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The Impact of Adult Mortality on Primary School Enrollment in Northwestern Tanzania

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Foreword

The AIDS epidemic in Sub-Saharan Africa has already taken the lives of 18 million people, almost all of them adults, and 28 million more are living with HIV/AIDS. Given the high fertility and family size on the continent, millions more children are affected—both children who are orphaned and other children in households that lose prime-aged adults. Two recent World Bank publications have highlighted the impacts and implications from the perspectives of social protection and education policy. *Social Protection of Africa's Orphans and Other Vulnerable Children* (Subbarao and others, 2001, in this series) documents the breadth of welfare impacts on orphans and vulnerable children and programs to mitigate them. The policy paper *Education and HIV/AIDS: A Window of Hope* (Bundy and others 2002, World Bank Human Development Network, forthcoming) assesses the impact of orphan status on the supply and demand for schooling across the continent in the context of Sub-Saharan Africa's struggle to reach the goal of a basic "Education for All" by 2015. Both of these studies conclude that while the evidence of a problem is great, there are many information gaps. Evidence for a particular country on the magnitude and nature of the impacts and the policy implications cannot be applied to other countries, since they depend on the scope of the AIDS epidemic, social structures, the distribution of poverty, existing and past safety nets, and schooling policies. There is thus no single recom-

mended "solution" or "best practice intervention" in social protection or education for African countries affected by AIDS.

This study responds to the call for greater analysis of the problem in different country contexts by examining the impact of adult mortality and orphan status on primary school enrollment in Tanzania. Enrollment rates for both primary and secondary schooling in Tanzania are below the average for Africa and the secondary enrollment rate is among the lowest in the world. More than 80 percent of children who enroll in the first year of primary school do so at ages eight and older, a year beyond the mandatory enrollment age of seven. In the Kagera Region, where the study took place, HIV infection rates in the late 1980s ranged from less than 1 percent to as high as 25 percent; the AIDS epidemic had driven the adult mortality rate to levels three times higher than expected. The study uses longitudinal household data from a living standards survey collected on a relatively large sample, supplemented with detailed information on the quality and availability of local primary schools. This allowed the authors to isolate the impact of orphan status and of the recent death of an adult net of the other factors that affect enrollment. The enrollment of orphans and children in households with a recent death can be compared using statistical "controls" to that of non-orphaned children and those in households with no deaths.

The authors find that the children whose enrollment was most affected at the primary level were maternal orphans and children in poor households suffering an adult death. In the prevailing conditions in Tanzania, enrollment of maternal orphans was delayed compared to the enrollment of other children, exacerbating the existing problem of late enrollments. Once enrolled in primary school, orphans had similar enrollment rates as non-orphans; children in this region of Tanzania hard-hit by the AIDS epidemic, on average, did not tend to drop out of primary school to cope with a recent adult death. The study also offers the first evidence of adverse impacts of adult deaths on children whose parents are alive: the enrollment of non-orphaned children in poor households was also delayed following an adult death, while this was not the case in non-poor households. The authors point out that there are several additional dimensions of educational outcomes that they could not investigate, in-

cluding the impact of adult mortality on primary completion rates and learning outcomes. The impact of adult mortality on schooling outcomes at the secondary level remains to be studied.

This study serves as an important reminder that in many of the hardest-hit countries, the AIDS epidemic is exacerbating long-standing problems of low enrollments and educational outcomes, making their resolution even more urgent. Policies that address the root causes of these problems, as well as those that address the specific problems faced by orphans and children in affected households, are both important to improving educational outcomes of the most vulnerable children.

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Contents

I. Introduction	1
II. Factors affecting the demand for schooling	4
III. The setting and the data	7
The setting	8
The dataset	8
Demographic characteristics of the children	9
Characteristics of the primary schools in the sample	10
IV. The determinants of school enrollments in Kagera	12
The impact of adult mortality on primary enrollment	12
Multivariate analysis	15
V. Conclusion	22
References	24
Annex I	26

I

Introduction

The AIDS epidemic is making orphans out of many of Africa's children, and threatens to reverse hard-won gains in raising school enrollments. Because HIV in Africa is transmitted primarily through heterosexual contact, the epidemic is having a dramatic impact on the mortality of men and women in their prime childbearing and earning years, doubling or tripling mortality rates of adults 15–50 (Boerma et al. 1998).¹ The combination of high parent mortality and large family size has produced a tragic result: one in ten African children under the age of 15 is an orphan, having lost one or both parents (Hunter and Williamson 2000).²

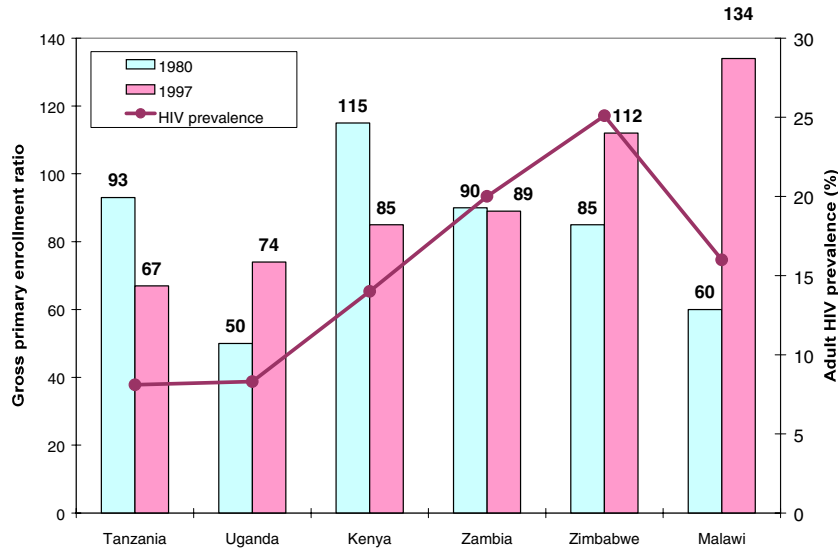
The loss of a parent could reduce a child's chances of starting, continuing, or completing school. Families may be unable to pay school fees, the demand for a child's time at home may increase, and guardians may be less willing to invest in the child's long-term welfare. Schooling has important private and social benefits, affecting a child's long-term productivity, earning capacity, health, and well-being (see, for example, Psacharopoulos and Woodhall 1985, and Strauss and Thomas 1995).

The AIDS epidemic in Africa often strikes countries with already low enrollments and low incomes. The average gross primary enrollment ratio (GPER)—the number of children enrolled as a percent of the total number of children of school age—was only 77 percent for Sub-Saharan Africa in 1996.³ In addition, the performance of African countries in raising enrollment rates has varied greatly. Fig-

ure 1 presents the change in gross primary enrollment ratios between 1980 and 1997 for six eastern and southern African countries with 1998 per capita incomes ranging from \$210 in Malawi to \$620 in Zimbabwe. Despite low incomes, some of these countries have seen marked improvements in enrollment ratios. Both Malawi and Zimbabwe, for example, raised their GPER to over 100 percent. However, the GPER has been stagnant in Zambia and declined in both Kenya and Tanzania. The drop in Tanzania has been particularly large; it now has the lowest GPER—67 percent—of any of these countries. All of these countries are hard-hit by the AIDS epidemic, with infection levels ranging from 8 percent of adults in Tanzania and Uganda to 25 percent of adults in Zimbabwe. Although AIDS may have contributed to declines in enrollment rates within these countries, when we look across the countries in Figure 1, HIV infection does not appear to be the driving force behind low enrollment rates. In fact, with the exception of Malawi, the countries with higher HIV prevalence have higher 1997 enrollment rates. Most of the differences in enrollment rates are no doubt due to differences in income and public spending: Zambia and Uganda spend less than 3 percent of GNP on education, while Zimbabwe spends more than 8 percent.

The international community now seems ready to fund programs to mitigate the impact of adult AIDS mortality, including the impact on children's schooling (Copson 2000). Many programs have been

Figure 1
Gross primary enrollment ratios, 1980 and 1997, and HIV prevalence rates—
selected African countries



Source: World Bank (2000) and UNAIDS (2000).

launched or proposed to support the school fees, uniforms, and other inputs of orphaned children (Hunter and Williamson 2000, Reid 1993). However, the evidence for the impact of adult mortality on schooling in these countries is largely anecdotal, or sometimes simply speculative (Gachuhi 1999). Evidence is often based on nonrepresentative samples and case studies of severely affected children, with no control group (Kitonsa et al. 2000). Although such adverse impacts cannot be disputed, from the public policy perspective it is important to understand how typical these outcomes are, which children are most affected, and which policy instruments are likely to have the greatest impact in raising enrollments.

The goal of this study is to measure the impact of adult deaths and orphan status on household decisions to enroll children in primary school. We also identify the characteristics of children with the lowest schooling and the policy variables that will raise enrollments. We focus on the enrollment of children age 7–14, using data from a longitudinal household survey conducted from 1991–1994 in Northwestern

Tanzania. We find that Tanzanian households are coping with adult deaths by delaying enrollment of young children (7–10), while maintaining enrollment of older children (11–14). Among orphans, only young maternal orphans are being held back—but they eventually enroll at the same rates as other children. The impact of a recent adult death on delayed enrollment depends on the economic status of the household—that is, children in low-income households have delayed enrollment following an adult death, while the enrollment of children in better-off households is not affected.

The sequence of this paper is as follows: Following this Introduction, Section II provides an overview of the factors that affect school enrollments and the channels through which adult deaths can have an impact. Section III describes the setting and the dataset. Section IV presents descriptive and multivariate regression results on the determinants of school enrollments. Finally, Section V summarizes the findings and discusses the policy implications.

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- 1 In Sub-Saharan Africa, 55 percent of adult HIV infections are among women (UNAIDS 2000).
 - 2 In some cases, war has also elevated the adult mortality rate and created many orphans.
 - 3 The gross primary enrollment ratio is defined as the number of children enrolled in primary school as a percent of all children of primary school age. It can exceed 100 percent because many children enrolled in primary school are older than they should be for that grade, because of delayed enrollment and repetition. The net enrollment ratio is the ratio of the number of children enrolled and of primary school age as a percent of all children of primary school age.

II

Factors affecting the demand for schooling

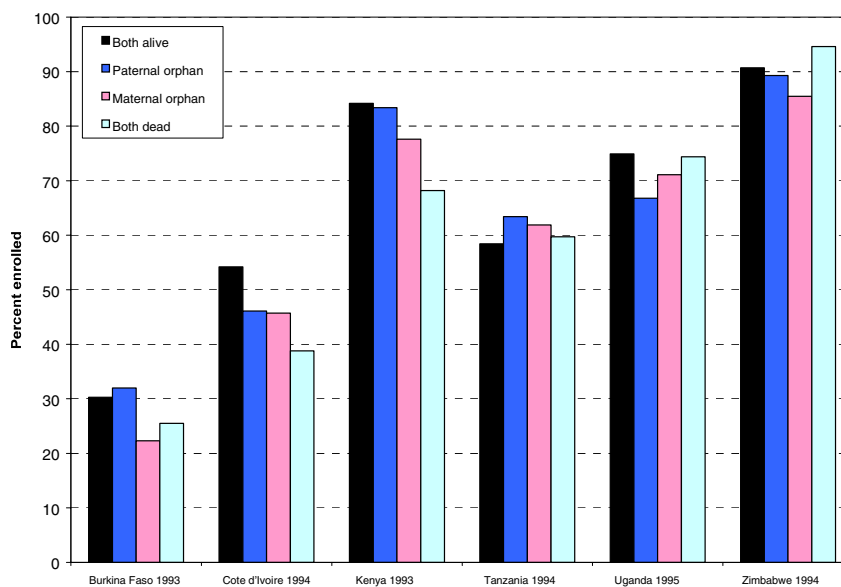
Schooling is both an investment and a consumption good. It represents an investment by parents in the future productivity and earnings of children, which affects the well-being of both parents and children in the long run. To the extent that parents also receive direct utility from the satisfaction of having "educated" children, it can also be seen as a consumption good. The factors affecting parents' decisions to enroll their children will include the costs and benefits of schooling, both now and in the future, and household budget constraints. Specifically, this includes:⁴

- The intrinsic value parents place on an "education"
- The expected long-run benefits of schooling, in terms of increased earning capacity and employment opportunities
- The quality of schooling available, which affects the economic "returns" that can be expected from an additional year of instruction
- The household's current income and its ability to borrow for school expenses against future earnings
- The parents' or guardians' assessment of the child's innate ability
- The value of the child's time in productive activities inside and outside the home (his/her "opportunity cost" of schooling)
- The other costs of schooling, including school fees, uniforms, the costs of other schooling inputs, and the availability of schools.

Enrollment decisions will depend on the intrinsic value of schooling to parents, the expected long-run benefits of schooling, the quality of schooling, household income or ability to borrow, and the child's innate ability—the higher these factors, the higher the enrollment rate. But, higher schooling costs and a high value on the child's time in the present will also likely reduce enrollment.

Adult deaths affect enrollment decisions through their impact on this same set of variables. For example, when an adult dies, household income may be lower, and the remaining members may be unable to afford school fees, uniforms, or text books—even if they think that schooling is a good investment. When an adult contracts a fatal illness, the opportunity cost of the child's time may also increase: the child may be needed to care for the patient or replace the patient in different economic activities. As a result, the child may attend fewer hours or drop out of school; or, young children may either be delayed in their enrollment or never enroll at all. In a broad sense, high adult mortality from AIDS may indirectly affect the schooling calculations of households without deaths—both by altering the scarcity of different kinds of labor (raising the wages of jobs in which there is insufficient manpower) and by affecting the parents' calculations of their children's probability of survival into prime-aged adulthood. If parents believe that their children are unlikely to survive into early adulthood, they might make fewer investments in child schooling.

Figure 2
Enrollment rates by orphan status, children 7–14



Source: Demographic and Health Surveys.

Figure 2 presents enrollment rates for children 7–14 by orphan status, drawing on data from the Demographic and Health Surveys (DHS) for six African countries in the early 1990s. The extent to which one-parent or two-parent orphans are under-enrolled compared to children with living parents depends on the country. Two-parent orphans are substantially under-enrolled in Burkina Faso, Côte d'Ivoire, and Kenya.⁵ A striking fact about Figure 2 is that the differentials in enrollment among orphans are swamped by the overall pervasive under-enrollment (especially in the Francophone countries), even for children with living parents. This under-enrollment is even more shocking at the secondary level (not shown).

Few studies have measured the impact of orphan status on enrollment and simultaneously examined the impact of other important determinants. Lloyd and Blanc (1995) use a multiple regression model that controls for living standards to predict the enrollment rates of children aged 10–14 in seven African countries (Cameroon, Kenya, Malawi, Namibia, Niger, Tanzania, and Zambia). They could not find a statistically significant impact of being a maternal

orphan or a paternal orphan on school enrollments in Tanzania, which had a lower enrollment rate than all of the other countries except Niger. However, in Kenya there was a statistically significant but relatively small difference in enrollment between paternal orphans (89 percent) and children with living fathers (93 percent). In Malawi, the differences were statistically significant and large, with maternal orphans having a 20 percent lower enrollment rate than children with living mothers (47 vs. 67 percent) and paternal orphans with a 7 percent lower rate than children with living fathers (60 vs. 67 percent). Kitonsa et al. (2000) study a sample of orphans in Entebbe, Uganda (with no control group of children with living parents) and find that their enrollment rate (88 percent) was higher than the national average, which they credit to the traditional extended family, the government universal primary enrollment plan, and, possibly, nongovernmental organizations (NGOs) operating in the area.⁶ In a study in three districts of Western Kenya, Conroy et al. (2000) found lower enrollment rates among orphans than non-orphans and, among orphans, lower rates among AIDS orphans.⁷

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- 4 In most countries enrollment up to a certain level of schooling is mandated by law. However, in countries like Tanzania that do not have sufficient resources to provide an adequate school infrastructure, these legal constraints can be considered non-binding.
- 5 The differentials in enrollment between orphans and non-orphans may also be affected by the presence of local public or private programs already targeting orphaned children for schooling subsidies. Note also that even in a large national sample, the number of two-parent orphans is very small. In the 1991–92 national Tanzania DHS, for example, among the 10,027 children 7–14, only 69 were two-parent orphans.
- 6 The area was also semi-urban, which could account for higher than average enrollment rates.
- 7 The differentials in enrollment were quite large in this study, but no information is available on the way in which the sample was selected. Of the 2,847 children in the study, 43 percent were AIDS orphans, 18 percent were orphans due to other causes, and 40 percent were non-orphans; it is not known the extent to which children in each category might be representative of the larger population of children. However, over half of the AIDS orphans in the sample were two-parent orphans, which is a much higher rate than found in the general population of orphans. Thus, it is difficult to generalize the results of this study.



The setting and the data

Tanzania is a low-income East African country (1998 GNP/capita of \$220) where, in the early 1990s, 51 percent of the population was living below the poverty line. The net primary enrollment ratio (NPER)—taking into account only children of primary school age—was only 48 percent in 1997, among the lowest in Africa, having declined from 68 percent in 1980. Current enrollment ratios for both primary and secondary education in Tanzania are below the African average, and its secondary education enrollment ranks among the lowest in the world.

The Tanzanian education system consists of a seven-year primary school cycle, followed by four years of lower secondary and two years of upper secondary school.⁸ Government runs virtually all the primary schools, and primary schooling is compulsory. Children are expected to start at age seven, but in fact 84 percent start later. The average age at first enrollment for girls is about nine years old, and for boys is nearly ten. There are both supply-side and demand-side explanations of late enrollment. On the one hand, because of overcrowding, school authorities often first admit the oldest children who have not yet enrolled. On the other hand, parents often keep their younger children out of school to help with household tasks. Focus group studies have suggested that parents enroll their daughters earlier, so that the girls may complete primary school before reaching puberty; enrollment of sons is delayed in order that they be of working age when they finish primary school. Poorer children are more

likely to have delayed enrollment (Mason and Khandker 1997).

There is a national diagnostic examination at the end of standard 4, midway through primary school, to determine whether the child is ready to advance to standard 5. About 80 percent of the children are allowed to continue, 15 percent repeat standard 4, and 5 percent drop out. Because of the late starts and repetition, children may be quite old when they complete primary school. In 1992, 16 percent of children enrolled in standard 7 were 17 years of age or older. Drop out rates are also high: of the cohort entering standard 1 in 1984, 42 percent dropped out before reaching standard 7. Access to secondary schools is restricted, and admission is governed by the results of an examination. On average, 5–7 percent of children who complete standard 7 are admitted to a government secondary school. Secondary enrollment rates, therefore, are extremely low—a gross secondary enrollment ratio of only 6 percent in 1997. The quality of schooling and education infrastructure have been deteriorating rapidly (Omari and Mosha 1997; Roy-Campbell 1992; TADREG 1993), and only recently has the private sector been encouraged to expand provision of secondary education. Parents are increasingly reluctant to send their children to school, given the low expected returns coupled with the cost of schooling and the opportunity cost of children's time (TADREG 1993). Using data from the 1990/91 Labor Force Survey, Mason and Khandker (1997) estimated

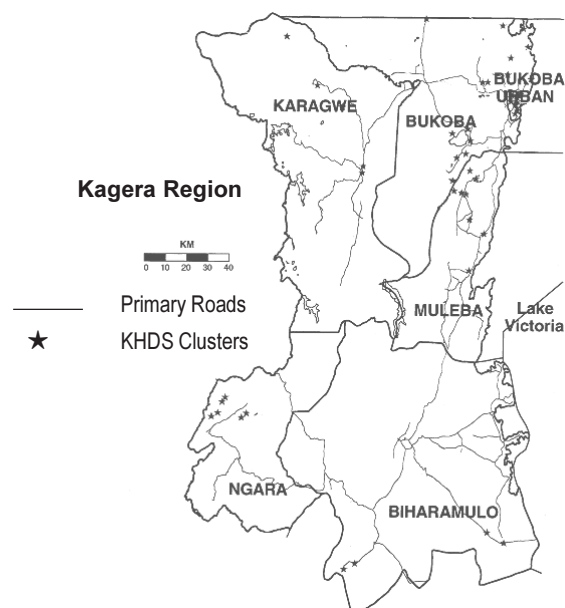
that the average return per year of primary school in Tanzania was only 7.9 percent, which they assert is low compared to other developing countries.

A previous study of the determinants of enrollment using the nationally representative Tanzania Human Resources Development Survey (THRDS) found that enrollment in 1993–94 was not strongly influenced by the monetary costs of schooling (Mason and Khandker 1997). The Universal Primary Enrollment (UPE) fee charged at the time of the first wave of the survey used in this paper in 1991–92 was 200 Tanzania shillings (Tsh), or about 91 cents (US).⁹ The schools retain this fee and use it to finance an annual school plan approved by the school committee (E. Malangalila, personal communication).¹⁰ The 1993–94 THRDS found that uniforms were 48 percent of primary school costs, followed by contributions and fees (20 percent), and supplies (20 percent) (World Bank 1999b).

The setting

The Kagera Region of northwestern Tanzania has been especially hard-hit by the AIDS epidemic. Kagera is located on the western shore of Lake Victoria, bordering Uganda to the north and Rwanda and Burundi to the west (Figure 3). Its overwhelmingly rural population (1.3 million in 1988) is primarily engaged in producing bananas and coffee in the north and rain-fed annual crops (maize, sorghum, cotton) in the south. A population-based seroprevalence survey of the region's population in 1987 found levels of HIV infection among adults ranged from less than 1 percent in the rural southern part of the region to 10 percent in the rural north, and 24 percent in the regional capital of Bukoba. In addition to the AIDS epidemic, the region suffered considerably from the 1979 war with Uganda and from an infestation of pests and diseases that reduced banana output. At the time of the survey, HIV infection rates in Kagera were higher than in the rest of Tanzania. In addition, orphan rates were at least one-third higher than the national average (based on DHS data), and primary and secondary school enrollment rates were below the national average. Within Kagera, the net primary rate fell

Figure 3
Map of Kagera



from 58 percent in 1978 to 44 percent in 1988, with essentially no difference by gender (TADREG 1993).

The dataset

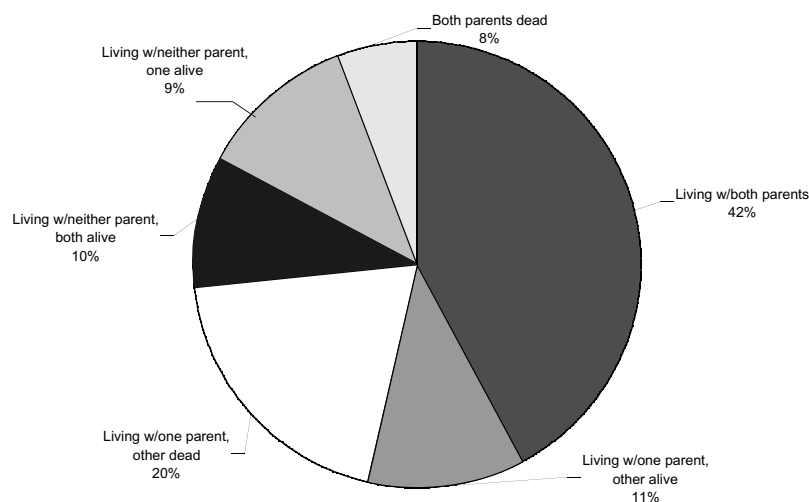
We use the Kagera Health and Development Survey (KHDS), a longitudinal socioeconomic survey of more than 800 households, conducted from 1991–94 throughout the region (see Ainsworth et al. 1992 and World Bank 1993). The KHDS household sample was stratified based on the agro-climatic features of the region, levels of adult mortality in communities, and indicators of elevated adult illness or mortality. The survey aimed to interview each household four times, at 6–7 month intervals. Of the 816 households initially selected, a total of 757 completed all four waves of the survey. Households that moved out of the sample were replaced, so that a total of 915 households were interviewed. The KHDS household questionnaire is based on the World Bank's Living Standards Measurement Survey, modified for a longitudinal research design to explicitly capture the impact of adult mortality. In addition to collecting detailed measures of household consumption expenditure and income, as well as information on all individuals who died in a re-

cent time period, the survey interviewed each household member to obtain demographic characteristics, survivorship of parents, labor force participation and economic activities, acute and chronic health conditions, school enrollments, migration, and fertility. The KHDS also surveyed community leaders and all primary schools in the survey cluster. (The questionnaire and research design are described in Ainsworth et al. [1992]).

This study uses the sample of children aged 7–14 from all four waves of interviews, from September 1991 to January 1994. However, because some households dropped out of the survey and some joined to replace them, we will—for the purposes of comparing the indicators for children between the first and last interview—restrict ourselves to the 1,213 children 7–14 in the 757 households interviewed four times.¹¹ We select seven years of age as the lower bound, since this is the age at which children are legally supposed to enroll in primary school, which lasts seven years. Many children over the age of fourteen are still enrolled in primary school because of repetitions and late enrollment. However, many will also be enrolled in secondary school, which in Tanzania involves more restricted access and a different set of policy variables. Therefore, we restrict ourselves to analyzing essentially primary enrollment for children aged 7–14.

We study the impact of two measures of adult mortality on current school enrollment: (1) whether the child is an orphan, and (2) whether any prime-aged adult household member (15–50) has recently died (in the past 6–7 months).¹² By definition an orphan has lost the person(s) likely to be most concerned with his/her welfare. If other relatives do not receive the same satisfaction or benefits from investing in the schooling of a child that is not theirs, then orphans may have permanently lower enrollment,

Figure 4
Distribution of children 7-14 by living arrangement

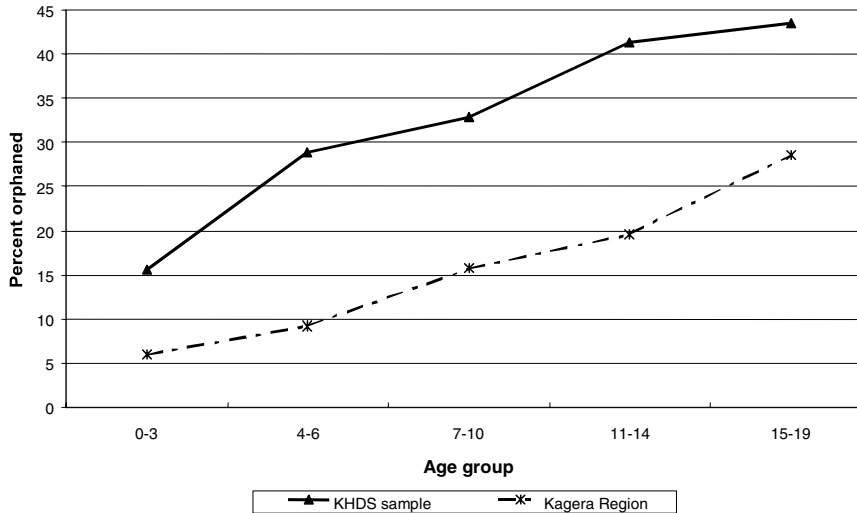


particularly two-parent orphans. The prolonged illness and death of a prime-aged adult can also affect the schooling of other children in the household not orphaned. In Sub-Saharan Africa, high levels of child "fostering" result in many children living in households of relatives other than their parents, even when both are alive (Ainsworth 1996).¹³ Often, fostering is linked to schooling decisions—for example, children might be sent to live with relatives who are closer to schools or have access to better quality schools (Gould 1985, Saint-Vil 1985). Thus, deaths in the host household have the potential to disrupt the schooling of both the family's own children and co-resident foster children.

Demographic characteristics of the children

Among the children in the KHDS sample, nearly three-quarters reside with at least one parent, but fewer than half (42 percent) reside with both parents (Figure 4). Almost one in five children aged 7–14 (19 percent) does not live with a parent, although one or both parents are alive. This reflects a high degree of child fostering. Eight percent of children 7–14 were two-parent orphans. Young children are significantly more likely to live with both parents than children 11–14 years. By gender and by eco-

Figure 5
Orphan rates by age group, 1991–92
KHDS sample and Kagera Region compared



nomic status of the households, we do not see significantly different patterns in living arrangements.

Of the children 7–14 in the first wave of interviews, 17.2 percent had lost their fathers, 11.1 percent had lost their mothers, 7.9 percent had lost both parents, and 63.6 percent had two living parents. Paternal orphan rates are substantially higher than maternal orphan rates because men have higher mortality than women of the same age and fathers are typically older than their spouses. Orphan rates increase with the age of the child, and rates for the KHDS sample are more than twice as high as would be observed in a non-stratified random sample (Figure 5). This reflects the project's sampling strategy of over-sampling households at risk of an adult death. Fifteen percent of children were living in households in which an adult household member aged 15–50 died in the twelve months before the first interview.¹⁴

Characteristics of the primary schools in the sample

In parallel to the household survey, the KHDS also conducted, a longitudinal survey of the sixty-two primary schools serving the forty-nine communities from which the KHDS sample was drawn (Koda and Ainsworth 1995). The quality of schools across all districts was low. At least some schools in every district had crowding problems, and more than half of the schools (59 percent) had fewer blackboards than classrooms. The student/teacher ratio was high everywhere except in the

schools in Bukoba Urban district, and mean class size per school in wave 1 was 41. There was a shortage of even the most basic and crucial textbooks (Kiswahili and math)—on average, nearly four children had to share a single Kiswahili and a single math book, and often parents had to buy the texts. Among students 7–14, 79 percent reported some expenditures on books and other school supplies in the twelve-month period before the first KHDS interview. Almost all schools reported an annual UPE fee of 200 Tshs (\$0.91) (Koda and Ainsworth 1995). About one in six schools exempted destitute pupils from paying, and one in four if the child was orphaned. The share of schools with exemptions was surprisingly low, given the severity of the AIDS epidemic in the region. This may be because the fees were low compared to other school costs, such as uniforms. Among children 7–14 enrolled during the first wave of the KHDS, school fees accounted for 3.4, and contributions to the school development fund and UPE fund accounted for 16.9 percent of annual school expenditures per child respectively.

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- 8 The material in this section is drawn from an excellent review of the education sector by the World Bank (1999b).
- 9 The dollar-Tanzanian shilling exchange rate rose from 219 Tsh/\$ in 1991 to 509 Tsh/\$ in 1994. In this paper, we use the 1991 exchange rate of 219 Tsh/\$ because our descriptive statistics are for expenditures in the past twelve months of household interviewed in late 1991 and early 1992.
- 10 Since the early 1990s, the UPE fee has been raised to 2000 Tshs.
- 11 Because some of the 757 households interviewed four times never had a child under 15 during the survey, the total number of households from which the sample of children are drawn is only 553. The statistics presented here describe the original sample; they have not been weighted to represent the Kagera Region.
- 12 The variable to indicate the past death of a prime-age adult household member applies to the six months preceding the first interview in the data set and then any such death between survey rounds, which were 6–7 months apart.
- 13 In Tanzania, about 16 percent of all households had a foster child—a child with one or more living parents who was not living with either of them (authors' calculations, 1996 DHS). In Côte d'Ivoire, one in five children 7–14 is living away from two living parents, almost always living with relatives, and many are residing with grandparents (Ainsworth 1996). A quarter of Ivorian households had a foster child living with them, and 19 percent had sent a child 7–14 to live elsewhere. Lloyd and Blanc (1995) found in seven African countries that 20–51 percent of children 6–14 were living in households headed by someone who is not their parent.
- 14 Of the 131 adults 15–50 who died from six months before the first wave until the end of the survey, 46.6 percent were reported by relatives to have died of HIV/AIDS. Other reported causes of death were: "other illness" 25.2 percent; malaria 4.6; TB/other communicable disease 3.1; diarrhea 2.3; accident 0.8; childbirth 0.8; witchcraft 3.8; other cause 1.5; and don't know 9.9 percent.

IV

The determinants of school enrollments in Kagera

Among the children in the sample, 58.3 percent were enrolled in school at the time of the first wave of the KHDS household survey.¹⁵ There was no difference in the enrollment rate for boys and girls, which is consistent with other evidence for primary enrollment in Tanzania (Figure 6). Enrollment rates increased with age until ages 11–15, when they reached a plateau of about 80 percent; thereafter, enrollment rates dropped sharply. On average, children who were enrolled spent 23.8 hours in school during the seven days before the interview. The mean number of hours among those enrolled did not differ across children by gender, but increased with the age of the child, from 19.2 hours for children 7–10 to 25.8 hours for those 11–14.

In Figure 7, we divide children in two groups according to the value of their household's assets per capita.¹⁶ Those residing in households with less than the median value of assets per capita (that is, the lower 50 percent) are labeled as children in "poor" households, and those with more than the median as "non-poor." Children in poor households are less likely to be enrolled than children from non-poor households. Children 7–10 living in non-poor households had enrollment rates one-third higher than those in poor households. This gap persists for older children, where 68 percent of poor children are enrolled compared to 84 percent of non-poor children. This is consistent with evidence that enrollment rates are positively correlated with expen-

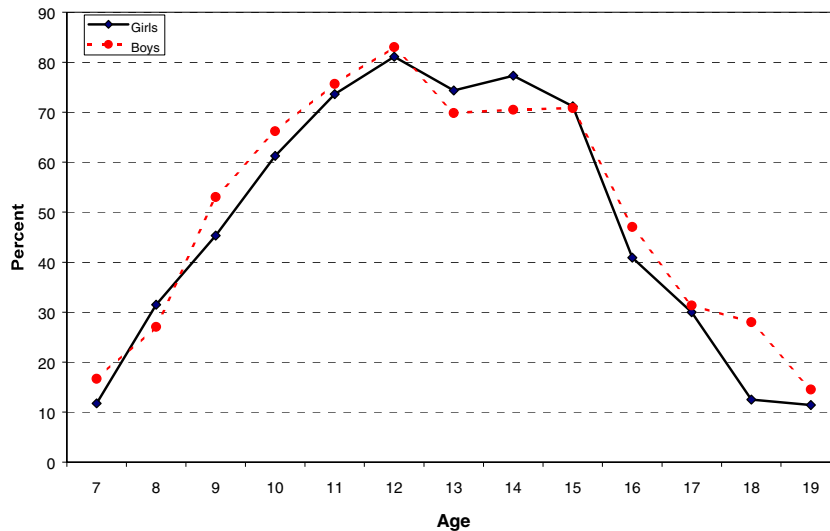
diture quintiles (World Bank 1999b) but not consistent with the findings of Mason and Khandker (1997), who found no statistically significant correlation between household consumption and enrollment.¹⁷

The impact of adult mortality on primary enrollment

Figure 8 shows enrollment rates by orphan status. Fewer than 40 percent of children 7–10 are enrolled. Maternal orphans have the lowest enrollment rate (31 percent), but there is no statistically significant relation between orphan status and enrollment in this two-way tabulation. Enrollment rates among the children 11–14 are about twice as high, but still less than 80 percent. Among children 11–14, enrollment rates for two-parent orphans (65 percent) are 14 percentage points lower than for children with living parents (79 percent). This difference is statistically significant but does not remain in multivariate regression results when household assets and other individual and household characteristics are controlled for.

In combining orphan status with a measure of household wealth, we find that the most disadvantaged group is orphans in poor households (Figure 9). Household wealth raises the enrollment rate of orphans, though their enrollment is still lower than that of non-orphans. Orphans in non-poor households have higher enrollment rates than non-orphans in poor households. This pattern is observed among both groups of children, but among children 11–14, household wealth seems to almost com-

Figure 6
Enrollment rates by age and gender



pletely compensate for orphan status because the enrollment rate for orphans and non-orphans in non-poor households is very similar. Among children 11–14 in poor households there is a much larger gap in enrollment between orphans and non-orphans.

The death of other adult members in the household can also affect enrollment rates. Figure 10 compares enrollment rates at the first and last KHDS interview among children in two groups of house-

holds—those that experienced a prime-aged death during the KHDS survey and those that did not. The enrollment rate in wave 1 for children in households that eventually experienced a death during the survey is slightly higher in the first interview than for children in households with no adult death during the survey (62 vs. 58 percent). By the last interview, enrollment rates for both sets of children had increased by more in the households without an adult

Figure 7
Enrollment by age and household status

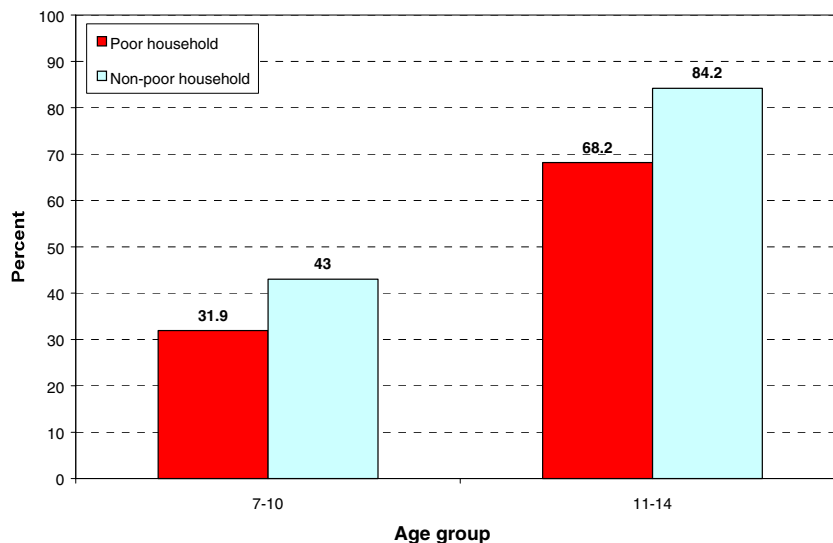
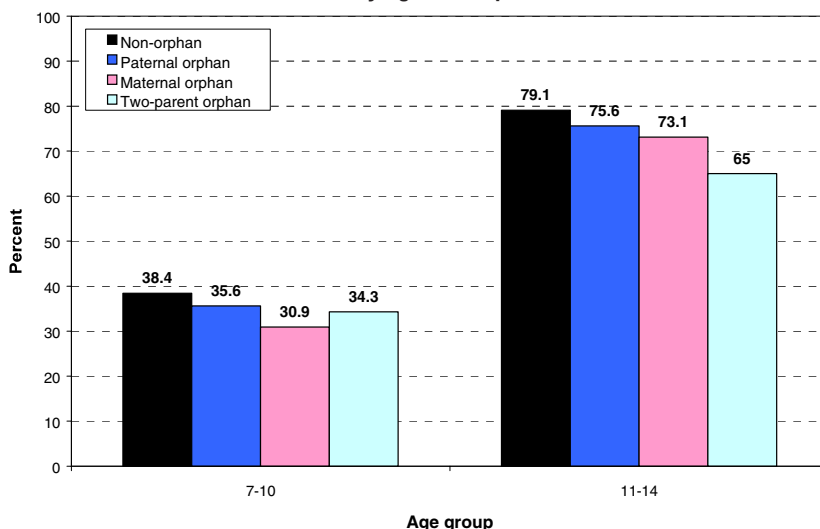


Figure 8
Enrollment of children 7–14 by age and orphan status

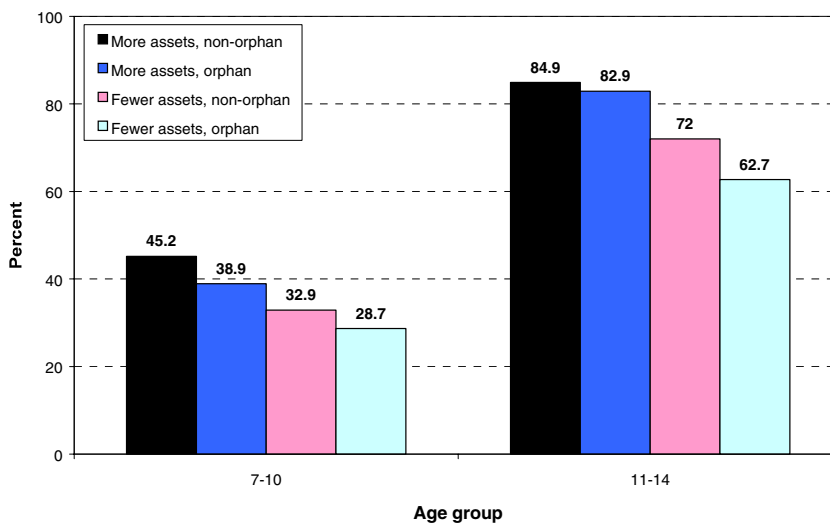


death, and they are roughly equal. This increase is probably because wave 4 occurred at a slightly different time of the school year. Without accounting for other differences, children in households with an adult death during the panel survey do not have higher dropout rates, or even lower enrollment rates.¹⁸

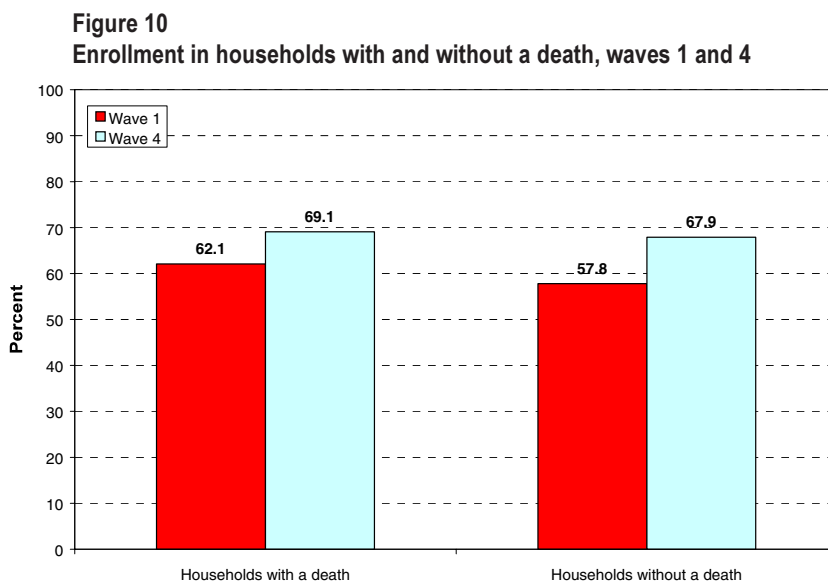
The death of a female adult may have a different impact on enrollment than male deaths. First, children may be closer substitutes for female labor in

the household, particularly in rural Tanzania where the formal labor market is dominated by men. Second, if women are stronger proponents of schooling for children, then their presence may be an important determinant of enrollment. This is consistent with evidence found in other studies of Tanzania (Al-Samarrai and Peasgood 1998, Mason and Khandker 1997), as well as other parts of Africa (Tansel 1997, Glick and Sahn 2000), that the mother's

Figure 9
Enrollment of children 7–14 by age, orphan status, and household assets



Orphan in this figure includes one-parent and two-parent orphans.



presence (and her own schooling) is a stronger determinant of child schooling than the presence of the father. Using data only from the first wave of interviews, enrollment rates for children 7–10 in households with a female adult death in the previous twelve months (18 percent) are half the enrollment rate than that among children experiencing no female deaths (39 percent), and this result is statistically significant. For older children, the difference in enrollment is small and not statistically significant. The lack of such a gap for older children suggests that the impact of female death is through delayed enrollment into primary school for children 7–10 years.¹⁹

Multivariate analysis

The analysis of the impact of orphan status and deaths on enrollment is complicated by the fact that households of different economic status are not equally likely to experience a death nor are they equally likely to enroll their children. In fact, HIV infection in eastern and central Africa appears to be positively correlated with socioeconomic status (Ainsworth and Semali 1998; World Bank 1999a). If we compare the completed schooling of parents who died and parents still alive of children 7–14 in the Kagera data, for example, the orphaned

children's deceased parents had higher average schooling than did the living parents of non-orphaned children.²⁰ If those with higher socioeconomic status also tend to have higher enrollment, then orphans and children in households with an adult death might well have higher enrollment than children with living parents. To understand the short-run impact of deaths and orphan status, we need to look at changes over time and control for socioeconomic status.

In order to isolate the impact of orphan status and adult death, we need to address other factors that simultaneously influence the decision to enroll children. In our empirical models, we regress the dependent variable, whether or not a child is currently enrolled in school, on a set of exogenous explanatory variables likely to affect child schooling.²¹ The explanatory variables in the regression represent the factors affecting enrollment in the economic model in Section II:

- Demographic characteristics: age, gender, relation to the head of the household (head's child/ grand-child)
- Characteristics of the household head: age, gender, years of schooling²²
- Characteristics of the parents: mother's schooling, father's schooling

Table 1
Determinants of primary enrollment: Results of multivariate analysis

Variable	Children 7–10	Children 11–14	All children 7–14
Adult mortality variables			
Orphan status (compared to non-orphans)			
Maternal orphan	↓	No effect	↓
Paternal orphan	No effect	No effect	No effect
Two-parent orphan	No effect	No effect	No effect
Recent adult death (six mos.)	↓ (in HHs with dirt floors)	No effect	↓ (in HHs with dirt floors)
Characteristics of parents and head			
Mother's schooling	↑	↑	↑
Father's schooling	No effect	↑ (only for non-orphans)	No effect
Head's schooling	↑	↑	↑
Child of head	No effect	↑	↑
Grandchild of head	No effect	↑	↑
Household economic status			
Household assets/flooring	↑	↑	↑
Land owned	↓	No effect	No effect
Community and school variables			
Urban area	↑	No effect	↑
Distance to secondary school	↓	↓	↓
Teachers per primary class	No effect	↑	↑
Blackboards per classroom	No effect	No effect	↑
Students per math book	↓	No effect	No effect

Note: ↓ Lowers enrollment; ↑ raises enrollment. The total impact on a two parent orphan is the sum of the impact of maternal orphan, paternal orphan, and two-parent orphan. Maternal orphan status is not statistically significant when controls for assets and housing quality are excluded, nor is adult death for the entire sample. Enrollment rises with age but does not differ by gender (not shown).

- Household assets: logarithm of the value of household assets per capita, quality of housing (whether the dwelling had a non-dirt floor)
- Opportunity cost of the child's time: hectares of land owned by the household
- Adult mortality: orphan status of the child, whether a prime-aged adult died in the household in the six months before the first interview or between waves of the survey
- Availability and quality of schooling: distance to the nearest secondary school, whether any primary school in the community exempts orphans

from paying school fees, the mean number of blackboards per classroom, the mean number of students per math textbook, the mean number of teachers per class

- Community variables: district of residence, urban residence, 1991 adult mortality rate in the community as measured by the KHDS enumeration.

In addition to these explanatory variables, we included numerous interactions to assess whether the impact of different determinants varied according to the orphan status of the child or the event of an

adult death.²³ The regressions also controlled for the month of the interview, since enrollment can also be affected by school vacations and seasonal demand for child labor. Throughout all four waves of the survey, including households seen fewer than four times, we analyze the enrollment decision using 4,872 observations on 1,743 children.²⁴ (Appendix I shows variable definitions, their means, and standard deviations.). We have analyzed the results for the entire sample and for younger (7–10) and older (11–14) children separately.

The determinants of enrollment among younger and older children are quite different and yield insights into parents' or guardians' decisions concerning delayed enrollment and dropping out (Table 1). The results indicate that households cope with adult mortality through delayed enrollment of young children, and that they "protect" the enrollment of other children already enrolled. Maternal orphans 7–10 and children in households with an adult death in the past six months have roughly a 10 percentage point lower enrollment rate, compared to children who are not maternal orphans or had no recent adult death. The impact of a recent death depends on the economic status of the household. Children in households with low quality housing (with a dirt floor) that had a recent adult death have lower enrollment, while the enrollment of children whose households have better housing is unaffected by an adult death. However, these impacts basically delay enrollment. Neither orphan status nor adult deaths significantly affect the enrollment of children 11–14, and this result holds even if we do not control for the household's economic status. There is no evidence that the enrollment of these older children in primary school is permanently affected by orphan status or that they are dropping out following an adult death.

The results also highlight key factors that determine whether a child will ever enroll. The mother's schooling (irrespective of whether she is alive) and household assets raise the probability of enrollment of children of all ages. The father's schooling raises enrollment probabilities for older children (11–14),

but only if the father is alive, which we interpret to mean that the children of more educated, living fathers are less likely to drop out. For children of all ages, the schooling of the head of the household has a strong positive effect on the probability of enrollment, equal to the mother's schooling for younger children, and twice as large as the mother's schooling for older children. Children of the head or grandchildren of the head have no lower probability of enrolling at an early age, but older children who are the child or grandchild of the head have an enrollment rate about 10 percent higher than children related in other ways to the head. This contradicts the widely held belief that children left in their grandparents' care will receive less schooling or may otherwise be disadvantaged. Interactions between the child's orphan status and a grandparent as household head were not statistically significant, indicating that orphans in households headed by a grandparent are no worse off in terms of primary schooling than other children in households headed by a grandparent. There was no relation between living in a female-headed household and enrollment when the samples are broken down by age group. But when all children are considered as a group, children in female-headed households are (weakly) more likely to enroll than those in male-headed households. Girls are no less likely to enroll than boys, at all ages.

These results for younger children are consistent with the evidence discussed earlier that Tanzanian parents frequently delay their children's enrollment. Since we have controlled for household wealth, we conclude that the reason for delayed enrollment of orphans does not relate to the ability to pay schooling costs but is an independent effect linked to being an orphan. The results offer evidence of some of the other reasons parents cite for delaying enrollment: (a) children are more likely to have delayed enrollment if the household owns more land, particularly for boys; (b) children in rural areas are more likely to enroll late than children in urban areas. Once in school (ages 11–14), however, neither land ownership nor urban residence affects enrollment decisions.

Table 2
Participation rates of children 7–14 in market and non-market activities in the past seven days
by orphan status (percent)

<i>Orphan status</i>	Activity						
	N	Farming	House-work	Collecting firewood	Fetching water	Caring for sick	Mourning
Both living	765	49.5	50.3	45.0	74.3	4.1	3.0
Father dead	205	55.6	52.7	48.3	76.1	2.0	5.4
Mother dead	133	52.6	52.6	39.1	76.7	3.0	3.8
Both dead	95	51.6	50.5	51.6	69.5	5.3	7.4
All children	1198	51.0	51.0	45.4	74.5	3.7	3.8

These results attest to the high opportunity cost of children's time and substantiate the report in focus group interviews that parents delay enrollment of young children so that they can help on the family farm (World Bank 1999b). The number of students who must share a textbook—an indicator of crowding as well as quality—significantly determines the enrollment of young children, but not older children. Crowding is another frequently cited reason for delayed enrollment in Tanzania.

The farther away the nearest secondary school is, the less likely are boys and girls of all ages to be enrolled. This may reflect parents or guardians' assessment of the probability that, having completed primary school, the child will be able to continue. Two indicators of the quality of schooling—the number of blackboards per class and the number of teachers per class—were positively related to enrollment of older children but not younger children. We interpret this as evidence that older children in better-quality schools are less likely to drop out. The crowding and school quality variables have a larger impact on the enrollment of girls than of boys.

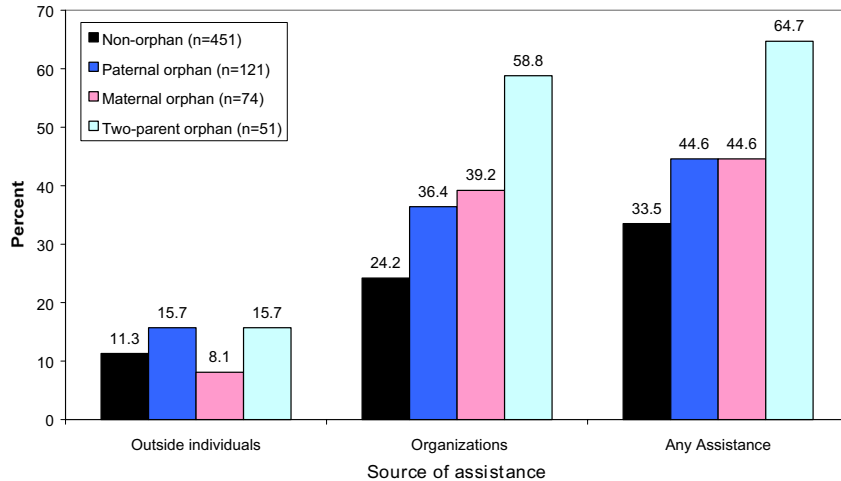
The result that adult deaths do not seem to affect the primary schooling of older children challenges the widespread (but mostly speculative) literature pointing to school dropouts as a coping mechanism (e.g., Barnett and Blaikie 1993; Hunter and Williamson 2000). While this survey took place in

the early 1990s, parts of the Kagera Region were already experiencing a tripling of the adult mortality rate in some areas, as measured crudely by the 1988 census and the research team's enumeration in 1991. What can account for this unexpected result? We have two hypotheses.

First, adult mortality may have no effect on the enrollment of primary students because children 7–14 may not have much of a role in coping with the impact of a death. The opportunity costs of the child's time may not be that much greater following an adult death if they are not good substitutes for adults in productive activities—so there may be no pressure to withdraw from school. Alternatively, primary-school aged children can live at home, perform chores, care for the sick, and go to school. Additional time spent on these activities can be taken from leisure and need not involve dropping out of school, even if the demand for their time increases following an adult death. Results on children's participation rates in coping and economic activities seem to confirm this. Overall, children 7–14 had very low participation rates in caring for the sick and mourning (Table 2). About half engaged in farming, housework, and collecting firewood, and three-quarters fetched water. However, there are no substantial differences by orphan status.

But in households with an adult death, children's participation in housework rose between the first

Figure 11
Percent of children 7-14 currently enrolled who received schooling assistance in the past 12 months, by source and orphan status



and last wave (from 51 to 59 percent) compared with children in households without an adult death (51 to 53 percent). Breaking this down by age group, the participation rate of younger children in household work rose substantially in households with an adult death (from 29 to 44 percent) while that for older children was much higher but almost unchanged (from 69 to 72 percent). Participation rates in mourning and funeral activities rose for children in households with an adult death (from 3 to 8 percent) but

stayed the same (4 to 3 percent) in households without an adult death. Multivariate analysis found that, following an adult death, children did not significantly change the number of hours they spend in the activities (Beegle 1999). Thus, the evidence suggests very little adjustment on average of children's use of time following an adult death, except for an increase in housework for children 7-10.

A second hypothesis is that the older children 11-14 are already receiving targeted financial assistance

Figure 12
Percent of children receiving schooling assistance among children enrolled, households with and without a death

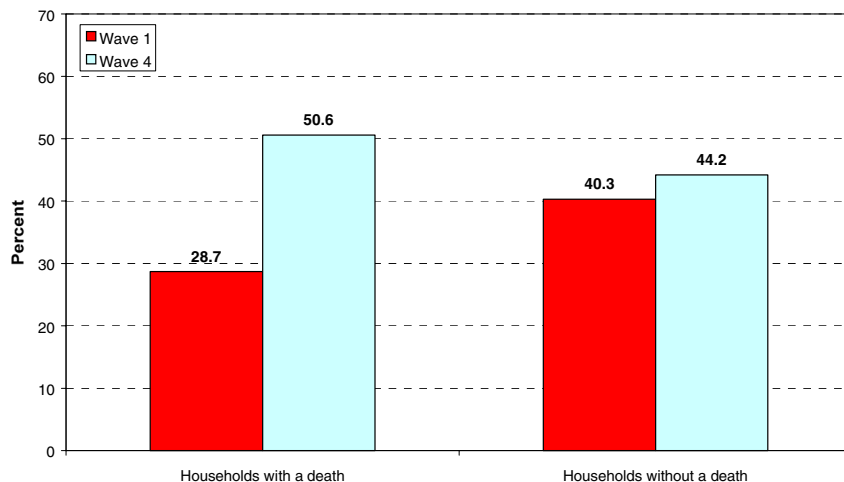
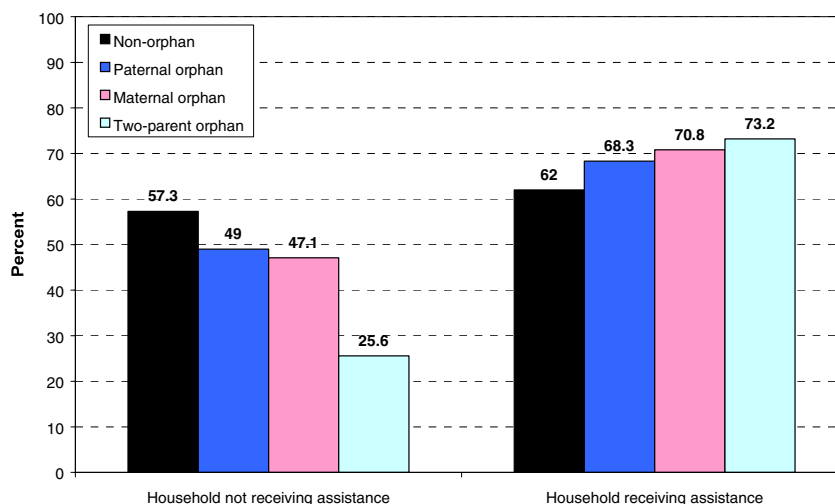


Figure 13
Enrollment rates by orphan status according to whether the household received assistance



from relatives, government, or nongovernmental organizations (NGOs) for the costs of schooling, muting the differentials in enrollment between orphans and non-orphans. Among the children in the households visited four times who were attending school during the first interview, 12.1 percent received schooling assistance from individuals outside the household, 30.4 percent received assistance from organizations, and 38.9 percent received assistance from either source.²⁵ Schooling assistance from outside organizations was more likely to be received by orphans, especially two-parent orphans, while the share of children who received assistance from individuals outside the household was essentially no different among orphans and children with living parents (Figure 11). This pattern is the same for children 7–10 and 11–14, although the older children are slightly more likely to receive assistance from organizations than the younger children; however, assistance is no more likely to be targeted to orphans. Multiple regression analysis has confirmed the higher probability of orphans receiving schooling assistance than non-orphans. Indicators for the wealth of the household were generally not linked to receiving assistance from either source. Furthermore, while children in households that eventually

suffered an adult death were initially less likely to receive schooling assistance than children in other households, the percent receiving schooling assistance by the last wave increased considerably and was higher than in households without an adult death (Figure 12).²⁶ This suggests that children in households with an adult death were also being targeted for schooling assistance, either by relatives or organizations.

In addition to direct assistance for schooling, about 40 percent of children 7–14 were living in households that received outside assistance from government or NGOs in the twelve months prior to wave 1. Children living in these households were more likely to be enrolled than children in households not receiving assistance (Figure 13). In households receiving assistance, orphans were in fact equally if not more likely to be enrolled than children with two living parents. In households not receiving assistance, orphans were less likely to be enrolled than children with living parents. Note, however, that assistance to the household is not the only determining factor in school enrollments, since even in households receiving assistance, fewer than three-quarters of children are enrolled.

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- 15 Current enrollment includes children who may not have actually attended in the last week (due to school vacation, holiday or illness, for example), but are otherwise considered to be "in school."
- 16 Household assets include the total value of financial and physical stock of all household members (savings, durable goods, land, farm buildings and equipment, livestock, business assets, dwellings, stocks of unsold crops, and business inventory), as valued by respondents.
- 17 However, here we use assets (wealth), not household consumption, because the latter was deemed to be more easily influenced by expenditures related to adult deaths.
- 18 This result points up one of the confounding factors in analyzing the impact of adult deaths when those deaths are not completely exogenous. Most studies that have examined the socioeconomic correlates of HIV infection or AIDS deaths in Sub-Saharan Africa have found a positive correlation between socioeconomic status and HIV or AIDS death (see the review in World Bank 1999a). For this sample, prime-aged adults who die of AIDS are more likely to be educated and be in non-farm occupations (Ainsworth and Semali 1998). Without the help of panel data, it is extremely difficult to disentangle the negative effects of death in better-off households.
- 19 However, the impact of a female adult death in the past six months, in the multivariate analysis using all waves of data is not statistically significant.
- 20 In the first wave of observations, for example, the mean years of completed schooling was roughly one year higher for the deceased mothers of maternal orphans (4.68 years) compared to children whose mothers were alive (3.57 years). Likewise, the deceased fathers of paternal orphans had more schooling (5.82 years) than the living fathers of non-orphans (5.09 years).
- 21 We use a maximum likelihood probit statistical model for enrollment regressions, with robust standard errors to account for the multiple observations of some children.
- 22 Parents' schooling was collected for all children, even if the parents were dead.
- 23 In different specifications, orphan status was interacted with mother's schooling, father's schooling, grandchild of the head, school availability and quality variables. Adult death was interacted with assets, housing characteristics, and availability and quality of schooling.
- 24 Of the 1,743 children, 748 were seen four times, 285 were seen three times, 315 were seen twice and 395 were seen once. Children were seen fewer than four times if they turned 7 or 15 during the survey, entered or left the sample. In addition, some households moved away and were replaced by new households, neither of which were seen all 4 waves.
- 25 On average, schooling assistance from private individuals in the past twelve months was 1,073 Tshs (US \$4.90) per recipient. Most of the children receiving assistance from an organization (62.3 percent) received assistance directly from the school. The amount received from schools was small, however—only 270 Tshs (US\$ 1.23) in the prior year. Contributions toward schooling, in cash or in kind, from organizations, amounted to 1,898 Tshs (US\$8.67) per recipient.
- 26 The reference period for assistance in the last wave is 6–7 months (since wave 3), while for the first wave it is the past 12 months.

V

Conclusion

As AIDS continues to elevate adult mortality rates, there is a growing concern about the fate of orphans. In this study we explore one dimension of this impact—their schooling. Schooling is an important investment in children's future productivity and well-being. However, the schooling of orphans and other children in homes with an adult death is threatened because families affected by an adult death may be less able to afford direct and indirect costs of schooling, and the child's opportunity cost of time may rise in household and farm activities. In this paper, we assess whether orphans or children in households with an adult death are less likely to be enrolled in primary school. The data come from the Kagera Region of Tanzania, which at the time of the study was the area of Tanzania hardest hit by the AIDS epidemic, with adult mortality rates three times higher than would normally be expected. We draw on a sample of children ages 7–14, the main years for primary school enrollment. These data provide some advantages in addressing this issue, including a relatively large sample of orphans, detailed information on primary schools, and multiple observations on households and children. This allows us to examine enrollment before and after an adult death occurs in the household. Moreover, these data allow us to compare a representative sample of orphans with a representative sample of non-orphans.

We find that Tanzanian households are coping with adult deaths by delaying enrollment of young children (7–10), while maintaining enrollment of older children (11–14). Among orphans, only maternal orphans are being held back. The practice of delaying enrollment of primary-aged children is already the norm in Tanzania; studies have found that over 80 percent of primary-aged children have delayed enrollment. The reasons why schooling is delayed are well known: the opportunity costs of the children's time, overcrowding in schools, low returns to primary schooling, and limited opportunities for secondary schooling. Multivariate results found that these same factors are affecting enrollment decisions in our sample. However, controlling for these factors and for household wealth, we find that maternal orphan status and adult deaths have a separate and independent effect on delayed schooling of the youngest children. We find no evidence that older orphans (11–14) or older children in households with an adult death drop out of primary school. The lack of correlation between orphan status and enrollment for older children is consistent with other research for Tanzanian children 10–14 nationwide, based on DHS data (Lloyd and Blanc 1995). Children and orphans in households headed by grandparents are equally likely to be enrolled as children of heads of household, and more likely to

be enrolled than children in households headed by relatives other than the parent or grandparent. Thus, the concern that Tanzanian children's schooling may be sacrificed if they are raised by grandparents seems to be unfounded, at least with respect to primary schooling.

We have suggested several explanations for these findings. First, household coping mechanisms may buffer any long-term impact on enrollment. Extended families and support networks may be effectively fostering children or transferring resources so that children can stay in school when a death occurs. Second, the opportunity cost of time of the children in school may be less than anticipated. We find an increase in participation rates in household—only for the youngest children—consistent with their delayed enrollment. The participation rates of children 11–14 in most activities are unaffected by either orphan status or an adult death. These results are for primary schooling only—the impact of adult deaths on secondary enrollment, which is very much constrained in Tanzania, must yet be studied. In addition, children in secondary school are much older, and the opportunity cost of their time is greater in the event of an adult death. Third, targeted assistance from organizations to orphans and households with a death may help keep children in school. Among the children currently enrolled, we do find that orphans were significantly more likely to be receiving assistance from organizations (but not from individuals) for schooling costs. However, many orphans do not receive assistance, while many non-orphans do receive assistance. Assistance also seems to be targeted to households with an adult death, although not exclusively. Disentangling the role of school assistance in enrollment is on the agenda for future research.

The number of children attending primary school in Tanzania is low and has been in decline for many years, even before the AIDS epidemic. Nearly half

of the children of primary school age are not enrolled, one of the lowest primary enrollment rates in Sub-Saharan Africa. Since most children will only receive primary school, parents and guardians typically enroll them late, a situation exacerbated by crowding and low school quality. However, most children do eventually enroll; those who do not are generally the poorest children.

Our study has shown factors that are likely to reduce delayed enrollment and dropout rates at the primary level. These include better access to secondary schooling, reduced crowding of classes, better quality of physical facilities (such as blackboards), and a higher teacher-class ratio. In terms of programs for the schooling of orphans and children in households with an adult death, we have shown that AIDS mortality occurs in both poor and non-poor households, and that those in non-poor households are already in a position to cope. Thus, programs linked to the impact of adult mortality must target children in the poorest households.

However, given the low investment in and quality of primary schooling in Tanzania, policies must address the relative costs and impact of raising enrollments via targeted transfers to orphans compared to improvements in school quality, and better access to secondary schooling. The latter strategy would not only raise enrollments but also raise the returns to schooling by improving its quality for all children, including orphans. It conceivably could have a larger impact on the welfare of orphans than targeted transfers or subsidies to attend low-quality, crowded schools with limited opportunities for secondary schooling. The results also remind us to resist the temptation to search for a single policy solution for all countries. Each Sub-Saharan country starts with a different level, quality, and history of school enrollment, which means that the best response to the impact of AIDS on child schooling may be the one that is country-specific.

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Annex I

Variable means and standard deviation for the multivariate regressions^a

Variable	Mean	SD
Currently enrolled in school*	0.657	0.475
Age 8-11*	0.466	0.499
Age 12-14*	0.418	0.493
Female*	0.488	0.500
Child of household head*	0.662	0.473
Grandchild of household head	0.173	0.378
Mother dead*	0.206	0.404
Father dead*	0.273	0.445
Both parent's dead*	0.088	0.283
Father's education (years)	5.370	3.104
Mother's education (years)	3.822	2.985
Age of household head	49.947	14.881
Female household head*	0.265	0.441
Education of household head (years)	4.264	3.086
Flooring is non-earth*	0.163	0.369
Acres of land owned	4.944	4.939
Logarithm of the value of household assets per person	11.228	1.320
Any male adult death in past 6 months*	0.017	0.128
Karagwe district, rural*	0.085	0.279
Muleba district, rural*	0.139	0.346
Biharamulo district, rural*	0.076	0.265
Ngara district, rural*	0.112	0.315
Urban community*	0.245	0.430
Community adult morality rate, per 1000	15.696	8.071
Distance to secondary school in km	17.485	20.082
Average teachers per class in primary schools	1.339	0.451
Average students per math text in primary schools	3.760	5.155
Average blackboards per classroom in primary schools	0.807	0.217
Any adult death in past 6 months	0.044	0.206
Any female adult death in past 6 months	0.029	0.168

* Dichotomous variable (=1 if condition is met, otherwise = 0)

^a Controls were also introduced for months of the interview, but are not shown here to conserve space.