

COMMENTS WELCOME

**The impact of parental death on school enrollment
and achievement: Longitudinal evidence from South Africa**

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ABSTRACT

We analyze longitudinal data from a demographic surveillance area (DSA) in KwaZulu-Natal, to examine the impact of parental death on children's outcomes. We find significant differences in the impact of mothers' and fathers' deaths. The loss of a child's *mother* is a strong predictor of poor schooling outcomes. Maternal orphans are significantly less likely to be enrolled in school, and have completed significantly fewer years of schooling, conditional on age, than children whose mothers are alive. Less money is spent on their educations on average, conditional on enrollment. Moreover, children whose mothers have died appear to be at an educational disadvantage when compared to non-orphaned children with whom they live. We use the timing of mothers' deaths relative to children's educational shortfalls to argue that mothers' deaths have a causal effect on children's educations. The loss of a child's *father* is a significant predictor of household socioeconomic status. Children whose fathers have died live in significantly poorer households, measured on a number of dimensions. However, households in which fathers died were poor prior to fathers' deaths. The death of a father between waves of the survey has no significant effect on subsequent household economic status. While the loss of a father is correlated with poorer educational outcomes, this correlation arises because a father's death is a marker that the household is poor. Evidence from the South African 2001 Census suggests that the estimated effects of maternal deaths on children's school attendance and attainment in the Africa Centre DSA reflect the reality for orphans throughout South Africa.

Keywords: Demographic surveillance area, education, orphans

1. Introduction

The HIV/AIDS pandemic is leaving in its wake a generation of children who have lost parents, care-givers, and other loved ones to illness and death. Since 1990, orphan rates have increased by more than a third in sub-Saharan Africa, the region with the highest prevalence of HIV/AIDS. UNAIDS estimates that 43 million children in the region under the age of 18 are orphans, more than 12 million as a result of HIV/AIDS. In South Africa, an estimated 2.3 million children under the age of 18 have lost one or both of their parents, representing 13.3% of all South African children (South African Census 2001).

Orphans are vulnerable in many dimensions. Recent work has found a consistent pattern of lower school enrollment for children who have lost mothers or both parents (Case, Paxson and Ableidinger 2004, Evan and Miguel 2004, Gertler et al 2003, Bicego, Rutstein and Johnson 2002). In addition, children who have lost fathers are found to live in significantly poorer households on average (Yamano and Jayne 2004).

Are orphans' poorer outcomes the result of parental death? Estimating whether the loss of a parent has a causal effect on children's outcomes is difficult. In many cross-sectional data sets, such as the Demographic and Health Surveys analyzed by Case *et al*, one cannot know the relative wealth of a child's household, or the child's school achievement, prior to the parent's death. Children who have lost a parent may themselves be ill, and may be behind in school because of their own illnesses. Orphans' households may have been systematically poorer than other households prior to parents' deaths, leading to correlations between the death of a parent, household poverty and school achievement. With cross-sectional data, it is generally not possible to rule out such explanations for orphans' poorer outcomes. Longitudinal data -- in which the

same children are being followed through time, with parents' deaths recorded as they occur -- allow us to move some distance in evaluating alternative explanations for children's outcomes following the death of a parent. However, large longitudinal datasets are relatively rare in developing countries struggling with the AIDS crisis.

An exception is the database established by the Africa Centre for Health and Population Studies, in Northern KwaZulu-Natal, which has been following 100,000 people in 11,000 households since 2000. Data collected by the Africa Centre allow us to follow children through time, and to examine the extent to which children's outcomes respond to parental death.

In this paper, we analyze longitudinal data from the Africa Centre, and document the association between parental death and children's educational achievement, enrollment, and the resources devoted to each child's education. Because all children in the field site have been followed through time, we are able to identify whether children were behind in school prior to a parent's death, or fell behind only after a parent died. In addition, we can analyze the extent to which household poverty precedes parents' deaths, or appears to be the result of this loss.

We find significant differences in the impact of mothers' and fathers' deaths. The loss of a child's *mother* is a strong predictor of poor schooling outcomes. Maternal orphans are significantly less likely to be enrolled in school, and have completed significantly fewer years of schooling, conditional on age, than children whose mothers are alive. Less money is spent on their educations on average, conditional on enrollment. While this may simply reflect the fact that children are themselves ill, or are poor students, we find no evidence to support this hypothesis. Children whose mothers were alive when the first data were collected on educational attainment in 2001, but whose mothers subsequently died, were not lagging other children in

enrollment or educational attainment in 2001. Furthermore, children of school-going age who themselves die after 2001 have not fallen behind in school by 2001, nor are they less likely to be enrolled. Our evidence is consistent with mothers' deaths having a causal effect on children's educational outcomes.

The loss of a child's *father* is a significant predictor of household socioeconomic status. Children whose fathers have died live in significantly poorer households, measured on a number of dimensions. However, households in which fathers died were poor prior to fathers' deaths. The death of a father between waves of the survey has no significant effect on subsequent household economic status. While the loss of a father is correlated with poorer educational outcomes, this correlation arises because a father's death is a marker that the household is poor.

The Africa Centre database is rich both in the detail it offers on each child, and in its ability to follow children through time. The picture it draws holds for Zulu children being raised in one province of South Africa. To what extent do these results reflect the impact of parental death on children in other parts of the country? Evidence from the South African 2001 Census suggests that the estimated effects of maternal deaths on children's school attendance and attainment found for the Africa Centre data are also found for South Africa as a whole.

We proceed as follows. Section 2 introduces the Africa Centre data. Section 3 documents the relationship between orphanhood and educational achievement. The timing of parental death, relative to the timing of children falling behind in school, is discussed in Section 4. Section 5 examines whether all maternal orphans are at equal risk. Specifically, we explore whether girls are at special disadvantage, and whether the impact of being an orphan is synonymous with

being poor in South Africa. Section 6 compares results from the Africa Centre to those of South Africa as a whole, and Section 7 discusses policy options.

2. Data

The Africa Centre is maintaining a database on all individuals who live in, or are members of households that reside in, a demographic surveillance site in the Umkhanyakude District in KwaZulu-Natal. Data on births, deaths, migration, and changes in marital status are collected twice annually for all household members in this *demographic surveillance area* (DSA). The District is relatively rural and poor, when compared either to South Africa as a whole, or to the rest of KwaZulu-Natal (Case and Ardington 2004). It is struggling with a heavy disease and death burden, the result of the HIV/AIDS pandemic.

Our analysis of children's education relies on information collected on children's living arrangements and on their parents' vital status. In addition, we use data on school enrollment and achievement, and on households' economic status, which have been collected in two rounds of the Africa Centre's Household Socio-Economic (HSE) survey. The first round, which we refer to as HSE1, collected data from all households in the DSA in the first half of 2001, and the second round, HSE2, collected socioeconomic data over the 18 month period from January 2003 through June 2004. The later round contained a rich set of questions on household employment, income and expenditures, with detailed questions on educational expenditures for each child. We will begin by analyzing the data collected in HSE2, and will return to HSE1 data in order to better understand the timing of parents' deaths relative to the point at which children fall behind in school.

The demographic surveillance area is experiencing high rates of death among adults in middle age, largely a result of the AIDS crisis. The top panel of Figure 1 presents the log-odds of dying and, separately, the log-odds of dying from something other than AIDS, at each age in 2001.¹ For non-AIDS related deaths, the log-odds of dying increases approximately linearly with age in adulthood, consistent with what is found in many parts of the world (Elo and Preston 1996). The inclusion of AIDS deaths renders the log-odds of dying concave in age in early and middle adulthood. That the risk of dying of AIDS increases sharply for people in their 20s can also be seen in the bottom panel of Figure 1, which presents the probability of dying of AIDS at each age in 2001.

Death in early and middle adulthood has led to a large and growing number of orphans in the DSA. Figure 2 presents the fraction of children who were orphans in the DSA when the first individuals were registered (January 1, 2000), and changes in orphanhood between 2001 and 2004. The left panel of Figure 2 presents the fractions of resident children at each age who had lost their mothers but whose fathers were alive; children who had lost fathers, but whose mothers were alive; and children who had lost both parents. We find the risk of all three types of orphanhood increase with age. By the age of ten, for example, 4.9 percent of children had lost their mothers, 13.5 percent had lost fathers, and 1.7 percent had lost both parents. That the crisis is deepening can be seen in the right panel of Figure 2, which presents the fraction of resident

¹Cause of death is currently available for deaths that occurred in 2000 and 2001 in the DSA. In calculating the log-odds of dying of something other than AIDS for Figure 1, we assumed those who died of AIDS would not have died otherwise.

children whose mothers had died at two points in time: January 1, 2001 and at January 1, 2004.² This fraction increased at every age from 1 to 16 between 2001 and 2004, with rates among 10 years olds increasing from 8 percent to 11.6 percent in this three year period.

Table 1 presents information on the living arrangements of orphans and all other children aged 6 to 16 who were resident in the DSA at the time that data were collected for HSE2. Of the 19,889 children for whom data were collected, information on the status of a child's mother is available for 89 percent of all cases. That is, for approximately 2,000 children, the identity of the child's mother is unknown -- generally because she was not a member of a resident household in the DSA at any time after data collection began in year 2000. While information on mothers is available for 89 percent of all children, information on the status of fathers is available for only 59 percent. That men were not registered as fathers in such large numbers reflects cases in which a child's father was never known to the household, and cases in which the father is known, but has not been identified as a member of any household in the DSA since the census started in 2000.

To fix ideas, one can think of a child living in the DSA with his grandmother. His mother may live in Durban (a two-hour drive from the DSA). Suppose that, although his mother is not resident in the DSA, she is identified as a member of her own mother's (and child's) household. In that case, she will be followed by the census as a non-resident household member. Suppose that the child's father also lives in Durban, but is not recognized as a member of any household in the DSA. He would not be followed by the census, and we would not be able to observe his vital

²Rates presented are for children whose mothers' status is known.

status through time, beyond knowing whether he was dead at the time the child was first registered in the census.

In what follows, we will generally restrict our attention to those children for whom mothers' status is known. Eleven percent of such children (2,014 out of 17,776) had lost their mothers by the time data were collected for HSE2. These numbers are large, even when compared to other areas of Southern Africa (see UNAIDS *et al* 2004). Of those children for whom fathers' status is known, 27 percent had fathers who were dead at HSE2 (3,152 out of 11,748). It does not follow that this fraction of all fathers are dead. Rather, *of those children for whom fathers are identified in the census*, 27 percent have fathers who were either dead when the child was first registered in the census or who died before the second round of socioeconomic data was collected. A lower bound on the loss of fathers can be calculated by assuming that all fathers with unknown status are alive. The orphan rate in that case is high (15.9 percent), but lower than that calculated for KwaZulu-Natal as a whole using the South African 2001 Census (18 percent), where the vital status of the parents of children was recorded.³

Table 2 provides information on child and household characteristics for all resident children in DSA whose mothers' status is known, divided by whether their mothers are alive (column 1) or dead (column 3). Consistent with the results presented in Figure 2, we find that

³Point-in-time reports of parents' vital status are available for almost all children in both the Africa Centre database, at the time a child is registered in the DSA, and the 2001 South African Census. The problem with following the vital status of a child's parents in the DSA arises when the parents are not registered themselves. A child registered in January 2000 could have been reported to have a living father, for example, but if that father is not followed through time, we do not know whether he is dead or alive in 2004.

children whose mothers have died are significantly older on average. In all that follows, we will control for children's ages, in order to separate the differences in outcomes that are (potentially) attributable to orphanhood from general differences between children that are due to age. Table 2 shows, for example, that orphans have completed significantly more years of education than have non-orphans. It will become clear below that this difference is attributable to the fact that orphans are older on average.

Data collected by the Africa Centre allow us to focus on three education variables: years of completed schooling, school enrollment, and school-related expenses reported for each child. Children in South Africa begin school at age 6. If all children were enrolled at age 6, and all advanced one grade every year, we would expect to find the average years of completed schooling to be 5 years for this sample of children (whose ages are distributed roughly uniformly from 6 to 16). Among Black South Africans, however, on average children gain only between 0.7 and 0.8 of a grade for each year of age (see Case and Deaton 1999). This is consistent with the average years of completed education we observe for our HSE2 sample (4.2 years).

Sending a child to school generally entails expenses for fees, books and a school uniform. For a smaller fraction of children, families also pay for transport and a school-related allowance. These school-related expenses (including zeros) amount on average to 30 percent of spending per person in the child's household. Table 2 shows that significantly less is spent on children's schooling when their mothers are dead. Enrollment rates are high in South Africa, but are significantly lower for orphans (94 percent) than for other children (96 percent).

The household socioeconomic survey provides a rich set of variables that may affect children's educations, including the household's relative prosperity -- here represented by total

spending per household member, the number of assets owned by the household, and indicators for whether the household has access to toilet facilities and to piped water. As Table 2 makes clear, there is no significant difference in socioeconomic status between children whose mothers are alive or dead, when measured using expenditure per resident member, number of assets owned, or access to piped water.

That the economic well being of children in the DSA is highly correlated with their fathers' vital status can be seen in results presented in the first panel of Table 3. Here, we examine four markers of socioeconomic status -- log of total expenditure per household member, the number of assets owned by the household, an indicator for whether the child's household reports access to piped water, and an indicator that the household has access to any type of toilet facility. These are regressed on indicators that the child's mother is dead, an indicator that father's status is unknown, and an indicator that the child's father is known to be dead (which is set equal to one if the child's father is known to be dead, and equal to zero otherwise). In all regressions, we include a complete set of indicators for children's ages and an indicator for whether the child is female. Robust standard errors are presented, where correlation has been allowed between unobservables for children who live in the same *bounded structure* (house or compound). Bounded structures identify the physical units within which households reside, see Hosegood and Timæus (2003) for discussion.

For three of our socioeconomic status indicators -- household expenditures, assets, and access to piped water -- we find that children whose fathers have died are at significant disadvantage. On average, these children live in households where expenditure per person is 12 percent lower. Their households own on average almost one fewer (-0.7) household durable. In

addition, they are 2.9 percentage points less likely to have access to piped water. In contrast, Table 3 finds no significant correlation between a child's socioeconomic status and maternal orphanhood. These results echo those of Case *et al* who find, using 19 Demographic and Health Surveys from sub-Saharan Africa, that on average paternal orphans are living in significantly poorer households, while maternal orphans are not.

Without additional information, we would not be able to tell whether households in which prime aged males (here, fathers) have died are poorer because the households lost important contributors to household economic well-being, or whether the correlation exists because household poverty contributed to the men's deaths, or is correlated with something that did. We can address this question using data available through the Africa Centre, in which we can measure household socioeconomic status at two points in time (with the exception of household expenditure, which is not available for 2001). In the second panel of Table 3 we examine, for children whose fathers were known to be alive at HSE1 (2001), whether a father's death between HSE1 and HSE2 is a significant predictor of changes in household socioeconomic status, measured at HSE2. Holding constant resources present in the household at HSE1, if fathers' deaths moved households closer to or deeper into poverty, we would expect to see household socioeconomic status suffer when fathers die. We find no such effect: fathers' deaths between waves of the survey have no significant effect on household economic status, as measured by assets, access to piped water or toilet facilities. Our results are consistent with a model in which poverty may have contributed to the men's deaths, but their deaths did not lead to greater poverty in the household.

In the following sections, we examine both the extent to which the loss of a parent lowers educational investment and attainment, and the extent to which such reductions could be explained by the differences in socioeconomic status associated with orphanhood.

3. Parents' vital status and children's educational outcomes

Table 4 presents a first look at the relationship between parents' vital status and children's educational outcomes. To begin, we restrict the sample to resident children ages 6 to 16 for whom both parents' vital status is known. We do so in order to test whether the impact of losing a parent is different, if the child's other parent is known to be dead (and for this the other parent's vital status must be known). Each column of the table reports results from a separate regression, with robust standard errors presented in parentheses. A complete set of age indicators and an indicator that the child is female are included in all regressions. An indicator that the child moved into this residence between HSE1 and HSE2, and household characteristics that may affect educational investments and attainment are included in the second column for each outcome. These include the log of total expenditure per resident member, the log of the number of resident members, the fraction of resident members under age 14, the fraction who are pensionable (women aged 60 and above, men aged 65 and above), the number of assets owned by the household, and indicators for whether the household has access to any toilet facilities, and to piped water.⁴

⁴Information on household expenditures, assets, and resident members and their characteristics refer to the bounded structure in which the child resides.

Table 4 shows that while paternal orphans are disadvantaged in school attainment, enrollment and expenditures, most of this disadvantage is accounted for by their household socioeconomic status, discussed in Section 2. Without controls for household socioeconomic status, paternal orphans are one percentage point less likely to be enrolled in school, a disadvantage that falls to an insignificant loss once controls for household economic status are included in the regression. Similarly, without controls for household status, paternal orphans are observed on average having 13 percent less spent on school-related expenses. However, when controls for household socioeconomic status are included, this shortfall is reduced to 2.6 percent, and is not significantly different from zero. Table 3 found no evidence that fathers' deaths were the cause of household poverty. Those results, used together with schooling outcomes for orphans presented in Table 4, provide no evidence in support of a hypothesis that fathers' deaths caused worse schooling outcomes through their effect on household economic status. Instead, fathers' deaths appear to be associated with worse schooling outcomes because the event of a father's death is a marker that the household is poor.

Table 4, in contrast, shows a large and significant association between schooling outcomes and mothers' deaths. Maternal and double orphans are at significant disadvantage with respect to their schooling, with or without controls for household characteristics. Specifically, children who have lost mothers have fallen more than a third of a year behind other children in school, on average. They are 3 percentage points less likely to be enrolled in school and, controlling for household socioeconomic status, children who have lost mothers have less spent on their education-related expenses, relative to other children on average.

For each regression we test whether the impact of losing a mother only (maternal

orphan) is significantly different from losing both mother and father (double orphan). While losing one's mother affects all three measures -- attainment, enrollment, and school-related expenditures -- there is no significant difference between losing one's mother alone, and losing both parents. (These results are virtually unchanged if we include all children, and add to the regressions indicators that father's status is unknown, mother's status is unknown, and both are unknown.) As can be calculated from the numbers presented in Table 1, while 55 percent of children whose fathers have died live with their mothers, only 10 percent of children whose mothers have died are living with their fathers, rendering maternal orphans in the DSA virtual double orphans. This is similar to what is found in other parts of Southern Africa that rely heavily on migrant work (see Case *et al*), although male absence may be even greater in South Africa as a result of apartheid policy.

Results in Table 3 found that children whose mothers had died were not living in poorer households, on average. Unlike the results for fathers, we find no evidence that the poorer educational results of maternal orphans are attributable to their economic status. The next section will address whether mothers' deaths appear to cause children to fall behind in school.

In what follows, both because our information on fathers is limited, and because our evidence suggests that the death of a mother has a much larger effect on children than does the death of a father, we will focus on mothers' deaths. Table 5 opens up our analysis of the impact of orphanhood to all children for whom fathers' status is unknown, increasing the sample of resident children aged 6 to 16 by roughly 60 percent. In all of the analysis of educational outcomes at HSE2 that follow, we include indicators that father's status is unknown, and that father is known to be dead.

Similar to the results presented in Table 4, which restricted the sample to children for whom fathers' status was known, we find that children who have lost mothers are at a significant disadvantage with respect to educational attainment, enrollment and school spending, and that the inclusion of controls for household socioeconomic status has little effect on the estimated impact of losing a mother. One channel through which orphanhood may affect schooling is through the disruption of children's living arrangements. Orphans are at risk of being fostered, which may cause children to fall behind in school -- either because they are forced to wait until the beginning of a new school year to enroll, or because moving slows the learning process. Results in Table 5 suggest that moving is associated with lower educational attainment and enrollment, but that the lower attainment and enrollment of children who have lost mothers cannot be explained by moving. Even with controls for moving, children who have lost their mothers are a quarter of a grade behind other children their age, and are two percentage points less likely to be enrolled. Relative to other children, those who have lost mothers are also observed having 15 percent less spent on their school expenses on average.

The final column for each education measure presents regression results in which we include indicators for each bounded structure (which we refer to in the table as *household fixed effects*). Identification of orphan effects in these columns comes from comparing outcomes for children who have lost their mothers with outcomes for the non-orphaned children with whom they live. (Sixty percent of children who have lost their mothers live with a child of school-going age whose mother is alive.) Children in the same residence provide a natural comparison group for many reasons: the number of adults present, the wealth of the household, the distance to town, and (often) the distance to school and school fees, will be identical for these children. We find --

both for educational attainment and school spending -- that relative to the non-orphans with whom they live, children who have lost their mothers are at an educational disadvantage: they are a quarter of a year behind in school, and have 10 percent less spent on their schooling.

In summary, we find children whose mothers have died are behind in school, relative both to children in the DSA at large, and to non-orphans with whom they live. They are less likely to be enrolled than other children in the DSA, and spending on their school related expenses is significantly lower. In the following sections, we examine alternative hypotheses for why these children may be disadvantaged.

4. Do mothers' deaths have causal effects on children's schooling?

Many explanations exist for the schooling deficit we observe for maternal orphans. Some of these suggest that mothers' deaths have a causal effect on children's educations. Orphans may have fallen behind in school because they were caring for their mothers and their families after their mothers fell ill. Children may have been scarred by the death of their mothers, causing them to be less "school ready" than they had been previously. A non-competing explanation is that mothers are the gatekeepers for their children's educations and, when mothers are gone, no other caregiver is as vigilant in ensuring that children get to school or that money for school fees and uniforms is found.

Other explanations suggest the correlation we find between mothers' deaths and children's schooling is spurious. There may be any number of omitted family characteristics that make a child less likely to go to school and his or her mother more likely to die. Mothers' deaths may simply be a signal that children themselves are ill. Children whose mothers die may be those who

would have found it difficult to learn under any circumstances. Such children may have always been less prepared for school, and may have lagged behind in school, even if their mothers did not die.

We can rule out some of these hypotheses by looking at school enrollment and attainment of children who were not orphans when the first socioeconomic data were collected in 2001, but who subsequently lost a mother before the second round of data were collected in 2003/4. Results for this analysis are presented in Table 6, where we regress completed education at HSE1 on an indicator that mother is dead at HSE1, and an indicator that mother will be dead before data are collected at HSE2. All regressions include controls for the child's age, sex, and household socioeconomic status. Similar to the results above, we find that mother's death before HSE1 is associated with 0.3 fewer years of completed education. However, mother's *future* death has no significant effect on a child's schooling at HSE1. We find no evidence that a mother's death is simply a signal that a child has always been less prepared for school, and would have lagged behind in school, even if his or her mother did not die. If this were the explanation, we would expect mother's future death would predict the child lagging in school when first recorded at HSE1.

In addition, we find no evidence to support the hypothesis that the reason children lag behind when their mothers are dead is because the children are themselves ill. In columns 3 and 4, we include an indicator that the child will die after the HSE1 survey is collected. Such children have fallen behind in school (although not significantly so), and the inclusion of an indicator of child's future death has no effect on the estimated impact of the child's mother's death.

Table 6 also presents evidence on school enrollment at HSE1. Similar to our results for enrollment at HSE2, we find that children whose mothers are dead before the survey begins are two percentage points less likely to be enrolled. However, mothers' future deaths have no significant effect on enrollment at HSE1. These data do not support a hypothesis that children have fallen behind in school because they have been pulled out of school to tend to mothers who are ill or to take on additional household responsibilities. In addition, we find no evidence that a mother's death is simply acting as a proxy for a child's own illness: there is no significant relationship between children's death after HSE1 and their school attendance in year 2000.⁵

With these data, we cannot rule out that children's enrollment and attainment suffer because of the scarring caused by mother's death. Children may have been on track in school until their mothers died, and the trauma of mothers' deaths may have made the children less "school ready." However, we take the evidence in Table 6 to rule out explanations based on innate child "quality." Regardless of whether we find the mechanism at work is scarring, or is instead the loss of mother as gatekeeper, our results are consistent with mother's death having a causal effect on children's schooling outcomes.

5. Are all maternal orphans at equal risk?

⁵Among children aged 0 to 4, mother's death predicts children's deaths from AIDS. However, by the time children reach school-going age (6 and above), deaths from AIDS are rare. Less than 0.2% of all children resident on January 1, 2001 died in that year (26 children), and less than a third of those died of AIDS (8 children). Of the 1527 children whose mothers were dead on January 1, 2001, 5 children aged 6 to 16 died in that year. All five were under 10 years old; three died of AIDS.

Sections 3 and 4 made clear that, when mothers die, children fall behind in school and have fewer resources devoted to their schooling. To better understand the risks these children face, we examine whether outcomes for orphans vary according to their characteristics and those of the households in which they reside.

Table 7 examines whether educational outcomes depend on how long a child's mother has been dead. We add to our analysis, which already includes an indicator that mother is dead at HSE2, an indicator that a child's mother died before January 1, 2000. The coefficients for these two indicators of death track differences in outcomes based on the time since mother's death. We find that mothers' deaths appear to have a cumulative effect on years of completed education. Children whose mothers have been dead since 2000 have fallen significantly farther behind in school relative to children whose mothers died between 2000 and the HSE2 survey. In contrast, while an indicator that mother is dead affects enrollment and spending on schooling, an indicator that the child's mother has been dead since 2000 has no significant effect on enrollment or spending. Results in Table 7 suggest that the length of time a child has been an orphan has different effects on a child's educational "stock" (years of completed education) and educational "flow" (enrollment and current spending on children's schooling). These findings are consistent with a model in which, over time, the reduced probability of being enrolled cumulates as an ever larger deficit in educational attainment.

Researchers and some international agencies have warned that girls who have lost their mothers may be especially vulnerable with respect to schooling (Giese *et al* 2003, World Bank 2002, UNAIDS 2002). If children become care-givers for parents who are ill, one might expect girls would be disproportionately burdened. We examine this phenomenon in Table 8, where we

include an interaction term between the indicator of mother's death and the indicator that the child is female. These interaction terms are small and insignificantly different from zero for enrollment, attainment, and school spending. In addition, some researchers have argued that orphans have poorer educational outcomes because they live in poor households, and that their poverty explains their outcomes. Such statements are difficult to reconcile with our findings. Table 5 found that an orphan's educational attainment suffers relative to that of non-orphaned children with whom he or she lives. We push this further in Table 8 by including an interaction term between the indicator of mother's death and the log of expenditure per household member. If higher socioeconomic status protected orphans, we should expect to see this interaction term offsetting the impact of being an orphan. Contrary to this notion, we find no significant offsetting effect: the interaction terms for enrollment and attainment are small and insignificantly different from zero, and the interaction term for school spending takes a perverse sign. Orphans living in wealthier households have significantly less spent on their schooling than other children in similarly situated households.

In South Africa, a generous old age pension is paid to all men and women who reach pension age (60 for women, 65 for men) without a private pension. Almost all African (Black) South Africans qualify for this pension. Does proximity to a pensioner protect the schooling of orphans? We find no evidence of this in our data. When our indicator that a child has lost a mother is interacted with an indicator that the child is living with a person of pensionable age, we find no significant effect on school enrollment, attainment, or school spending.

Perhaps orphans lag behind in educational attainment because they are sent to schools of lesser quality with lower fees. Case and Deaton (1999) show a strong association in South Africa

between school quality and children's progression through school. To investigate whether orphans' relative disadvantage is primarily driven through school choice, we examine how orphans fare relative to other children in the same school. Table 9 present results from regressions in which indicators are added for every school in the DSA. In this way, the impact of being an orphan is identified by comparing outcomes for orphans relative to other children of the same age in the same school. Maternal orphans fall behind in school, in part, because they are less likely to be enrolled. However, of orphans who are enrolled in school, we find school choice explains some of the deficit in their schooling: the gap in educational attainment falls from -0.27 to -0.19 years, and the estimated shortfall in school spending falls from 15 to 12 percent. The differences between maternal orphans and other children continue to be significant; even relative to other children in the same school, orphans are disadvantaged.

6. South African orphans: Additional evidence from the South African Census

The results in the Sections above examined the impact of parental loss on education for those children living in one demographic surveillance site in Northern KwaZulu-Natal. To estimate the extent to which these results might generalize, we examine the impact of mothers' and fathers' deaths on children's enrollment and attainment for African (Black) children in the province of KwaZulu-Natal, and in South Africa as a whole, using data from the 10 percent sample of the 2001 South African Census.⁶

⁶For additional information, see www.statssa.gov.za.

Results in Table 10 are markedly similar to those presented above. As was true in the Africa Centre data, Census results show that mothers' deaths are associated with schooling deficits that are four to five times as large as those observed for fathers' deaths. In both the Africa Centre data and the South African Census, whether we compare orphans to all other children their age, or to non-orphaned children with whom they live (i.e., without or with household fixed effects), the loss of a child's mother is associated with two-tenths of a year less completed schooling, and with a two to three percentage point reduction in the probability of enrollment.

We can also compare our results for the DSA with those for other parts of sub-Saharan Africa. Case *et al* examine the association between orphanhood and school enrollment in 19 Demographic and Health Surveys run in 10 other sub-Saharan African countries from 1990 to 2000. Case *et al* estimate negative effects of maternal orphanhood on enrollment in 18 of 19 surveys, with significant effects in Kenya (1993, 1998), Malawi (1992, 2000), Niger (1992), Zambia (1992), and Zimbabwe (1994, 1999). Similar to the results presented above for South Africa, the DHS results suggest that children whose mothers have died are at risk for lower school enrollment throughout sub-Saharan Africa.

Results in Table 4 show that maternal orphans and double orphans in the DSA are at equal risk with respect to educational attainment and enrollment. In contrast, the DHS surveys analyzed by Case *et al* generally show larger effects for double orphans than for maternal orphans. Only one in ten maternal orphans in the Africa Centre Demographic Surveillance Area is living with a father, which is a lower paternal presence rate than is reported for any country studied by Case *et al*. Father absence may help to explain the differences in relative outcomes for maternal orphans in the DSA and those in other parts of Africa. If father absence turns maternal orphans into virtual

double orphans, then we would expect to find maternal orphans with outcomes similar to double orphans.

7. Policy challenges

One of the lasting effects of the HIV/AIDS crisis will be the impact it has on the education of the generation of children now of school going age. Throughout sub-Saharan Africa, the crisis is reducing educational achievement, a result that can be expected in turn to dampen economic growth and the health and general well-being of Africans.

Policy makers are currently grappling with selecting policies to deal with the crisis, and disagreement abounds. Some policy makers are currently arguing for free universal state education as the fairest way of dealing with the gathering storm (Giese *et al*). While this is a laudable goal, it seems unlikely to become reality any time soon. Some researchers-cum-policymakers in South Africa argue that it would be unfair to provide special services to orphans (Meintjes *et al* 2003). They note that there are many poor children in South Africa whose parents are alive, who are also at risk for poor schooling outcomes. Meintjes *et al* ask “why, in the context of widespread poverty, [should] children in the care of relatives require special grants different from children living with biological parents?” (page 22). The evidence provided here speaks directly to this question, showing that, in both poor and wealthy households, children who have lost mothers are at risk of poor outcomes, relative to the children with whom they live.

Documenting that orphans are vulnerable, however, does not provide sufficient grounds for recommending policies that target orphans. Targeted policies bring with them a host of problems. It is often difficult to find an effective screening device that does not screen out the

very people one is trying to target. In South Africa, a foster care grant is currently available (at least in theory) to help care-givers provide for orphans. In the DSA, only 9 percent of double orphans receive grants of any kind, and less than 2 percent receive a foster care grant. It is thought that barriers to grant receipt (such as providing death certificates) raise the bar to the point that care-givers don't even apply for such grants. Moreover, we remain unconvinced that special grants are the best policy response to the risks orphans face with respect to their schooling. Results presented above suggest that cash transfers to orphans' care-givers are unlikely to close the gap in school achievement. Orphans suffer relative to the non-orphaned children with whom they live, and orphans in wealthy households are also at risk for education deficits.

In-kind educational transfers to orphans merit consideration. To date, such transfers have not been evaluated for their effectiveness (Subbarao and Coury 2004) and, in South Africa, in-kind transfers targeted at poor children's educations have not proved to be successful for children in the DSA. There is on the books a fee exemption for poor children. However, school fees collected are used directly by the schools that collect them -- for maintenance, equipment, and school supplies -- so that it works against the schools' interests to waive fees. Indeed, in the DSA, only one percent of resident children aged 6 to 16 were reported to have had paid no school fees in HSE2. To be effective, in-kind transfers to orphans (such as waiving school fees and subsidizing school uniforms) would need to be provided through a central fund that did not deplete local school resources.

Whether these policies are to be recommended will depend on the extent to which orphans are behind because they have lost their education champion when their mothers died, and the

extent to which orphans are behind because they have been scarred through the process of losing a mother.

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Figure 1. Log-odd of dying and the probability of an AIDS Death 2001
Africa Centre for Health and Population Studies

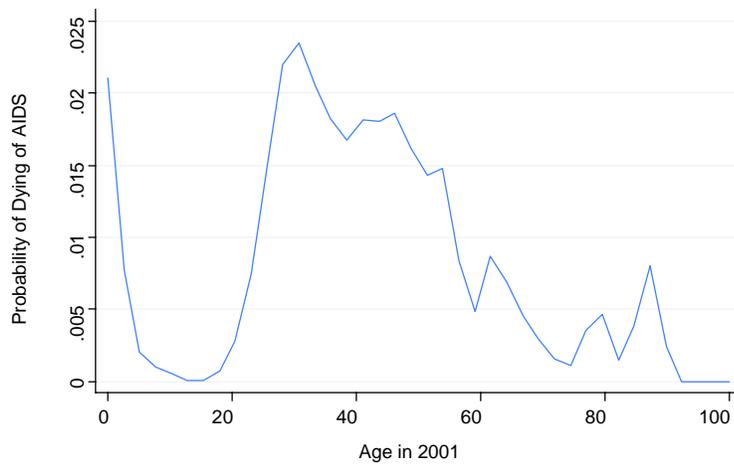
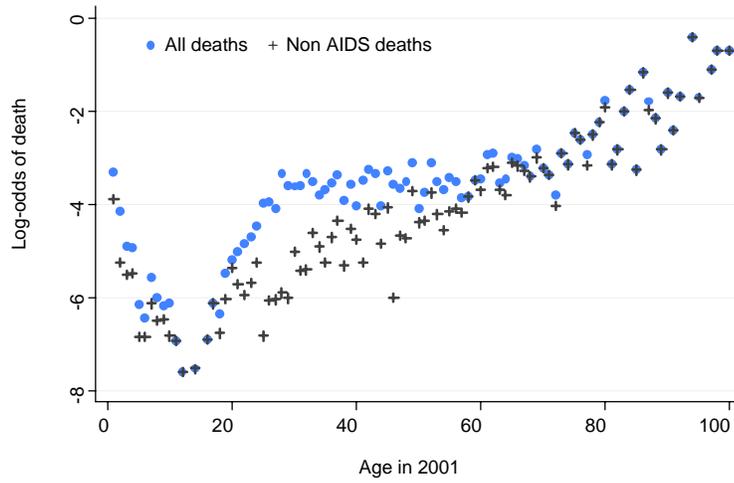
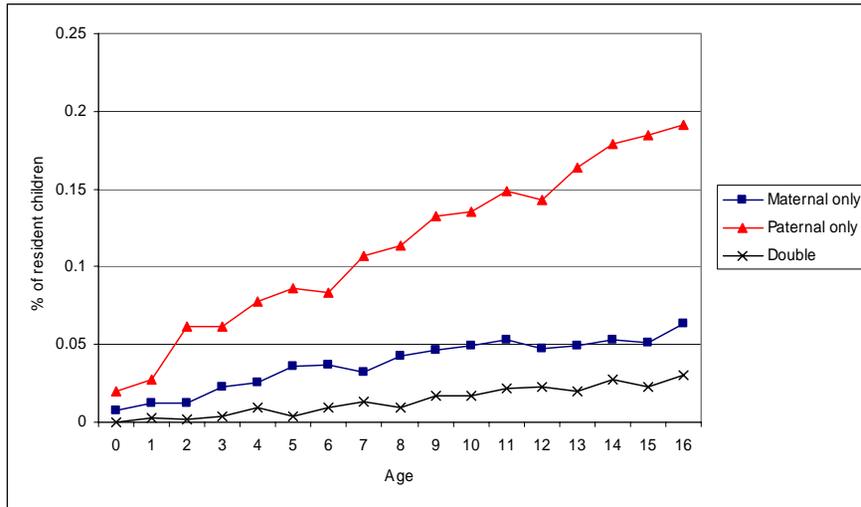


Figure 2. Rates of orphanhood in the DSA.

PANEL A: Orphans as a percentage of resident children as at 1 January 2000



PANEL B: Maternal orphans as a percentage of resident children as at 1 January 2001 and 1 January 2004

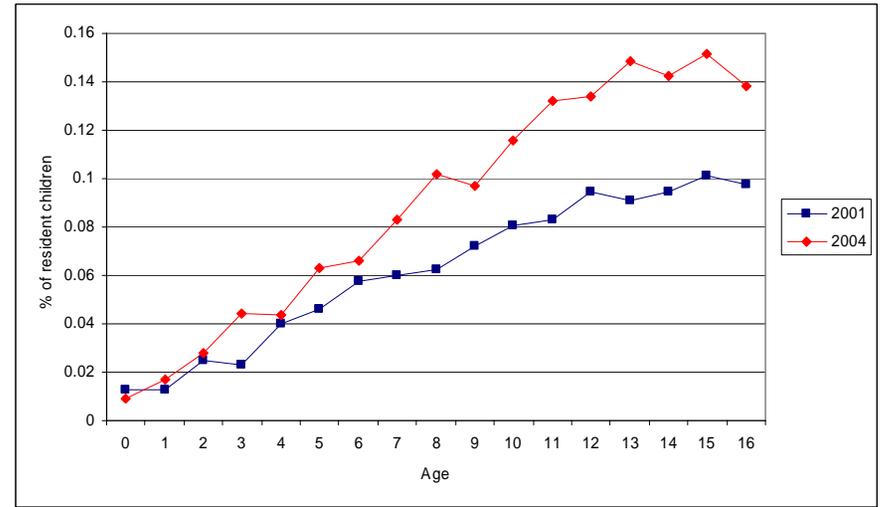


Table 1. Parental Status of Resident Children Aged 6-16 in the DSA at HSE2

Mother's Status:	Father's Status					Observations (Row totals)	Percentages (mothers):
	Resident in child's household	Resident in DSA	Non- resident in DSA	Dead	Father Status Unknown		
Resident in child's household	3580	130	2819	1724	3537	11790	59.3
Resident in the DSA	67	50	95	102	332	646	3.3
Non-resident in DSA	271	33	417	431	2174	3326	16.7
Dead	203	21	187	540	1063	2014	10.1
Mother status unknown	249	26	448	355	1035	2113	10.6
Observations (column)	4370	260	3966	3152	8141	19889	
Percentages (fathers):	22.0	1.3	19.9	15.9	40.9		100

Table 2. Sample Characteristics
Children resident in the DSA at HSE2, ages 6 to 16

	Mother is Alive at HSE2		Mother is Dead at HSE2	
	Means	Obs	Means	Obs
Child Characteristics				
Child's age at HSE2 (2003/04)*	10.87	15762	11.57	2014
Indicator: child is female	0.50	15761	0.49	2014
Indicator: mother dead at HSE1 (2001)*	0.00	15762	0.64	1742
Indicator: father dead at HSE1 (2001)*	0.17	9507	0.43	826
Indicator: father dead at HSE2 (2003/4)*	0.23	9719	0.57	951
Child Educational Outcomes				
Educational attainment at HSE2 (2003/4)*	4.17	15037	4.36	1937
Indicator: enrollment at HSE2*	0.96	14944	0.94	1944
Monthly educational expenditures for this student at HSE2 (Rands)*	53	14253	42	1809
Household Characteristics HSE2 (2003/4)				
Total expenditure/resident member (Rands)	178	15762	171	2014
Number of assets owned	6.65	15540	6.61	1992
Indicator: has toilet facilities*	0.72	15721	0.74	2001
Indicator: has access to piped water	0.50	15722	0.50	1999
Indicator: child moved to this residence between HSE1 (2001) and HSE2 (2003/4)*	0.23	15762	0.33	2014
Number of resident members	8.90	15762	8.78	2014
Fraction resident members less than age 14*	0.46	15762	0.43	2014
Fraction of resident members of pension age*	0.05	15762	0.08	2014

Notes: An asterisk * indicates that the mean for children with mothers who have died is significantly different from that for children with mothers who are alive. The sample is restricted to children resident in the DSA at the time of the second socioeconomic survey for whom the status of the child's mother is known.

Table 3. Household Socioeconomic Status
Children resident in the DSA at HSE2, ages 6 to 16

PANEL 1: CHILDREN WITH COMPLETE INFORMATION ON MOTHERS				
		Dependent variable:		
	Log(expenditure per member)	Assets owned HSE2	Piped Water HSE2	Toilet facilities HSE2
Indicator: Mother is dead at HSE2	.044 (.030)	.129 (.119)	-.006 (.016)	.017 (.015)
Indicator: Father is known to be dead at HSE2	-.118 (.034)	-.699 (.120)	-.029 (.017)	.002 (.016)
Indicator: Father's status is unknown	-.102 (.025)	-.569 (.091)	.005 (.013)	.046 (.011)
Number of Observations	17508	17531	17720	17721

PANEL 2: CHILDREN WITH FATHERS KNOWN TO BE ALIVE AT HSE1				
		Dependent variable:		
		Assets owned HSE2	Piped Water HSE2	Toilet facilities HSE2
Indicator: Father is dead at HSE2		-.286 (.207)	-.011 (.034)	-.023 (.030)
Assets owed at HSE1		.660 (.016)	.007 (.003)	.018 (.002)
Piped water at HSE1		.579 (.111)	.471 (.018)	.137 (.015)
Toilet facility at HSE1		1.23 (.110)	.042 (.020)	.432 (.018)
Number of Observations		7502	7594	7589

Notes: Sample in Panel 1 is restricted to resident children in the DSA ages 6 to 16 at HSE2. Sample in Panel 2 is restricted to resident children in the DSA ages 6 to 16 at HSE2 whose fathers were known to be alive at HSE1. All regressions include an indicator that the child is female, and a complete set of age indicators. Ordinary least squares regression coefficients are presented, with robust standard errors that allow for correlation between unobservables of children living in the same *bounded structure* (house or compound).

Table 4. Parents' Vital Status and Children's Educational Outcomes
Children resident in the DSA at HSE2, ages 6 to 16

	Years of completed education		Dependent variable:			
			Indicator: child is currently enrolled		Log(monthly educational expenses)	
Maternal orphan: mother is dead, father is alive	-.380 (.102)	-.395 (.096)	-.032 (.013)	-.032 (.013)	-.086 (.080)	-.111 (.072)
Paternal orphan: father is dead, mother is alive	-.166 (.045)	-.083 (.042)	-.014 (.005)	-.009 (.005)	-.134 (.043)	-.026 (.035)
Double orphan: both parents are dead	-.394 (.084)	-.347 (.082)	-.034 (.012)	-.030 (.012)	-.254 (.066)	-.226 (.063)
F-test: maternal orphan= double orphan (p-value)	0.01 (.9141)	0.16 (.6925)	0.01 (.9109)	0.01 (.9149)	2.85 (.0913)	1.55 (.2128)
Controls for household characteristics?	No	Yes	No	Yes	No	Yes
Number of observations	10033	10033	10076	10076	9516	9516

Notes: Ordinary least square regression coefficients are presented, with standard errors that allow for correlation between unobservables from the same *bounded structure* (house or compound) presented in parentheses. The sample is restricted to resident children for whom vital status of both parents is known. An indicator for each year of age and an indicator that the child is female are included in all regressions. Household characteristics included in columns 2, 4, and 6 are the log of total expenditure per resident member, the log of the number of resident members, the fraction of resident members under the age of 14, the fraction of resident members who are of pensionable age (60 and above for women, 65 and above for men), an indicator that the child moved to this bounded structure between 2001 and the collection of HSE2, the number of assets owned by the household, and indicators for whether the household has access to any toilet facilities, and to piped water. Information on household expenditures, resident members and their characteristics refer to the physical bounded structure in which the child resides.

Table 5. Mothers' Vital Status and Children's Outcomes
Children resident in the DSA at HSE2, ages 6 to 16

	Dependent variable:								
	Years of completed education			Indicator: child is currently enrolled			Log(monthly educational expenses)		
Indicator: Mother is dead	-.269 (.046)	-.270 (.045)	-.246 (.051)	-.020 (.006)	-.019 (.006)	-.012 (.008)	-.151 (.037)	-.157 (.032)	-.095 (.030)
Indicator: Child moved into this residence between 2001 and HSE2	--	-.236 (.032)	-.246 (.047)	--	-.023 (.005)	-.032 (.007)	--	-.036 (.027)	-.029 (.027)
Controls for household characteristics?	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Controls for household fixed effects?	No	No	Yes	No	No	Yes	No	No	Yes
Number of observations	16606	16606	16606	16698	16698	16698	15604	15604	15604

Notes: Ordinary least square regression coefficients are presented, with standard errors in parentheses. In regressions that do not include household fixed effects, correlation is allowed between unobservables for children from the same *bounded structure* (house or compound). The sample is restricted to resident children for whom mother's status is known. Included in all regressions are indicators for father's status at HSE2 (father known to be dead, father's status unknown), and a complete set of indicators for child's age and sex. Household characteristics included are the log of total expenditure per resident member, the log of the number of resident members, the fraction of resident members under the age of 14, the fraction of resident members of pensionable age, the number of assets owned by the household, and indicators for whether the household has access to any toilet facilities, and to piped water. Information on household expenditures, resident members and their characteristics, and household fixed effects refer to the physical bounded structure in which the child resides.

Table 6. Educational Attainment and Future Deaths
Children resident in the DSA at HSE1, ages 6 to 16

	Years of completed education at HSE1				Attendance in Year 2000-2001			
Indicator:	-.290	-.284	-.289	-.282	-.016	-.018	-.016	-.018
Mother is dead at HSE1	(.056)	(.084)	(.056)	(.084)	(.009)	(.013)	(.009)	(.013)
Indicator: Mother will be dead by HSE2	--	-.007 (.068)	--	-.008 (.068)	--	.002 (.009)	--	.002 (.009)
Indicator: Child will be dead at most recent survey (2004)	--	--	-.226 (.218)	-.227 (.219)	--	--	-.026 (.039)	-.026 (.039)
Number of observations	17674	17674	17674	17674	16292	16292	16292	16292

Notes: Ordinary least square regression coefficients are presented, with standard errors presented in parentheses. Correlation is allowed between unobservables for children from the same *bounded structure* (house or compound) at HSE1. The sample is restricted to resident children at HSE1 for whom mother's status is known. Included in all regressions are indicators for father's status at HSE1 (father known to be dead, father's status unknown), a complete set of indicators for child's age and sex, the number of assets owned by the household at HSE1, indicators for access to piped water and toilet facilities, and an indicator that the household is connected to the electricity grid at HSE1. For school attendance in year 2000-2001, the indicator that mother is dead at HSE1 is an indicator that mother was dead before January 1, 2000.

Table 7. The Cumulative Impact of Mother's Death
Children resident in the DSA at HSE2, ages 6 to 16

	Dependent variable:		
	Years of completed education	Indicator: child is currently enrolled	Log(monthly educational spending)
Indicator: Mother is dead at HSE2	-.115 (.065)	-.011 (.009)	-.100 (.047)
Indicator: Mother is dead on January 1, 2000	-.227 (.086)	-.010 (.012)	-.062 (.063)
<i>F</i> -test: Mother variables (<i>p</i> -value)	15.65 (.0000)	3.57 (.0283)	7.86 (.0004)
Number of observations	16327	16410	15346

Notes: Ordinary least square regression coefficients are presented, with standard errors in parentheses. Correlation is allowed between unobservables for children from the same *bounded structure* (house or compound). The sample is restricted to resident children for whom mother's status is known. Included in all regressions are indicators for father's status at HSE2 (father known to be dead, father's status unknown), and a complete set of indicators for child's age and sex. Household characteristics included are the log of total expenditure per resident member, the log of the number of resident members, the fraction of resident members under the age of 14, the fraction of resident members of pensionable age, an indicator that the child moved to this bounded structure between 2001 and the collection of HSE2, the number of assets owned by the household, and indicators for whether the household has access to any toilet facilities, and to piped water. Information on household expenditures, resident members and their characteristics refer to the physical bounded structure in which the child resides. When mother's time since death is missing, it is predicted from a regression of time since mother's death on a constant and indicators that mother was dead on January 1, 2000 and at HSE1.

Table 8. Poverty, Gender and Orphanhood
Children resident in the DSA at HSE2, ages 6 to 16

	Dependent variable:											
	Years of completed education				Indicator: child is currently enrolled				Log(monthly educational expenses)			
Indicator: Mother is dead	-.270 (.045)	-.335 (.233)	-.262 (.060)	-.295 (.063)	-.019 (.006)	-.067 (.035)	-.018 (.008)	-.026 (.009)	-.157 (.032)	.227 (.164)	-.176 (.043)	-.188 (.045)
Interaction: Mother is dead H log(expenditure per member)	--	.014 (.048)	--	--	--	.010 (.007)	--	--	--	-.081 (.035)	--	--
Interaction: Mother is dead H orphan is female	--	--	-.017 (.078)	--	--	--	-.002 (.011)	--	--	--	.038 (.054)	--
Interaction: Mother is dead H pensioner household	--	--	--	.055 (.087)	--	--	--	.013 (.012)	--	--	--	.066 (.063)
<i>F</i> -test: Mother coefficients (<i>p</i> -value)	36.52 (.0000)	18.39 (.0000)	18.34 (.0000)	18.28 (.0000)	9.55 (.0020)	5.06 (.0064)	4.81 (.0082)	5.00 (.0068)	23.50 (.0000)	12.67 (.0000)	11.84 (.0000)	12.04 (.0000)
Number of observations	16606	16606	16606	16606	16698	16698	16698	16698	15604	15604	15604	15604

Notes: Ordinary least square regression coefficients are presented, with standard errors in parentheses. Correlation is allowed between the unobservables of children from the same *bounded structure* (house or compound). The sample is restricted to resident children for whom mother's status is known. Included in all regressions are indicators for father's status at HSE2 (father known to be dead, father's status unknown), a complete set of indicators for child's age and sex, and an indicator that the child moved into this residence between HSE1 and HSE2. Household characteristics included are the log of total expenditure per resident member, the log of the number of resident members, the fraction of resident members under the age of 14, the fraction of resident members of pensionable age, the number of assets owned by the household, and indicators for whether the household has access to any toilet facilities, and to piped water. Information on household expenditures, resident members and their characteristics refer to the physical bounded structure in which the child resides.

Table 9. Orphans' Relative Outcomes Within the Schools They Attend
Children resident in the DSA at HSE2, ages 6 to 16

	Dependent variable:			
	Years of completed education		Log(monthly educational expenses)	
Indicator: Mother is dead	-.270 (.051)	-.189 (.030)	-.154 (.026)	-.119 (.026)
Indicator: Child moved into this residence between 2001 and HSE2	-.234 (.050)	-.159 (.023)	-.038 (.027)	-.024 (.019)
Controls for household characteristics?	Yes	Yes	Yes	Yes
Controls for school fixed effects?	No	Yes	No	Yes
Number of observations	16526	16526	15551	15551

Notes: Ordinary least square regression coefficients are presented, with standard errors in parentheses. In regressions that do not include school fixed effects, correlation is allowed between the unobservables of students attending the same school. The sample is restricted to resident children for whom mother's status is known. Indicators for fathers vital status (known to be dead, and status unknown) are included in all regressions, together with a complete set of age and sex indicators. Household characteristics included are the log of total expenditure per resident member, the log of the number of resident members, the fraction of resident members under the age of 14, the fraction of resident members of pensionable age, the number of assets owned by the household, and indicators for whether the household has access to any toilet facilities, and to piped water. Information on household expenditures, and resident members and their characteristics refer to the physical bounded structure in which the child resides.

Table 10. Parental Death and Children's Schooling: South Africa and KwaZulu-Natal
African children ages 6 to 16 in the 2001 South African Census

	Years of completed education				Indicator: child is currently attending school			
	All South Africa		KwaZulu-Natal		All South Africa		KwaZulu-Natal	
Indicator: Mother is dead	-.188 (.012)	-.192 (.016)	-.164 (.022)	-.218 (.029)	-.026 (.002)	-.024 (.003)	-.030 (.004)	-.027 (.005)
Indicator: Father is dead	-.038 (.007)	-.049 (.012)	-.049 (.014)	-.056 (.021)	-.008 (.001)	-.012 (.002)	-.011 (.002)	-.010 (.004)
Controls for household fixed effects?	No	Yes	No	Yes	No	Yes	No	Yes
Number of observations	605458	605458	136160	136160	667511	667511	148936	148936

Notes: Ordinary least square regression coefficients are presented, with standard errors in parentheses. In regressions that do not included household fixed effects, correlation is allowed between unobservables for children observed in the same household. The sample is restricted to children for whom mother's and father's status is known. Included in all regressions are a complete set of indicators for child's age and sex. Household characteristics included are the log of the number of resident members, the number of assets owned by the household, indicators for whether the household has access to any toilet facilities, and to piped water, and indicators for 12 household income categories and nine provinces.