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The impact of orphanhood and HIV/AIDS on school enrolment

Evidence from Zambia

Bachelor thesis 15 ETCS

Spring 2013

Department of Economics

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Abstract

HIV/AIDS has made a great number of children orphans in sub-Saharan Africa where Zambia is one of the worst hit countries. The impact of the HIV/AIDS pandemic has become an issue of not only health, but of cross-sectional importance affecting other major corner stones in society such as education. The destruction of human capital and its impact on some of the most vulnerable children, i.e. orphans has been a subject of discussion in research literature, but the results regarding why orphans' education might differ from non-orphans vary. The aim of this study is to examine whether orphan status affects school enrolment among children in Zambia and to investigate whether the effects of orphanhood are stronger in regions with high HIV prevalence. Other variables found to impact children's education in previous studies are also examined. To study this relationship a probit model is conducted based on micro data from the Zambia Demographic and Health Survey (ZDHS). The results show that maternal orphanhood has a significant negative impact on school enrolment. The study further finds evidence of there being a stronger negative effect of maternal orphanhood in regions with high HIV prevalence. The number of household members, age, the education level of the head of household, wealth and the relationship to the head of household are also found to impact school enrolment among children.

Keywords: education, HIV/AIDS, orphans, Zambia

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Introduction

Just over thirty years ago, the first case of AIDS in the world was reported, originating from the USA in 1981 (MMWR 2001). At this stage, the effects and the transmission of HIV/AIDS were unclear and people did not know much about the virus. Nowadays it is a widespread topic and something that most people have heard of, even though the majority of people in the developed part of the world have never had to face the consequences or have even seen the effects up close. The reality is, however, that for many people it is part of their everyday lives, a tough struggle that they cannot win. The spread of HIV/AIDS is a serious problem, not only for the infected people, but for societies at large. This study aims to provide a deeper understanding of the socioeconomic impacts of HIV/AIDS by focusing on orphans and their education.

It is currently estimated that 30-36 million people are living with HIV worldwide. The most severely affected region is sub-Saharan Africa, home to 2/3rds of the world's infected people (UNAIDS 2012). Zambia is one of the worst hit countries in the region. The first AIDS case in Zambia was diagnosed in 1984 and during the early nineties the epidemic spread throughout the entire country and resulted in a prevalence of one in every five adults. However, a strong downtrend followed that brought down the prevalence to 15.6 per cent by 2001. Since then the prevalence has remained fairly stable, and by 2011 it had decreased to 12.5 per cent (UNAIDS 2011).

A pandemic such as HIV/AIDS presents major threats to the development of a country. It affects the health outcomes and many aspects of social and economic development, leading to a crisis of cross-sectional importance. With a population of 14 million, widespread HIV prevalence and high poverty rates, the Zambian demographic pyramid has a large bottom, with more than 46 per cent of the population being between 0 and 14 years of age (CIA World Factbook 2012). The pandemic has led to a distorted population distribution and a young society where 20 per cent of the children have lost one or both parents. It is estimated that 680 000 children are orphans due to AIDS (UNAIDS 2009). The United Nations defines an orphan as a child below the age of 18 years who has lost one or both parents (UNAIDS 2011). When also taking into account the low life expectancy of 49 years, it becomes clear that handling the issues facing orphans and vulnerable children is central for future development (World Bank 2012).

Many theories stress the importance of human capital for a sustainable growth and according to the International Labor Organization (ILO 2004), education is essential for the establishment and development of human capital. In Zambia, the percentage of GDP invested in education by the government has decreased. The expenditure was 2 per cent of GDP in 2005 and only 1.3 per cent in 2008 (World Bank 2012). The average number of 5.5 years of schooling for the population over 15 years is low similar to many other sub-Saharan countries. In addition, the mandatory schooling, which is tuition-free, is only seven years, resulting in a high dropout rate after grade 7 (UNESCO 2011).

The destruction of human capital that results from the HIV/AIDS pandemic affects the future economic prospect of children and staff at all levels by compromising the quality of education through absent and ill teachers and by enhancing the problem of illiteracy and children dropping out of school. It has gone from being a problem that affects individual families to being a problem that affects entire communities and countries. This is not sustainable in the long run. In order to combat the problem of poverty and HIV/AIDS it might be of great importance that Zambia ensures that children stay in school and receive the education needed to build a well-functioning and more prosperous society in the future. Sadly, many studies show that orphaned children are less likely to attend school than non-orphans (UNICEF 2003; Case, Paxson Ableidinger 2004).

A lot of researchers have taken an interest in the socioeconomic impacts of HIV/AIDS and have examined the issue of orphans' education in Africa. Case et al have dug deeper into this question in their 2004 report about how orphanhood affects the enrolment of children and their living arrangements in ten sub-Saharan countries, Zambia included. They found that orphans have lower school enrolment than non-orphans and that it can largely be explained by the relationship to the household head.

Robson and Kanyanta (2007) looked at, among other things, the impacts of HIV/AIDS on basic education for orphans, AIDS-affected children and vulnerable children in the Copperbelt district, which is one of the most severely affected regions in Zambia. They researched students' perceptions of the impact of the pandemic on the quality and access to education. It was found that poverty, for instance being forced to work in order to earn money for food and clothing, is a main contributor to why these children drop out of school.

The fact that there is not much consensus regarding what determines orphans' education makes it an interesting issue to examine further. Moreover, previous research does not provide sufficient coverage of whether the effects of orphanhood are greater in regions with high HIV prevalence compared to regions with low prevalence. The main purpose of this study is to analyse the effect of orphanhood on schooling in Zambia. Does orphanhood affect school enrolment and if so is the effect larger in areas where the HIV prevalence is high and also, has it also changed over time? Aspects related to orphans' education that have been brought into question in previous research, such as poverty, age, the relationship to the head of the household and gender are analysed. Different orphan statuses are also examined to see whether there is a difference in losing one's mother, father or both parents.

Comparisons over time are based on the Zambia Demographic and Health Surveys (ZDHS) from 2001-2002 and 2007. The ZDHS data from 2001-2002 includes a sample of 10660 children aged 7 to 16 and in the ZDHS 2007, the sample included 10087 children. The restricted age chosen for children is based on the years of schooling from grade one to grade nine.

The study begins with a theoretical background in section 2. An overview of previous research literature is then presented in section 3. The data is introduced in section 4, followed by a description of the variables and the model in section 5. The results from the probit

models are presented in section 6. A discussion and analysis of the results is held in section 7. Finally the study is concluded in section 8.

Theoretical Background

There are many theories concerning education, its importance in today's society and through what channels it operates. As a response to the issue that has emerged regarding orphans' education several theories discussing why it might differ between orphans and non-orphans have followed. This section aims to provide an overview of the theories of the demand for education as well as theories explaining why it might differ between orphans and non-orphans.

Demand for education

The human capital theory is the main model for the demand for education. The two main components of human capital are health and education and it can correspond to both innate and acquired abilities. Education has become the most important investment in human capital as well as the most researched aspect of it. Educational levels have increased in the developing world over the past 50 years and the average number of years of education has doubled in developing countries from 1975 to 2010 (Weil 2013 p. 179). But education, like other investments, can be expensive and the rapid population growth in many developing countries to a large percentage of the population being of school age, thus putting a lot of pressure on the educational system (Weil 2013 p. 181). In addition to the direct costs associated with education such as textbooks, transport, school premises and teachers' salaries there are also the more subtle costs known as opportunity costs. Opportunity costs can correspond to the wages that students forgo while undertaking an education as well as what is produced through the unpaid chores around the house and on the family farm. One estimate from the USA suggests that opportunity costs, in fact, account for half of the total cost of education, thus making it an important aspect to consider (Weil 2013 p. 180).

The question is: why does the demand for education differ between countries and individuals? Globalization and technological change are thought to have contributed to the higher demand for education overall. But the general idea is that the benefits of education should outweigh the costs associated with it. There are certain benefits of education; however people may perceive these benefits differently. One aspect is that education has a value in itself; it can enrich a person's life intellectually as well as spiritually (Weil 2013 p. 196). One widely cited theory is Maslow's hierarchy of needs (1943) cited by Huit (2007), where needs related to esteem and self-actualization are at the top of the pyramid. Maslow argued that the physiological and safety needs, such as food, health, and shelter are at the bottom of the pyramid and have to be fulfilled in order to move to a higher level. According to this theory, people at different levels in the hierarchy may therefore value and perceive these benefits differently.

Another benefit that is also on a more personal level is that education has an economic value in the sense that it can earn a return. The return to education can be defined as the increase in wages if a person adds one more year of education (Weil 2013 p. 182). The theory is that you can increase your wage by adding more education, i.e. become more productive and get a

well-paid job in the future. The demand for education may for this reason be higher in regions where a chance of higher earnings exists, which, in turn, can improve the standard of living. However, knowing the actual return to education is difficult. Banerjee and Duflo (2011 p. 88) claim that many people believe that there is an S-shaped return to an education with low initial returns in developing countries. Rather than providing a little education to all children parents might therefore choose to provide a lot of education to one child. Weil argues that the return to education is associated with the lack of educated people, i.e. there is a higher return to education when there are fewer educated people in a country (Weil 2013 p. 184). There is evidence of a positive relationship between the average number of years of education and the GDP per capita (Weil 2013 p 190). However, the causality is difficult to prove.

Another benefit of education is positive externalities. Many economists believe that education can improve growth. By providing education to one individual it will not only raise his or her output, but the output of the surrounding people too. An example of this is if a company has a highly educated CEO he or she is likely to be able to raise the output of the workers. An educated population is also believed to help democracy by creating a well-functioning and honest government. Furthermore, positive externalities are one of the key reasons to why governments choose to be involved in issues such as public schooling and mandatory schooling. Individuals tend to underestimate the benefits of education because they neglect the aspect of positive externalities and therefore the investment in education can be lower than what is socially optimal. In other words, the private return is lower than the social value (Weil 2013 p. 196).

The education of orphans

Beegle et al (2006) discuss the major risks related to orphanhood, where poverty in adulthood is a main concern, primarily due to the shortfalls in human capital investments. The HIV/AIDS pandemic has made a marked increase in orphanhood in sub-Saharan Africa and this is expected to influence the schooling outcomes for these children. There are different theories concerning the educational differences between orphans and non-orphans. Sharma (2006) discusses some theories on why orphans might fall short in comparison to non-orphaned children.

First, it may be more likely for orphans to live in poorer households compared to non-orphans. If there are credit constraints, the labour allocation within the household where a parent has died is therefore likely to be reallocated in order to obtain additional income to meet consumption needs. In other words, there are new responsibilities as well as a changed family structure and thus the investment in education may decrease. Sharma (2006) stresses the far distance to the future financial return of education as an essential argument for families bringing their children out of school. The opportunity cost of having these children in school is simply too high.

Second, he mentions the hypothesis of discrimination from other relatives or household members where the investment in the orphaned child is not taken into consideration. Crawley

(2001) sheds further light on this when he discusses the issue that orphans are often treated as second-class members of the household and that the discrimination can involve everything such as food, education, abuse and being forced to work. A cited theory in the study by Case et al (2004) that explains why orphans are less likely to be enrolled in school is referred to as Hamilton's rule, by William Donald Hamilton (1964). The theory suggests that biological ties control selfless behaviour. The outcome for an orphan is dependent on their relationship to the head of the household. Sharma (2006) gives financial return as example here as well. The biological child is more likely to yield a return to the household whereas the return for an orphan is likely to be lower.

Third, trauma from the death of parents and the loss of parental guidance and support, especially in the presence of HIV/AIDS, may lead to the child being unable to perform in school and in turn, affecting the decision to attend school (Sharma 2006). Shimamura and Carter (2011) add that orphans are likelier to repeat grade levels in school because they have experienced a parental death and its consequences. This might lead to an interruption of human capital accumulation and the orphan's educational progress may lag behind. This delay in educational progression can then affect the orphan's schooling decisions in a negative way. The AIDS-related stigma is also believed to affect orphans in their decision to return to school. Furthermore, losing a parent is a grieving process and some children may never stop grieving, which is likely to affect their schooling decision as well as their future (Boler & Carrol 2003).

The main theory behind the demand for education is the human capital theory where the major aspects are direct and indirect costs, personal enrichment, return to education and positive externalities. There are also a number of theories when it comes to why an orphan's education might differ from non-orphans such as credit constraints, discrimination and trauma. Many researchers have been interested in the topic, and as presented in the next section, their results differ regarding which theory seems to be the most accurate.

Literature overview

As the HIV/AIDS pandemic has spread through sub-Saharan Africa, there has been a surge in the interest for its consequences on society. This has resulted in a lot of research related to the socioeconomic impacts of HIV/AIDS. Orphans are some of the most severely affected by the pandemic because they have lost one and sometimes even both parents at a young age. Education is considered the most important type of investment in human capital (Weil 2013 p. 178) and is believed to impact economic growth as well as democracy in a number of ways, such as, through higher wages, increased productivity and more efficient and honest governments. This is part of the explanation as to why orphans' education has been a hot topic for researchers over the past decade. In this section the aim is to provide an overview of the previous research analysing the education of orphans in Africa.

One widely cited paper is 'Orphans in Africa: parental death, poverty, and school enrollment' from 2004 by Case, Paxson and Ableidinger. They use data from 19 demographic and health surveys (DHS) that were carried out in ten sub-Saharan countries from 1992-2000 and study how orphanhood affects the enrolment of children and their living arrangements. The obtained results showed that orphans in sub-Saharan Africa are less likely to be enrolled in school than non-orphans, independent of household poverty. They argue that the lower enrolment of orphans is a result of the fact that they tend to live with distant relatives or unrelated caregivers. Sharma (2006) is critical towards these findings. He claims that Case, Paxson and Ableidinger are unable to provide accurate information on whether orphanhood affects schooling outcomes. He argues that the single cross-section data fails to show that many orphans had stopped attending school before the death of parents. In addition, he says that this event is even more likely if the parents were infected by HIV, since parents pulling their children out of school is a common occurrence resulting from reduced income or high medical expenses.

Kürzinger, Pagnier, Kahn, Hampshire, Wakabi and Dye (2008) conducted a study in Tanzania and Burkina Faso examining the education status of orphans and non-orphans in communities affected by HIV/AIDS. They found that variables other than orphan status itself provide a better explanation to differences in education. These variables include age, the relationship between the child and the household head and the child/adult ratio of the household. Their study, for instance, showed that a higher dependency ratio between children and adults is related to a greater risk of not attending school. They also found that children between 12 and 18 years experienced a higher risk of education discontinuance compared to children of 6 to 11 years. Nampanya-Serpell (2000) concluded in a study from Zambia that age affects mainly the educational outcomes of children living in rural areas.

Robson and Kanyanta (2007) found that despite the fact that basic education is free in Zambia, there are other costs related to education that restrict some children from attending school. Some examples include books, transport and clothing. Further, they found that children are least likely to attend the upper basic levels, i.e. grades 8 and 9. The reason for this is primarily due to the fact that grade 8 and 9 are excluded from the free basic education policy and therefore not all families can afford the tuition fees. Frequently absent students

reported that working in order to obtain money for clothes and food was their main reason for absenteeism, hence economic stress plays a crucial role. New responsibilities in the household, changes in the family structure, trauma and loss of parental support and guidance also have an impact on students being absent or dropping out of school entirely.

Beegle, Weerdt and Dercon (2006) found in their study from Tanzania that single orphans are less likely to reside with their living parent after losing their first parent. Their study also revealed that the head of the household was often female, less educated or older. Kakooza and Kimuna (2006) examined the Kayunga district in Uganda and their study revealed that the large number of AIDS-related deaths among the ages of 20 to 49 dramatically increased the number of orphans in elderly headed households. Elderly people have gone from being provided for to being providers and according to the study their main concern is that they lack the resources needed, such as money and time, to provide an education. Therefore it might not be possible for orphans living in these households to receive an education. They conclude that it is likely that households headed by elderly people will continue to withdraw orphans from school. These results are inconsistent with the study by Kürzinger et al (2008) who found significant evidence from Tanzania and Burkina Faso that children living with their grandparents were more likely to attend school than those living with relatives and, even, their parents.

Kakooza and Kimuna (2006) further found in their study that it is more common for girls to drop out of school in order to increase household income or assist around the house. Kürzinger et al (2008) also confirmed that female children are at a higher risk of not attending school. A study by Nampanya-Serpell (2000) earlier found that the children most at risk of educational discontinuance in Zambia were girls, children of low-income families and children living in urban areas. A study of Zambia from 1994 also found that the infection rate of HIV was twice as high in cities compared to rural areas (Weil 2013 p. 146).

Another paper by Case and Ardington (2006), examines the outcome of South African children whose parents have died. They find that there is a significant difference whether the child is a maternal or paternal orphan, but there is no significant difference between being a maternal orphan and a double orphan. According to the study, maternal orphans are less likely to be enrolled in school and they receive fewer years of education compared to a child whose mothers are still alive.

Furthermore, the expenditure on maternal orphans' education is also lower, conditional on enrolment. This is partly consistent with Bicego (2003) who concluded that for single orphans, a mother's death causes more deterioration in education at the primary school ages as compared to a father's death. Moreover Bicego concludes that an orphan is less likely to be at his/her proper educational level than a child whose parents are alive and double orphans are less likely to be at their proper level than single orphans are. Beegle et al (2006) also found that there is a significant effect on school attainment when a child loses their mother. In addition they found that children at the ages 19 to 28 that were orphaned due to the loss of their mother between ages 7 and 15 complete approximately one year less of schooling.

Makame, Ani and Grantham-McGregor (2002) argue that the effect of losing one's mother is greater because it can cause more psychological distress.

The results from Case and Ardington (2006) regarding paternal orphans show that they are more likely to live in poorer households compared to children whose fathers are still alive. However the results do not show that they are necessarily less likely to be enrolled in school. Kürzinger et al (2008) on the other hand found that paternal orphans in Burkina Faso are at higher risk of not attending school. The results from Case and Ardington (2006) regarding wealth indicated that the households where fathers died were often poor prior to the deaths (Case & Ardington 2006). A study from Zambia by Nampanya-Serpell (2000) concluded that households where fathers died first were more likely to suffer economically compared to those where mothers died first because the father is most often the breadwinner of the family. The death was then followed by a drop in the income level.

A study from Zimbabwe by Nyamukapa, Foster and Gregson (2003) had previously shown some similar results to Case and Ardington (2006), but also some surprising exceptions. They found that the death of a child's mother lowers the chances of completing primary education, whereas the death of a child's father had no such effect. On the contrary, fathers' deaths were associated with a greater chance of having completed primary school, thus improving the children's prospects. The effect was especially strong for girls for whom a higher number of years had passed since the father died.

Furthermore, they found that rates of paternal orphanhood were higher than rates for maternal orphanhood and that orphans in general tend to live in poorer households. However, their results also showed one exception, because a number of double orphans were found in wealthier households. Ainsworth and Filmer (2006) also confirmed that orphans are not necessarily always concentrated in poorer households and argued that it is common for relatives with the most resources to take care of orphaned children as a way to cope with the parents' death. Finally, Nyamukapa et al (2003) concluded that there is a substantial gap in the educational outcome for double orphans. In addition to this they found that the effects of maternal orphans escalate and become more severe over time.

Despite many results confirming lower enrolment of orphans the results from a USAID report (2005) did not suggest that there are any differences in school enrolment among orphans, children with chronically ill caregivers, and other children aged 6 to 19 in Zambia and Rwanda. They suggested that educational programs should target all out-of-school children, not only orphans and children with chronically ill caregivers. Adolescents, particularly those between the ages of 13 to 19, need encouragement and support to stay in school.

Case et al (2004) believe that the decreasing number of investments resulting from orphans' lower enrolment has potentially long-term consequences for a number of children in the shape of reductions in the standard of living as well as a slower African growth. Sharma (2006) also finds similar evidence from Malawi. He argues that orphanhood in Malawi due to HIV/AIDS deprives children of basic needs such as health and education. The results show that there is a drop in school enrolment as orphaned children become older, which may lead to these

children being trapped in poverty for the rest of their lives. This would create a future where a large share of the population is underclass citizens without future prospects, which compromises sustainable development.

As presented throughout this section, some results regarding orphans' education support similar conclusions, whereas other results differ from country to country. There are several theories explaining why orphans drop out of school. Some researchers find that it could be due to the relatedness of the orphans to the head of the household, whereas many others argue that it is to a great extent related to poverty and its associated complications. Nevertheless, what researchers seem to agree on is that less education for these children is not sustainable and is an issue that must be dealt with.

Descriptive data

Database and samples

“The Demographic and Health Surveys (DHS) program has collected, analysed, and disseminated accurate and representative data on population, health, HIV, and nutrition through more than 300 surveys in over 90 countries” (Measure DHS 2013). Zambia was selected, as it is one of the countries with the highest HIV/AIDS prevalence in Africa. The analysis in this study is based on the data obtained from the nationally representative surveys made in Zambia in 2001-2002 and 2007. The stratification was separating every province into urban and rural areas and the samples were selected independently (ZDHS 2007). The focus lies on school-aged children between 7 and 16 years and the estimates are executed in STATA.

In the ZDHS from 2007, 7164 households were questioned, while the data from 2001-2002 include 7126 households. The number of children within the restricted ages of 6 to 17 years included in the sample was 10660 for 2001-2002 and 10087 for 2007. In the descriptive data, the children are divided into two groups depending on their age: one group for the children between 7 and 14 years of age who are entitled to tuition-free primary schooling and another group for the children aged 15 to 16 for the two years of junior secondary school. Late enrolment and grade repetition is not considered in the data, hence the information on which grade the children are in is unknown. The majority of the children live in rural areas. In ZDHS 2001-2002 approximately 70 per cent of the children lived in rural areas, whereas in ZDHS 2007 the percentage had decreased to approximately 61.5 per cent.



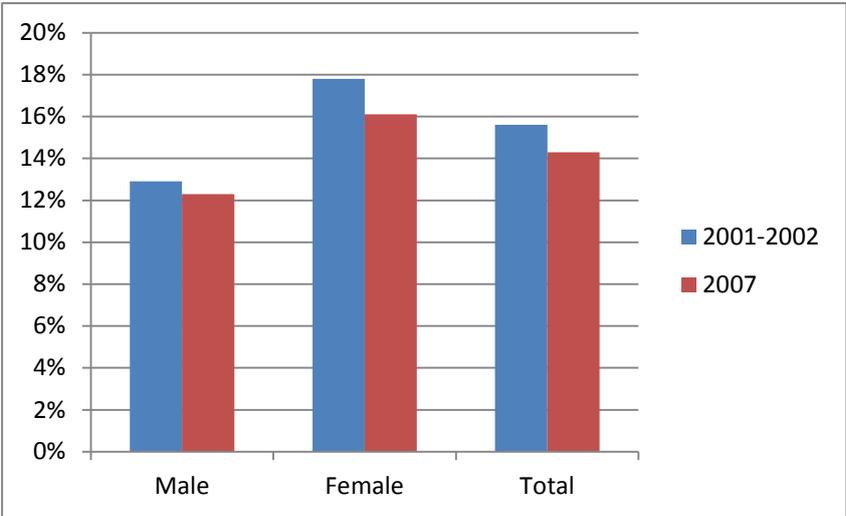
Source: Victoria falls 24 2011

HIV/AIDS and Orphanhood

In this section, the aim is to provide an overview of the ZDHS data and the main variables of interest, making comparisons both over time and between provinces in Zambia. The tables and graphs are based on our own computations using ZDHS from 2001-2002 and 2007.

In order to combat the HIV/AIDS epidemic, Zambia developed a cross-sectional intervention with the 2002-2005 Strategic Intervention Plan followed by the 2005-2010 National AIDS Strategic Framework (UNGASS 2011). The HIV prevalence rate in Zambia decreased during the first years of the 21st century for both males and females. Nevertheless, the gender distribution in Figure 1 displays a higher prevalence among women than men.

Figure 1 HIV prevalence in per cent. Individuals aged 15-49



Looking closer at the HIV prevalence in Zambia, Figure 2 shows the prevalence within the nine provinces. Between 2001 and 2007, the central and western provinces as well as Luapula experienced an increase in HIV prevalence by around two percentage points, while the other regions experienced a slight decrease.

Figure 2 HIV prevalence in per cent, by province. Individuals aged 15-49

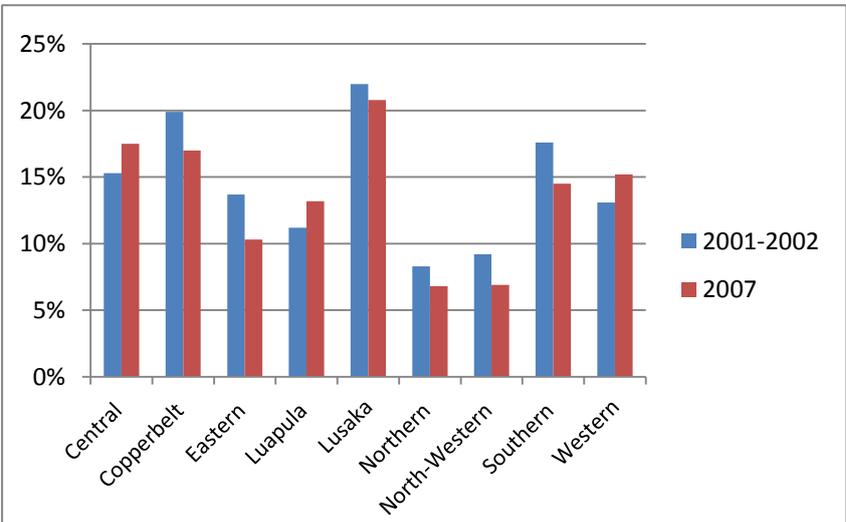
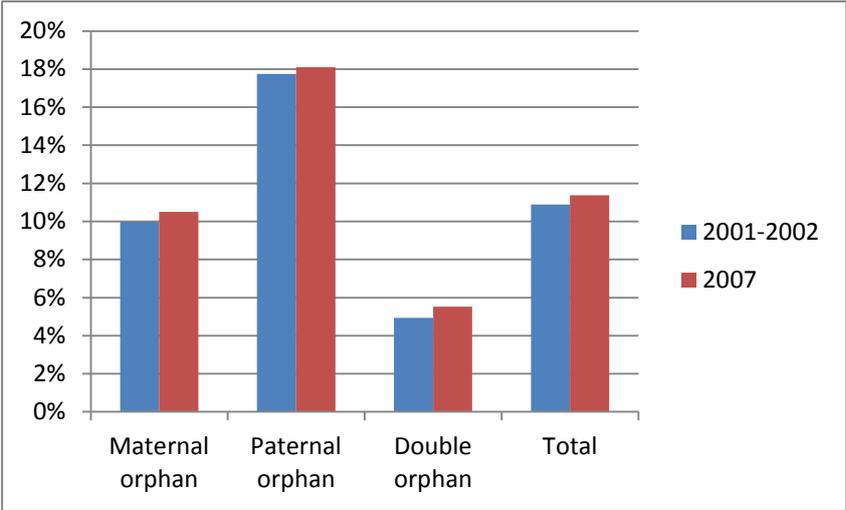


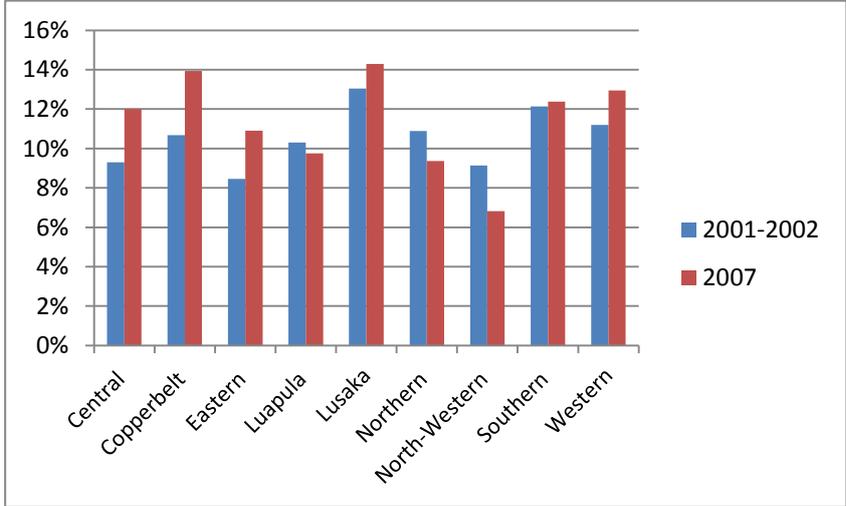
Figure 3 below shows the share of children aged 7 to 16 who are orphans, distributed among the different orphan types. The total number of orphans has increased in Zambia between 2001 and 2007, with an increase concerning all three categories. Though, the increase may be due to the fact that orphan status for children over 14 years was unknown in the 2001-2002 data. Among orphans in the sample, the majority of them are paternal orphans, which is consistent with observations from other sub-Saharan countries (Case and Ardington 2006; Case, Paxson, and Ableidinger 2004). The reason might be the general mortality rates, which is higher for men (Gorman 2007) and the higher life expectancy for women in the rest of the world.

Figure 3 Type of orphan in per cent. Individuals aged 7-14 (2001-2002) and 7-16 (2007)



Considering the different provinces in Figure 4, there was a percentage increase in the number of orphans in the majority of the regions during the period. However, the increase may, once again, be due to the fact that orphan status for children over 14 years was unknown in the 2001-2002 data. Nevertheless the Luapula, Northern and North-Western provinces experienced a decline.

Figure 4 Orphans in per cent, by province. Individuals aged 7-14 (2001-2002) and 7-16 (2007)



Considering Table 1, the provincial variation in the prevalence of orphans reflects the infection rate of HIV in Zambia, which is in line with the UNICEF report, ‘Africa’s orphaned generation’ (2003). For example, the Copperbelt had both high orphan rates and a high HIV prevalence during the period. The capital, Lusaka, had the highest infection rate of HIV as well as the highest proportion of orphans. The percentage of orphaned school-aged children was 13 per cent in 2001 and 14 per cent in 2007, and even though the HIV prevalence had decreased within the time period under study, it was still the highest among the regions. The western region experienced an incline in both the people infected by HIV and the prevalence of orphans. However, the incline may be caused by the fact that orphan status for children over 14 years was unknown in the 2001-2002 data. Nevertheless there are some indicators that the high incidence of orphans might be caused by AIDS-related deaths.

Table 1 Regional comparison of HIV prevalence and orphan rates in per cent

Region	HIV prevalence		Orphans prevalence	
	2001-2002	2007	2001-2002	2007
Central	15.3	17.5	9.3	12.01
Copperbelt	19.9	17.0	10.67	13.93
Eastern	13.7	10.3	8.46	10.91
Luapula	11.2	13.2	10.3	9.75
Lusaka	22.0	20.8	13.04	14.29
Northern	8.3	6.8	10.89	9.36
North-Western	9.2	6.9	9.14	6.81
Southern	17.6	14.5	12.14	12.38
Western	13.1	15.2	11.19	12.94

School enrolment

In 2002, the Zambian government decided on nationwide tuition-free schooling for grades 1 to 7, as well as deregulating compulsory school uniforms to reduce household costs (UNESCO, 2003). The education level is not only interesting for school-aged children, but for adults as well. Later in this study the education level of the head of household is examined to see if higher education might have a positive impact on schooling of the children in the household. The education of head variable is measured in single years of education and in table 2 the average number of years among all males and females between 18 and 49 is displayed.

Table 2 Statistics of education in single years. Individuals aged 18-49

Education in single years	Male		Female		Total	
	2001-2002	2007	2001-2002	2007	2001-2002	2007
Mean	6.84	7.51	4.90	5.75	5.84	6.59
Median	7	7	5	6	7	7
Std. Deviation	3.86	3.83	3.85	4.07	3.97	7.05
Minimum	0	0	0	0	0	0
Maximum	17	17	17	17	17	17

Looking at the summary statistics of education in single years compared to the situation in 2001-2002, the education level had increased with almost one year on average in 2007. Females were still at a disadvantage in 2007 compared to males, but did experience a larger rise in the average number of years of schooling in comparison to males. Even though the maximum number of single years is 17, the median is 7 for the total group, indicating that a small share of the population has a higher education than junior secondary school. However, the standard deviation is almost double in size in 2007 compared to 2001-2002.

Gaps in the standard of living among different regions often result in inequalities in education. In figure 5, school enrolment for children in rural and urban areas is presented. In 2007 the enrolment was 90 per cent in urban areas whereas it only added up to 79 per cent in 2001-2002.

Figure 5 School enrolments by rural and urban in per cent. Individuals aged 7-16

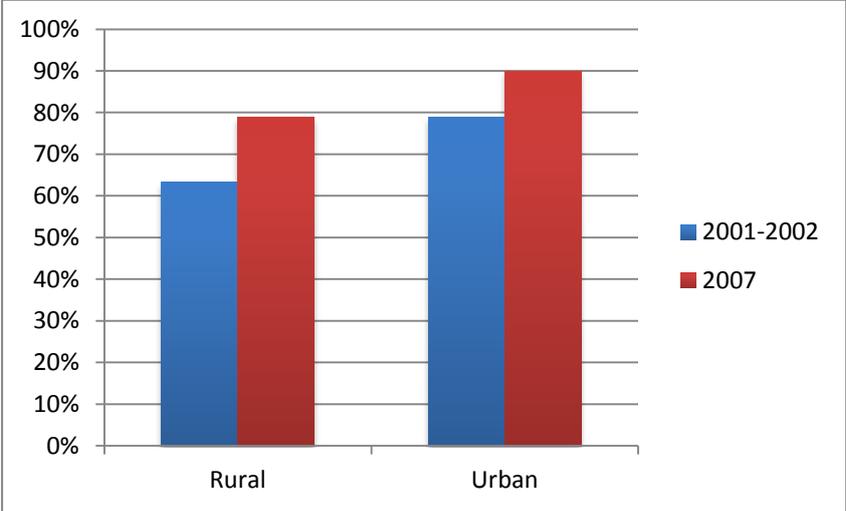


Figure 6 displays the most current data concerning average school attendance among orphans in comparison with non-orphans. The highest attendance among children is at 12 years old, where 93 per cent of non-orphans have attended school during the current school year and a corresponding 90 per cent of orphans. The school attendance is on average higher among non-orphans from age nine onwards.

Figure 6 School enrolments for orphans and non-orphans 2007. Individuals aged 7-16

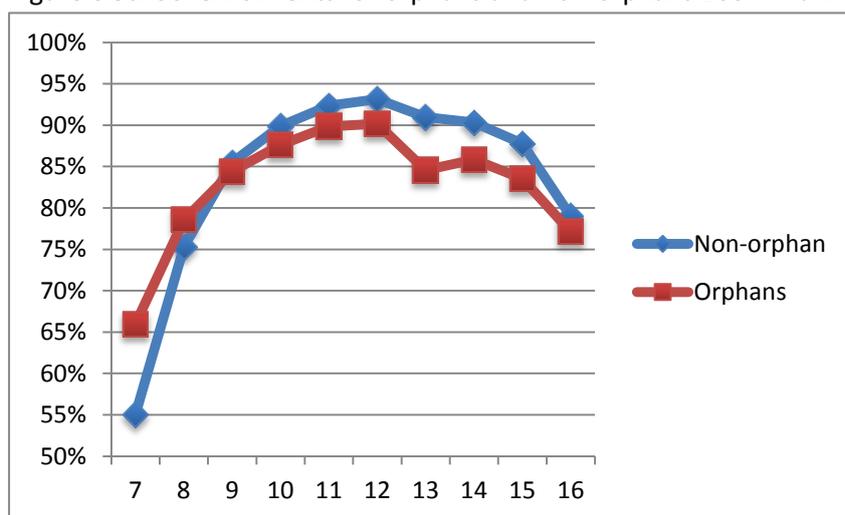


Table 3 displays school enrolment by orphan status of children in different ages and shows that the school enrolment in 2001-2002 was low for all groups.

Table 3 Statistics of school enrolment

School enrolment	Children aged 7-14		Children aged 15-16	
	2001-2002	2007	2001-2002	2007
Non-orphans	68.2	67.5	64.4	79
Maternal orphans	66	80.7	n/a	77.6
Paternal orphans	69.6	84.6	n/a	75.8
Double orphans	68.9	84.8	n/a	79.4

Among orphans, maternal orphans were the most disadvantaged, which suggests that children who lose their mother experience a greater negative impact on schooling outcomes than children who lose their father. In 2007, the data show that the disparities between maternal orphans and all other orphan categories are more severe for the older adolescence group, aged 15 to 16. While more than 84 per cent of non-orphaned children aged 7 to 14 were enrolled in school in 2007, only 80 per cent of maternal orphans attended school. The 2001-2002 data is missing for the orphan status among adolescence in the older age group; nevertheless the 2007 data indicate that the school enrolment is the lowest for parental orphans. However, the findings in Table 3 do not prove a causal relationship but only bivariate correlations; factors such as relationship to the head of household, standards of living and regional differences in school infrastructure may affect schooling.

Model description

In this segment, the core of the probit model is explained, to which the ZDHS data is adapted. By using repeated cross sectional data from 2001-2002 and 2007, a comparison over time can be made. Current school enrolment is the binary dependent variable that is used as a measure of investment in a child's accumulated human capital, which equals 1 if the child, aged 7 to 16, has attended school during the current school year.

Children, within the restricted age, are classified into four categories of main explanatory variables for the analysis: maternal orphans, paternal orphans and double orphans with the base group being non-orphans. These are dummy variables and allow for the separation of the impact of loss of one parent in comparison to both parents. Maternal orphans are children who have lost their mother while paternal orphans are the ones who have lost their father. A double orphan is a child whose parents have both deceased or their vital status is unknown.

The shares of HIV prevalence are accounted for within each province. In order to investigate if the effect of orphanhood on school enrolment is larger in high HIV prevalence provinces, interaction terms are incorporated. Further, previous studies have shown that older orphans and non-orphans are especially likely to drop out of school, adding the free schooling up to grade 7 in Zambia, one may expect that older adolescent school-aged children have are less likely to be enrolled compared to younger children. To test for this, *age* and *age*² variables are included in the models.

Since schooling is related to the resources of a household, the wealth of the household is taken into consideration. The wealth index in the DHS data is divided into quintiles of *poorest*, *poorer*, *middle*, *richer* and *richest*. The regression includes the last four, leaving the poorest quintile as a base. Households experiencing credit constraints might be affected by the number of household members, thus this is also controlled for in the model.

A child's relationship to the head of the household has proven to have a positive effect on a child's schooling, where children who reside with close relatives are more likely to attend school due to altruism (Case et al 2004). This relationship aspect is accounted for by three explanatory variables represented by *daughter/son*, *grandchild* and *not related* to the head of the household with a base category of other relatives. To see if girls might be at a special disadvantage, as stated by the World Bank in 2002, a gender dummy is included in the regression. Further control variables are the education of the head of household in number of years and residence place type i.e. a dummy variable indicating either urban or rural.

Result

The following section examines the effect of orphanhood on school enrolment with an emphasis on the impact of HIV prevalence. First the DHS data collected in Zambia during 2001 and 2002 is examined using a probit model to estimate the variables, followed by the data from 2007 and finally the pooled data for the two years is examined.

Results from 2001-2002

Table 4 on the following page lists the estimates of 2001-2002 ZDHS data. In most specifications¹, the sample is limited to children between 7 and 16 years of age. The equation estimated in the first probit model includes the main explanatory variables indicating orphan status as well as control variables for the number of household members, gender, *age*, *age*², an *urban* dummy and the education level of the head of household. Other explanatory variables such as wealth quintiles and the relationship to the head of household are not included in the first model due to the fact that they might be affected by whether a child is an orphan or not. Further, in model 4 the HIV prevalence variable is included in order to investigate if higher HIV prevalence affects school enrolment. In model 5, the interaction terms for orphan statuses and HIV prevalence are estimated.

¹ The 2001-2002 ZDHS does not include data on orphan status for children above 14 and therefore are specifications concerning orphans only applicable to children aged 7 to 14.

Table 4 Impact of orphanhood and HIV/AIDS on school enrolment (2001-2002)*

	1	2	3	4	5
matorphan	-0.168 (0.067)**	-0.349 (0.163)**	-0.215 (0.167)	-0.211 (0.167)	-0.439 (0.651)
patorphan	0.025 (0.045)	-0.033 (0.109)	0.115 (0.115)	0.113 (0.115)	-0.422 (0.359)
doubleorphan	0.044 (0.103)	0.094 (0.244)	0.113 (0.246)	0.107 (0.246)	1.916 (0.896)**
educ_head	0.351 (0.021)***	0.360 (0.050)***	0.382 (0.052)***	0.383 (0.052)***	0.381 (0.052)***
age	1.184 (0.068)***	1.155 (0.156)***	1.192 (0.157)***	1.193 (0.157)***	1.187 (0.157)***
age ²	-0.050 (0.003)***	-0.048 (0.007)***	-0.049 (0.008)***	-0.049 (0.008)***	-0.049 (0.008)***
female	-0.043 (0.030)	-0.060 (0.068)	-0.050 (0.069)	-0.050 (0.069)	-0.049 (0.069)
urban	0.335 (0.037)***	0.355 (0.097)***	0.363 (0.098)***	0.382 (0.108)***	0.390 (0.108)***
hhmembers	0.025 (0.005)***	0.034 (0.010)***	0.034 (0.010)***	0.034 (0.010)***	0.035 (0.010)***
poorer		-0.220 (0.102)**	-0.205 (0.102)**	-0.206 (0.102)**	-0.209 (0.102)**
middle		-0.207 (0.101)**	-0.219 (0.102)**	-0.218 (0.102)**	-0.213 (0.102)**
richer		-0.300 (0.102)***	-0.299 (0.103)***	-0.298 (0.103)***	-0.306 (0.103)***
richest		-0.142 (0.114)	-0.117 (0.115)	-0.120 (0.115)	-0.131 (0.115)
son/daughter			0.476 (0.105)***	0.475 (0.105)***	0.456 (0.106)***
grandchild			0.321 (0.125)**	0.321 (0.125)**	0.299 (0.127)**
not related			-0.126 (0.322)	-0.131 (0.322)	-0.281 (0.332)
hiv prevalence				-0.402 (0.895)	-0.556 (0.980)
hiv*matorphan					1.504 (4.284)
hiv*patorphan					3.986 (2.582)
hiv*doubleorphan					-13.324 (6.103)**
_cons	-6.788 (0.343)***	-6.626 (0.788)***	-7.266 (0.808)***	-7.225 (0.813)***	-7.171 (0.815)***
<i>N</i>	8,784	1,643	1,643	1,643	1,643

*Note: the estimates displayed are probit coefficients and standard errors are presented in the parentheses, * significance at 10 per cent, ** significance at 5 per cent, *** significance at 1 per cent. The data regarding orphan statuses for children over the age of 14 is missing.

The impact and statistical significance of orphanhood on school enrolment varies according to orphan statuses. The estimations show that children within the restricted age are less likely to attend school if they are maternal orphans. This effect is statistically significant when controlling for the base variables in model 1 and when the income of the household is considered in model 2. When the relationship to the head of household variables are added in model 3 there is no longer any significance. The double orphan dummy is significant and positive in model 5, however the interaction term for double orphan and HIV prevalence is negative and statistically significant at a 5 per cent level. These mixed results, indicate that the positive effect on school enrolment when losing both parents might disappear in areas with high HIV prevalence.

The education level of the head of household is an important determinant of a child's schooling, since the estimates in model 3 to 5 indicate that a greater number of years of education is likely to have a positive impact on schooling of the children in the household. As expected, there is a concave relationship between school enrolment and age. The age variables are highly significant in all five models. *Age* has a positive effect and *age*² a negative effect on children's school enrolment. Further, it is estimated that the likelihood of attending school is larger in households with a greater number of members. The models display no significant gender discrimination. All models show a significant difference in enrolment between children living in rural areas compared to urban areas. The effect is positive indicating that the likelihood of attending school among children living in urban areas is higher than for children in rural areas.

Adding the wealth index in model 2 implies that standard of living has a significant impact on investment in schooling. However, the negative sign of the coefficients is unexpected. In model 3, the effect of children's relationship to the head of household is examined. The estimates show that being a biological child has a significant positive effect on school enrolment. Children living with their grandparents may also experience a positive effect on school enrolment in comparison to other relations to the head of household. Furthermore, the *not related* variable is highly significant and displays a negative impact on schooling for children who are not related to the head of household.

Results from 2007

Table 5, on the following page, presents the results from the probit models with the data from 2007 are presented. By contrast to the 2001-2002 data all of the specifications in this sample are restricted to children between 7 and 16 years of age. The equation estimated in the first probit model includes the main explanatory variables indicating orphan status as well as control variables for the number of household members, gender, *age*, *age*², an *urban* dummy and the education level of the head of household. Other explanatory variables such as wealth quintiles and the relationship to the head of household variables are not included in the first model because they might be affected by whether a child is an orphan or not. Further, in model 5 the interaction terms for orphan statuses and HIV prevalence are estimated.

Table 5 Impact of orphanhood and HIV/AIDS on school enrolment (2007)*

	1	2	3	4	5
matorphan	-0.268 (0.073)***	-0.297 (0.074)***	-0.261 (0.076)***	-0.261 (0.076)***	0.336 (0.270)
patorphan	0.044 (0.051)	0.036 (0.052)	0.080 (0.053)	0.080 (0.053)	0.175 (0.169)
doubleorphan	0.120 (0.111)	0.124 (0.112)	0.098 (0.112)	0.097 (0.112)	0.075 (0.398)
educ_head	0.339 (0.023)***	0.259 (0.025)***	0.299 (0.026)***	0.299 (0.026)***	0.301 (0.026)***
age	1.223 (0.050)***	1.237 (0.051)***	1.237 (0.051)***	1.237 (0.051)***	1.240 (0.051)***
age2	-0.051 (0.002)***	-0.052 (0.002)***	-0.051 (0.002)***	-0.051 (0.002)***	-0.051 (0.002)***
female	-0.061 (0.032)*	-0.069 (0.033)**	-0.057 (0.033)*	-0.057 (0.033)*	-0.058 (0.033)*
urban	0.276 (0.038)***	-0.016 (0.053)	-0.016 (0.054)	-0.017 (0.054)	-0.017 (0.054)
hhmembers	0.023 (0.006)***	0.019 (0.006)***	0.018 (0.007)***	0.018 (0.007)***	0.018 (0.007)***
poorer		0.066 (0.048)	0.051 (0.048)	0.051 (0.048)	0.053 (0.048)
middle		0.193 (0.049)***	0.185 (0.049)***	0.186 (0.049)***	0.184 (0.049)***
richer		0.316 (0.064)***	0.329 (0.064)***	0.332 (0.066)***	0.333 (0.066)***
richest		0.773 (0.085)***	0.795 (0.086)***	0.799 (0.089)***	0.802 (0.089)***
son/daughter			0.251 (0.046)***	0.251 (0.046)***	0.251 (0.046)***
grandchild			0.370 (0.058)***	0.370 (0.058)***	0.360 (0.058)***
not related			-0.835 (0.176)***	-0.835 (0.176)***	-0.840 (0.177)***
hiv prevalence				-0.081 (0.391)	0.432 (0.437)
hiv*matorphan					-4.194 (1.791)**
hiv*patorphan					-0.720 (1.176)
hiv*doubleorphan					0.254 (2.651)
_cons	-6.510 (0.275)***	-6.563 (0.279)***	-6.870 (0.285)***	-6.860 (0.289)***	-6.942 (0.291)***
N	9,914	9,914	9,914	9,914	9,914

*Note: the estimates displayed are probit coefficients and standard errors are presented in the parentheses, * significance at 10 per cent, ** significance at 5 per cent, *** significance at 1 per cent.

The main independent variables of interest, i.e. orphan status, show that maternal orphanhood is statistically significant. The effect is negative, implying that losing one's mother negatively affects school enrolment among children. When the interaction terms for orphan status and HIV prevalence are added in table 5 it becomes insignificant. However, the interaction term for maternal orphanhood and HIV prevalence becomes statistically significant at a 5 per cent level. The effect on school enrolment is negative among children who are maternal orphans and living in high HIV prevalence provinces.

The control variables display various results regarding significance. The education level of the head of household is statistically significant and seems to be a positive and important determinant of a child's school enrolment. *Age* and *age*² are also significant and, as expected, the coefficients imply a positive relationship where the effect becomes weaker the older the child is. The dummy variable *female* is statistically significant and illustrates gender discrimination towards girls, as the effect is negative.

The dummy variable *urban* is statistically significant in the first model with a positive effect, showing that living in urban areas affects school enrolment among children positively compared to children living in rural areas. However, after controlling for wealth it becomes insignificant. A reason for this may be that wealthier children are likelier to live in urban areas. The variables indicating household income show that school-aged children are less likely to be enrolled if they live in households within the poorest quintile.

In model 3 the relationship to the head of household variables are included. The results show that they are all statistically significant at a 1 per cent level. Compared to other relatives, being a son/daughter or a grandchild affects school enrolment positively as opposed to not being related at all, which has a negative impact on enrolment. This indicates that the relationship to the head of household seems to play a crucial role in determining a child's school enrolment.

Results from pooled data (2001-2002 & 2007)

Table 6 displays the results from the probit models, conducted with pooled data, are presented. In the pooled data the model is estimated using a similar dependent variable as in the models for 2001-2002 and 2007. However, due to the fact that the data from 2001-2002 lacks the orphan status for children over 14 years the restricted age is changed to 7 to 14 years for all specifications. A dummy variable is also included to separate the impact on school enrolment between the two years.

Table 6 Impact of orphanhood and HIV/AIDS on school enrolment (pooled data)*

	1	2	3	4	5
matorphan	-0.209 (0.052)***	-0.298 (0.073)***	-0.255 (0.074)***	-0.263 (0.075)***	0.094 (0.269)
patorphan	0.032 (0.035)	0.016 (0.051)	0.071 (0.052)	0.068 (0.052)	0.047 (0.167)
doubleorphan	0.073 (0.079)	0.121 (0.111)	0.107 (0.111)	0.114 (0.111)	0.458 (0.393)
educ_head	0.350 (0.016)***	0.326 (0.023)***	0.359 (0.024)***	0.357 (0.024)***	0.358 (0.024)***
age	1.284 (0.051)***	1.364 (0.070)***	1.379 (0.070)***	1.378 (0.070)***	1.377 (0.071)***
age ²	-0.055 (0.002)***	-0.058 (0.003)***	-0.058 (0.003)***	-0.058 (0.003)***	-0.058 (0.003)***
female	-0.010 (0.023)	0.010 (0.031)	0.020 (0.031)	0.021 (0.031)	0.021 (0.031)
urban	0.331 (0.028)***	0.230 (0.045)***	0.230 (0.045)***	0.224 (0.046)***	0.223 (0.046)***
hhmembers	0.023 (0.004)***	0.022 (0.006)***	0.022 (0.006)***	0.021 (0.006)***	0.022 (0.006)***
year2007	0.515 (0.023)***	0.534 (0.039)***	0.532 (0.039)***	0.536 (0.039)***	0.540 (0.040)***
poorer		-0.005 (0.045)	-0.011 (0.045)	-0.009 (0.045)	-0.007 (0.045)
middle		0.052 (0.045)	0.047 (0.046)	0.047 (0.046)	0.047 (0.046)
richer		0.047 (0.053)	0.055 (0.054)	0.046 (0.054)	0.047 (0.054)
richest		0.364 (0.067)***	0.379 (0.068)***	0.367 (0.068)***	0.368 (0.068)***
son/daughter			0.313 (0.050)***	0.314 (0.050)***	0.311 (0.050)***
grandchild			0.384 (0.059)***	0.385 (0.060)***	0.374 (0.060)***
not related			0.092 (0.083)	0.094 (0.083)	0.087 (0.083)
hiv prevalence				0.672 (0.368)*	1.005 (0.409)**
hiv*matorphan					-2.507 (1.789)
hiv*patorphan					0.136 (1.172)
hiv*doubleorphan					-2.469 (2.648)
_cons	-7.301 (0.260)***	-7.750 (0.358)***	-8.171 (0.365)***	-8.255 (0.368)***	-8.296 (0.369)***
N	17,344	10,203	10,203	10,203	10,203

*Note: the estimates displayed are probit coefficients and standard errors are presented in the parentheses, * significance at 10 per cent, ** significance at 5 per cent, *** significance at 1 per cent. The restricted age for children in the sample is 7 to 14 years.

Examining the main independent variables of interest, i.e. the orphan status variables, it is shown that maternal orphanhood has a negative impact on school enrolment and is statistically significant at a 1 per cent level. When the interaction terms for orphan statuses and HIV prevalence are added in model 5, maternal orphanhood is no longer significant.

Model 4 shows another main variable of interest is included, i.e. HIV prevalence. The variable shows statistical significance at the 10 per cent level, but in model 5, when the interaction terms for orphan status and HIV prevalence are included, the significance level becomes significant at a 5 per cent level. The interaction terms display no statistical significance, which implies that the negative relationship of being a maternal or double orphan in areas where there is high HIV prevalence may just be variation by chance.

The results concerning the control variables show that the education level of the head of household has a significant positive impact, indicating, once more, that the higher the education of the head the likelier is school enrolment for children. As previous results have shown *age* and *age*² are statistically significant as well. The relationship is assumed to be concave, which means that the positive effect on schooling eventually becomes negative when the child becomes older.

The *urban* variable is statistically significant, even after controlling for wealth. The result implies that living in an urban area affects school enrolment positively compared to living in a rural area. The number of household members is significant and indicates that the greater the number of household members the greater the likelihood of school enrolment for children. The year dummy for 2007 is statistically significant and shows a higher school enrolment compared to year 2001-2002.

When the wealth variables are included the results show that the richest quintile is statistically significant, implying that children within households in the *richest* quintile are more likely to be enrolled in school than children from the poorest households. The other wealth variables show no statistical significance in this data set. Controlling for the relationship to the head of household, the results for *son/daughter* and *grandchild* are statistically significant with positive effects, which indicates that a child is likelier to be enrolled in school if there is a close relationship to the head of the household. The variable *not related* is not statistically significant in this case.

Analysis and Discussion

The aim of this study was to investigate whether orphanhood in Zambia has an effect on school enrolment among school-aged children and to examine whether the possible effect is stronger in regions with high HIV prevalence. The analysis starts by discussing the main explanatory variables in the sample, providing possible explanations to the outcomes. It is followed by an analysis of the control variables to see how other factors may affect school enrolment. Finally, a discussion of the general impacts of investment in human capital is presented along with limitations of the study and suggestions for future research.

The results from the two data sets and the pooled data show a variation in significance among the main the explanatory variables, as well as among the control variables. One of the main findings is that maternal orphanhood is statistically significant at a 1 per cent level and impacts school enrolment negatively. This applies to all data sets. However, the effect of maternal orphanhood becomes insignificant in the 2001-2002 data when the relationship to the head of household variables are controlled for, which may indicate that maternal orphan status itself does not explain the variation in school enrolment in this case.

The finding that maternal orphanhood affects school enrolment negatively is consistent with other studies made (Case & Ardington 2006; Nyamukapa et al 2003). Makame et al (2002) explain why this may be the case by stating that a mother's death can cause greater psychological distress. The fact that women traditionally stay at home and care for the children (Brescoll & Uhlmann 2005) might contribute to a stronger emotional bond between children and mothers, thus the negative effect on school enrolment is observed.

Evidence from the 2001-2002 data set also showed that double orphanhood is statistically significant at the 5 per cent level. The effect is positive, which may be regarded as surprising, however, Nyamukapa et al (2003) found similar evidence of this in Zimbabwe where a number of double orphans were found in wealthier households. Wealthier relatives may therefore have taken care of these children when their parents died as found by Ainsworth and Filmer (2006), which could explain the positive impact on school enrolment.

The descriptive data shows that there are more paternal orphans than maternal orphans, yet more women are affected by HIV/AIDS than men. The reason for this may be is that mortality is higher among men in general (Gorman 2007). The models provide no evidence of higher or lower school enrolment among paternal orphans compared to non-orphans. This is consistent with other studies such as Case and Ardington (2006).

After incorporating the HIV prevalence variable, the results showed that there is a significant positive effect of HIV prevalence on children's school enrolment. However, there is only evidence of this in the pooled data. The expectation was that lower school enrolment would be observed as a result of higher HIV prevalence since societies are affected through a number of channels, for instance through absent and ill teachers. After examining the descriptive data it is found that HIV prevalence as well as school enrolment is higher in urban areas, which may help explain the observed positive effect of the HIV prevalence variable.

In addition to the observed negative effect of maternal orphanhood, the interaction term *hiv*matorphan*, in the 2007 data provides an interesting result. The variable implies that the negative impact on school enrolment of maternal orphanhood is more severe in regions with high HIV prevalence. Many children become orphans due to AIDS and as the descriptive data showed, more orphans are found in regions where there is high HIV prevalence, for instance in Lusaka and the Copperbelt region. It is possible that it becomes more difficult for societies and caregivers to help these children in regions where the problem is more widespread, simply because it is of a much greater scale and resources may not suffice.

Moreover, when the interaction terms for orphan status and HIV prevalence are added there is also a significant negative effect for *hiv*doubleorphan* in the 2001-2002 data. The effect on orphans' school enrolment seems to be worse in areas where HIV prevalence is high. As previously established, the double orphan variable is positively significant in 2001-2002. This may indicate that the positive effect on children's school enrolment disappears in areas with high HIV prevalence. If caregivers are ill it is likely that it becomes more difficult for them to care and provide for these children. However, the results are rather suspicious and it may be that double orphanhood and HIV prevalence are not good explanatory variables in this case.

There are various results regarding the impact of wealth on school enrolment among children. The results from 2001-2002 are not consistent with the expectations as they show that there is a negative significant effect on children's school enrolment if the household belongs to the poorer, middle and richer quintiles, compared to the poorest quintile. The *richer* quintile is significant at the 1 per cent level, whereas the other two are significant at the 5 per cent level. A study from Ghana and Pakistan by Bhalotra and Heady (2003) presents a possible explanation to why this may be the case. They found that it is not uncommon for children from richer households living in rural areas to have lower school enrolment. The reason for this is due to the fact that there is more work for them if the family has abundant land and more animals.

The results from 2007 show the opposite effect on school enrolment where the *richest*, *richer* and *middle* quintiles are significant at a 1 per cent level with a positive effect compared to the poorest quintile. The results from the pooled data set show that households within the *richest* quintile have a positive effect on schooling at a 1 per cent significant level. These results are more in line with the expectations and the theory of credit constraints. If there are no credit constraints children are less likely to be removed from school in order to help out around the house and work to obtain extra income. The opportunity cost for these children may be low and therefore school enrolment is also likely to be higher. There is no sufficient explanation to why there is such a difference in the effect of wealth on school enrolment between 2001-2002 and 2007.

The *age* and *age*² variables are significant at the 1 per cent level in all three data sets. There is a positive effect of *age* and a negative effect of *age*², which is expected considering the results from the descriptive data, which indicate a concave relationship between school enrolment and age. A negative impact on school enrolment among older children is consistent with

previous studies by Robson and Kanyanta (2007) and Kürzinger et al (2008). Testing for the impact of age on orphans schooling by the use of interaction terms for orphan status and children aged 15 to 16 in the 2007 data was also exercised. However, when controlling for age^2 these interaction terms became insignificant, which indicates that the effect is mostly absorbed by age squared, hence orphan status seems to be of lesser importance as opposed to age. Therefore it was not included in the result. A study by USAID (2005) found that there is in fact no difference in the school enrolment between orphans and non-orphans and state that reach out programs should target all children, but especially older children as they need the most support to continue with their studies.

In order to see whether female children were at a disadvantage in comparison to male children all the models above were included with a gender dummy. In consistence with Kakooza and Kimuna (2006) and Kürzinger et al (2008) it was found that there is evidence that female children are at a greater disadvantage. Interestingly enough, this is only true for the 2007 data, not showing any significant gender discrimination in 2001-2002. Females are on average less educated in Zambia, an occurrence found in most developing countries. A common reason is that school-aged girls are more likely to stay at home in order to increase household income or help around the house.

A statically significant variable is the education level of the head of household. Many studies have found that parental education has a positive effect on children's schooling. If parents are educated, they may value an education more highly and therefore influence their children to undertake an education. This could be the explanation to why the marginal effect of this variable is positive. The desire of the head of the household on orphans is not investigated in this study, however, Beegle et al (2006) presents empirical evidence that orphans, in comparison to non-orphans, often live in households where the head has a low level of education. This, in turn, might lead to a weaker positive effect on school enrolment for orphans compared to non-orphans.

The results from the probit models show that the impact of living in urban areas was significantly positive in comparison to living in rural areas in 2001-2002, but there is no significance displayed in 2007. According to the descriptive data, the enrolment of children in urban areas is higher than in rural areas, which is consistent with findings from other sub-Saharan countries (Sahn and Stifel 2002), where a gap in living standards is given as a reason for these inequalities in welfare. Better access to education in urban areas may also partly explain the observed effect. However, it needs to be added that the difference in enrolment between regions in Zambia was smaller in 2007, which may indicate a development towards more equality in education.

One might believe that a greater household size could lead to financial distress, however, estimates across all data sets clearly show that the number of household members has a significant positive effect on school enrolment. The death of parents, along with the issue of credit constraints facing many households in developing countries, may change the family structure and for this reason there may be changes in the labour allocation as well (Sharma

2006). The observed positive effect might therefore be due to the fact that in households with a greater number of members they are able to obtain a higher income.

The results show evidence that the relatedness to the head of household is associated with school enrolment. The results for this specification indicate that school-aged children are more likely to attend school if they reside in households where their parents or grandparents reside. In addition, the estimate for 2007 shows a significant negative impact on schooling among children who are not related to the head of household, which is in accordance with the theory of Hamilton's rule. The theory states that selfless behaviour is dependent on biological ties. Adding the theory of distant future return to education (Sharma 2006), this may lead to weaker incentives to invest in orphans' human capital.

The observed positive and highly significant effect of the year dummy in the pooled data indicated that there was higher school enrolment in 2007 compared to 2001-2002. The reason for this may be that in 2002, the Zambian government decided on nationwide tuition-free schooling for grades 1 to 7. Furthermore, compulsory school uniforms were deregulated to reduce household costs (UNESCO 2003). This is likely to have improved school enrolment.

Findings from this study, in addition to previous empirical studies, illustrate varying significance levels for the impact of orphanhood on school enrolment, but also a variation in what variables actually affect school enrolment. In this study the variation is present between the data sets and the pooled data. There is a negative correlation observed between maternal orphanhood and enrolment, however, the estimates do not show any causal relationship between orphan status and school enrolment.

Other limitations of this study include that when investigating the impact of orphanhood on schooling there are possible unobserved correlations with orphanhood that may make the result biased, thus the significance found may only capture unobserved covariates. Further, the cross-sectional data might not be sufficient to explain variation in school enrolment. For example, the data fails to provide information on whether orphans stopped attending school before the death of their parents. Since the data cannot be used to estimate wealth before and after the death of parents and changes in the family structure as a result from this. The effect of orphanhood might therefore be overestimated. Another aspect to take into account is that the data sets do not include information about orphans that do not live in households. Orphans who live in orphanages or on the streets are likely to be particularly vulnerable, hence the underinvestment in human capital that orphans might experience overall could be underestimated. The study is also unable to detect differences in the quality of education and the continuity of attendance for these children, which may be even more important variables to consider when examining the situation for orphans.

Considering Zambia's very young population and the increasing number of orphans in the country, investment in education is essential for future economic sustainability and prosperity. The human capital theory stresses the importance of education and health for economic growth. These welfare factors might be improved through the investment in education, which can increase the quality as well as lengthen the years of schooling. This study has found some

indications that vulnerable children such as maternal orphans seem to be at a disadvantage, experiencing a shortfall in school enrolment. The question is whether the possible socioeconomic problems for orphans and vulnerable children are worsened by the still very high HIV/AIDS prevalence? This would be an interesting topic to examine further. However, the fact remains that investment in human capital among children is a complex but yet important issue.

Conclusion

In conclusion, the HIV/AIDS pandemic has had a severe impact on many people and societies in sub-Saharan Africa, where Zambia is one of the worst cases and orphans are one of the most vulnerable groups. Due to the extent of the spread of the virus, it has affected the education sector as well as the health sector. The breakdown of human capital has been a hot topic in the research literature and orphans' education has been a widely examined issue. However, there is not a lot of consensus regarding what actually affects children's education. Some even question whether there is any effect of orphanhood on children's education at all. This made it an interesting question to examine further.

According to the theory of human capital, education is believed to positively affect growth and democracy around the world. There are benefits as well as costs associated with education, where the benefits are supposed to offset the costs. If they do not, the demand for education will be lower. The benefits include the return to education, personal enrichment and positive externalities. The costs are both direct such as textbooks, teachers' salaries and buildings but also opportunity costs, which are believed to play a crucial role when children drop out of school.

The most cited theories in explaining why education might differ between orphans and non-orphans shed light on aspects such as credit constraints, discrimination and trauma. Previous studies stress various factors that impact children's education where orphanhood, wealth, gender, the relationship to the head of household, household demography and age are some of the most important determinants.

The aim of this study was to examine what variables affect school enrolment among children in Zambia. Focusing on whether orphan status and HIV prevalence have an effect and to determine whether the possible effect of orphanhood is stronger in regions with high prevalence of HIV/AIDS. To study these relationships data from the Zambia Demographic and Health Surveys (ZDHS) from 2001-2002 and 2007 were used and a probit model analysis was conducted with the dependent variable school enrolment of children between the ages of 7 to 16.

The results indicated that there is a significant negative impact of maternal orphanhood on school enrolment. This relationship has been illustrated in previous studies and is believed to be evident because a mother's death can cause greater psychological trauma. Furthermore, in 2007, the effect of maternal orphanhood seemed to be stronger in high prevalence regions. In the pooled data a high HIV prevalence also indicated a positive significance. In all three data sets, there was evidence that age, the education level of the head of household, wealth, the relationship to the head of household and the number of household members are important determinants of school enrolment among children.

However, there is still variation in the significance levels between the different data sets and variation in what variables seem to impact school enrolment. This study, as well as previous

studies, finds different results and therefore it can be concluded that children's education is a very complex issue. For this reason, along with the fact that Zambia has a population pyramid with a very wide bottom and that the education sector is likely to experience a lot of strain, the topic should be researched further. The quality of education and the continuity of children's school attendance may also be better indicators of the actual impact on education in the country; therefore they might be of interest to examine.

Investigating how HIV/AIDS impacts other socioeconomic segments of society would be interesting and help provide a better understanding of the situation in Zambia. The HIV prevalence has decreased overall in the country, but the number of orphans is still very high in many regions, indicating that there is still a lot to be done to combat these problems. Having more accurate information on what impacts children's education and on how orphanhood and HIV prevalence affect societies at large may therefore help the government become more efficient and target the right groups.

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