138 |
| Uganda 2000 | 18,449 | 0.029 | 0.072 | 0.027 | 0.127 |
| Zambia 1992 | 15,780 | 0.022 | 0.050 | 0.012 | 0.084 |
| Zambia 1996 | 18,107 | 0.029 | 0.074 | 0.023 | 0.126 |
| Zimbabwe 1994 | 13,244 | 0.019 | 0.065 | 0.016 | 0.100 |
| Zimbabwe 1999 | 11,999 | 0.026 | 0.093 | 0.034 | 0.153 |

Notes: Rates of orphanhood are calculated using all children age 14 and under whose parents are coded as being alive, deceased, or with unknown status. See text, Data and definitions, for details. Rates were calculated using the survey weights provided in the DHS data.

**Table 2. Living arrangements of orphans and other children, DHS data**

| | Non-orphan | Paternal orphan | Non-orphan | Maternal orphan |
|---|---|---|---|---|
| Survey: | fraction who live with mother | | fraction who live with father | |
| Ghana 1993 | 0.823 | 0.705 | 0.593 | 0.610 |
| Ghana 1998 | 0.810 | 0.674 | 0.576 | 0.528 |
| Kenya 1993 | 0.900 | 0.849 | 0.661 | 0.707 |
| Kenya 1998 | 0.895 | 0.849 | 0.687 | 0.540 |
| Malawi 1992 | 0.879 | 0.768 | 0.699 | 0.466 |
| Malawi 2000 | 0.874 | 0.719 | 0.702 | 0.278 |
| Mozambique 1997 | 0.864 | 0.776 | 0.733 | 0.580 |
| Namibia 1992 | 0.688 | 0.549 | 0.444 | 0.190 |
| Niger 1992 | 0.871 | 0.554 | 0.841 | 0.607 |
| Niger 1998 | 0.878 | 0.595 | 0.815 | 0.597 |
| Tanzania 1992 | 0.842 | 0.735 | 0.748 | 0.543 |
| Tanzania 1996 | 0.853 | 0.719 | 0.734 | 0.511 |
| Tanzania 1999 | 0.849 | 0.642 | 0.742 | 0.430 |
| Uganda 1995 | 0.827 | 0.591 | 0.732 | 0.601 |
| Uganda 2000 | 0.840 | 0.655 | 0.744 | 0.493 |
| Zambia 1992 | 0.848 | 0.671 | 0.755 | 0.398 |
| Zambia 1996 | 0.860 | 0.697 | 0.745 | 0.413 |
| Zimbabwe 1994 | 0.814 | 0.678 | 0.576 | 0.388 |
| Zimbabwe 1999 | 0.804 | 0.637 | 0.597 | 0.463 |

Notes: The sample consists of children aged 0-14 years. See text, Data and definitions, for details.

Sample weights were used to compute rates.

**Table 3: Summary of results in Figures 4-6**

| all orphans | maternal orphans | paternal orphans | double orphans |
|---|---|---|---|
| Average coefficients from Figure 4:durable goods, no household controls | | | |
| –0.170 | –0.036 | –0.270 | –0.029 |
| (0.051) | (0.095) | (0.064) | (0.122) |
| Average coefficients from Figure 5: school enrollment, no household controls | | | |
| –0.055 | –0.048 | –0.038 | –0.121 |
| (0.019) | (0.036) | (0.024) | (0.042) |
| Average coefficients from Figure 6: school enrollment, household fixed effects | | | |
| –0.067 | –0.038 | –0.049 | –0.152 |
| (0.023) | (0.039) | (0.034) | (0.048) |

Notes: This table contains unweighted means of the coefficients shown in Figures 4-6. The numbers in parentheses are the square roots of the averaged variances of these estimates. All of the underlying regressions are of an outcome (either the numbers of household durables or an indicator for school enrollment) on an orphan indicator, and indicators for the age and sex of the child. The results in Figure 6 are from regressions that included a set of household fixed effects. All regressions are weighted using survey weights provided by the DHS surveys. The regressions shown in Figure 4 and 5 (without household fixed effects) have standard errors that are corrected for heteroscedasticity at the cluster level.

**Table 4: Effects of co-resident orphans on school enrollment of orphans and non-orphans.**

| | coefficients and standard errors | | | F-tests and p-values | |
|---|---|---|---|---|---|
| | Orphan, non-blended household (1) | Orphan, blended household (2) | Non-orphan, blended household (3) | column 1 = column 2 | column 2 = column 3 |
| Ghana 1998 | –0.117 | –0.015 | 0.047 | 4.21 | 2.76 |
| | (0.031) | (0.039) | (0.034) | (0.041) | (0.098) |
| Kenya 1998 | –0.038 | –0.105 | 0.006 | 3.74 | 9.34 |
| | (0.015) | (0.033) | (0.018) | (0.054) | (0.002) |
| Malawi 2000 | –0.017 | –0.039 | 0.036 | 1.01 | 15.76 |
| | (0.014) | (0.017) | (0.015) | (0.315) | (0.000) |
| Mozambique 1997 | –0.074 | –0.048 | –0.009 | 0.23 | 0.73 |
| | (0.034) | (0.050) | (0.036) | (0.635) | (0.394) |
| Namibia 1992 | –0.087 | –0.005 | 0.010 | 5.49 | 0.69 |
| | (0.033) | (0.016) | (0.018) | (0.020) | (0.407) |
| Niger 1998 | –0.045 | –0.040 | 0.028 | 0.05 | 8.79 |
| | (0.018) | (0.021) | (0.019) | (0.828) | (0.003) |
| Tanzania 1999 | –0.048 | –0.055 | 0.015 | 0.02 | 2.71 |
| | (0.035) | (0.040) | (0.036) | (0.875) | (0.102) |
| Uganda 2000 | –0.028 | –0.024 | 0.035 | 0.03 | 9.63 |
| | (0.016) | (0.020) | (0.015) | (0.853) | (0.002) |
| Zambia 1996 | –0.037 | –0.071 | 0.019 | 1.65 | 17.96 |
| | (0.018) | (0.020) | (0.017) | (0.200) | (0.000) |
| Zimbabwe 1999 | –0.027 | –0.062 | –0.014 | 2.13 | 4.10 |
| | (0.014) | (0.022) | (0.022) | (0.146) | (0.044) |

Notes: Each row represents coefficients from a single regression of school attendance on a set of orphan measures (coefficients and standard errors shown) and other controls. See text for details. Regressions are weighted using sample weights, and standard errors are corrected for cluster-level heteroskedasticity.

**Table 5: Orphanhood and the relationship to household head**

| relationship to head: | non-orphans | maternal orphans | paternal orphans | double orphans |
|---|---|---|---|---|
| son/daughter | 77.82 | 47.61 | 48.17 | 0.00 |
| grandchild | 11.75 | 23.48 | 20.06 | 32.02 |
| brother/sister | 1.21 | 4.25 | 6.09 | 9.37 |
| other relative | 6.50 | 18.42 | 16.42 | 29.26 |
| adopted/foster child | 1.72 | 4.15 | 7.23 | 25.24 |
| non-relative | 0.99 | 2.08 | 2.03 | 4.10 |

Notes: 164,689 observations. The data are for all children aged 6-14 whose orphan status can be determined. These frequencies are based on pooled data from all countries and years, and are not weighted. 20.85 percent of double orphans were originally classified as being the "son" or "daughter" of the household head, and we re-classified these children as adopted/foster children. We also re-classified children to be adopted/foster children if they were: 1) maternal orphans who were originally classified as sons or daughters of the head in female-headed households, or 2) paternal orphans who were originally classified as sons or daughters of heads on male-headed households. Only 0.8 percent of maternal orphans and 1.34 percent of paternal orphans were re-classified.

**Table 6: School enrollment, orphanhood, and the relationship to the household head. Household fixed effects included.**

| | Ghana 1998 | Kenya 1998 | Malawi 2000 | Mozam-bique 1997 | Namibia 1992 | Niger 1998 | Tanzania 1999 | Uganda 2000 | Zambia 1996 | Zimbabwe 1999 |
|---|---|---|---|---|---|---|---|---|---|---|
| Panel A | | | | | | | | | | |
| orphan | –0.043 | **–0.100** | **–0.069** | –0.030 | –0.007 | **–0.091** | **–0.084** | **–0.065** | **–0.092** | **–0.066** |
| | (0.031) | **(0.022)** | **(0.016)** | (0.019) | (0.016) | **(0.021)** | **(0.032)** | **(0.015)** | **(0.018)** | **(0.019)** |
| Panel B | | | | | | | | | | |
| grandchild | 0.005 | –0.035 | **–0.058** | **–0.060** | –0.033 | –0.032 | –0.019 | 0.010 | **–0.044** | –0.040 |
| | (0.034) | (0.025) | **(0.020)** | **(0.032)** | (0.020) | (0.026) | (0.039) | (0.015) | **(0.026)** | (0.024) |
| brother/sister | –0.029 | **–0.122** | **–0.142** | **–0.182** | –0.011 | **–0.101** | –0.064 | –0.037 | **–0.104** | **–0.128** |
| | (0.088) | **(0.065)** | **(0.044)** | **(0.050)** | (0.056) | **(0.059)** | (0.078) | (0.055) | **(0.050)** | **(0.055)** |
| other relative | **–0.068** | **–0.106** | **–0.067** | **–0.184** | **–0.037** | **–0.101** | –0.034 | **–0.097** | **–0.157** | **–0.091** |
| | **(0.030)** | **(0.024)** | **(0.022)** | **(0.024)** | **(0.017)** | **(0.026)** | (0.036) | **(0.019)** | **(0.021)** | **(0.025)** |
| adopted/foster child | –0.009 | **–0.063** | –0.029 | –0.010 | 0.035 | **–0.074** | **–0.106** | 0.007 | 0.009 | –0.042 |
| | (0.046) | **(0.039)** | (0.039) | (0.031) | (0.050) | **(0.026)** | **(0.064)** | (0.029) | (0.037) | (0.044) |
| non-relative | **–0.326** | **–0.790** | **–0.762** | **–0.597** | **–0.073** | **–0.182** | **–0.532** | **–0.432** | **–0.433** | **–0.496** |
| | **(0.076)** | **(0.039)** | **(0.041)** | **(0.062)** | **(0.025)** | **(0.042)** | **(0.101)** | **(0.045)** | **(0.096)** | **(0.080)** |
| orphan | –0.026 | –0.005 | **–0.032** | **0.038** | –0.003 | **–0.047** | **–0.059** | **–0.037** | **–0.043** | **–0.041** |
| | (0.031) | (0.023) | **(0.017)** | **(0.020)** | (0.016) | **(0.023)** | **(0.033)** | **(0.016)** | **(0.020)** | **(0.020)** |
| F-test (p-value): grandchild=other relative | 2.89 | 4.63 | 0.09 | 11.41 | 0.04 | 4.07 | 0.11 | 13.60 | 13.03 | 2.44 |
| | (0.089) | (0.031) | (0.762) | (0.001) | (0.834) | (0.044) | (0.745) | (0.000) | (0.000) | (0.119) |
| F-test (p-value): other relative=nonrelative | 10.14 | 245.93 | 240.20 | 45.65 | 1.90 | 2.91 | 22.35 | 51.31 | 8.23 | 23.88 |
| | (0.002) | (0.000) | (0.000) | (0.000) | (0.168) | (0.088) | (0.000) | (0.000) | (0.004) | (0.000) |
| observations | 5,585 | 9,797 | 16,109 | 10,377 | 5,310 | 9,012 | 4,702 | 10,053 | 9,951 | 6,922 |

Notes: Panel A shows the coefficient on an indicator that the child is an orphan (of any type) from a regression of school enrollment on an orphan indicator, an indicator for the age and sex of the child, and a set of household fixed effects. The regressions shown in Panel B add a set of indicators for the relationship of the child to the household head. All regressions are weighted using sample weights. Standard errors in parentheses. The sample is of all children ages 6-14 who live in households in which all children in this age group can be identified as "orphans" or "non-orphans." Estimates in **bold** type are significant at the 10% level of better.