HIV/AIDS and the Living Arrangements of Older Persons across the Sub-Saharan African region

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ABSTRACT

Older adults in sub-Saharan Africa face harsh living conditions including severe poverty and an HIV/AIDS epidemic that results in unprecedented rates of mortality. Yet, because of a lack of available data and only a trickle of past studies, the impact of these conditions on living circumstances and subsequent quality of life is unclear. By reducing the availability of children and by increasing grand-parenting obligations, the HIV/AIDS epidemic, in particular, has been hypothesized to have impacts on living arrangements. This study utilizes cross-sectional and longitudinal Demographic and Health Survey (DHS) data from sub-Saharan African countries that are characterized by differing levels of severity of the HIV/AIDS epidemic. Individual level data is examined to assess regional living arrangement distributions. National level data from twenty-two countries is examined to tests hypotheses that the magnitude of the HIV/AIDS epidemic relates to being more or less likely to live with children and grandchildren, and more or less likely to live in specific types of arrangements, like in a skipped generation household. Longitudinal data from nine countries is used to test whether changes in these types of arrangements are more or less common where rates of HIV prevalence have been higher. Despite a small number of observations points, several fairly robust associations are found. For instance, older adults living in countries that have had a high accumulation of AIDS-related deaths are much more likely to live with a double-orphaned grandchild, while the average annual increase in the percent living with a double-orphaned grandchild over a decade or so is much higher in countries that have had higher AIDS prevalence. Although there are several possible explanations for these associations, they are consistent with hypotheses related to the loss of availability of children and the increase in grand-parenting obligations that accompany a severe HIV/AIDS epidemic. Results suggest that the AIDS epidemic could be negatively impacting quality of life for older adults in the region.

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Introduction

This paper explores living arrangement situations among older adults in the sub-Saharan African region through both individual and country-level cross-sectional data, as well as country-level longitudinal data. Older adults in the region face the harshest living conditions in the world, including severe poverty and an HIV/AIDS epidemic that results in unprecedented rates of mortality. Due to a limited number of previous investigations on social, demographic and economic circumstances among older adults in the region, the impact of these conditions is unclear. Zimmer and Dayton (2005) recently showed that skipped generation households were common in the region, and while this may be a normative part of family life, it may also be partly a function of, on the one hand, a desperate economic reality, which leads adults to migrate in search of employment, leaving their own children to be cared for by the grandparents, and partly on the other and, a consequence of the epidemic, which leaves older adults without adult children and increased grand-parenting obligations. The current study employs data from 22 countries that participated in a Demographic and Health Survey (DHS) between the years 2000 and 2005, and 9 countries with applicable longitudinal data dating back to the early 1990s. Given a paucity of literature on the topic, the analyses add to current understanding of the living conditions of older adults in the region by providing descriptive information on living arrangements, examining whether these arrangements differ across countries with differing levels of HIV/AIDS severity, and comparing changes over time. Particular attention is paid to particular living arrangements involving children and grandchildren that are hypothesized to be influenced by the HIV/AIDS epidemic, such as whether older adults live in skipped generation households or with grandchildren whose own parents are deceased.

Background

Like older adults in the rest of the developing world, living arrangements for sub-Saharan Africa elderly represent an essential indicator of well-being (Albert and Cattell 1994; Cattell 1990; Cliggett 2001; Cowgill 1986; Devisch, Makoni and Stroeken 2002; Knodel and Debavalya 1997; Shaibu and Wallhagen 2002). Part of the reason for this is that older adults tend to require support in a number of life spheres, particularly when their physical dexterity begins to decline. For instance, quality of life for some older adults is dependent upon the

support they receive in conducting instrumental tasks, such as cooking, cleaning and shopping, or self-maintenance functioning tasks, such as dressing or bathing. Some older adults benefit from material and psychological support that is provided by family members. Certainly, not every older adult experiences the types of declines in function, ability to earn a living, or other challenges that lead to support needs, but many do, and the longer an individual lives, the greater is the chance that they may benefit from support of some kind. While these types of supports may come from a combination of personal, public and private sources, personal resources for older adults in sub-Saharan African countries are likely to be modest, and public programs are nearly non-existent. The end result is that the family is the cornerstone of social support. Moreover, while the transfer of resources and the provision of support can occur without coresidence, often it is through coresidential arrangements that material and time exchanges take place across generations (Palloni 2000). Thus, coresidence tends to be a good starting point for the examination of living circumstances for older adults.

In part due to the significance of intergenerational support in determining well-being for older adults, major gains have been made in the study of living arrangements across much of the developing world. Research in Asia, for instance, has begun to move beyond descriptive examinations and into complex dynamics that explain how residency decisions are made, why living arrangements change over time and how different living situations and intergenerational associations serve to differentially impact the well-being of older adults. Some recent examples include: Brown et al. (2002), Cameron (2000), Chen and Silverstein (2000), Frankenberg, Chan and Ofstedal (2002), Silverstein, Cong and Li (2007) Takagi, Silverstein and Crimmins (2007) Zimmer (2005) and Zimmer et al. (2007). There has also been effort devoted to comparative studies of living situations, which may be particularly useful for determining how social change results in alterations in household formation (Asis et al. 1995; DeVos 1990; Frankenberg et al. 2002; National Research Council 2001; United Nations 2005).

This past research has relied accumulatively on a somewhat disparate set of theoretical propositions. A 'modernization' perspective, which hypothesizes that households become smaller and less complex as societies develop, has been referred to in a number of living arrangement studies (Bongaarts and Zimmer 2002; Cowgill and Holmes 1972). The idea here is that development that occurs within the structure of an economy leads to changes in employment and education, a movement of individuals from rural to urban areas, and other changes

that lead to subsequent shifts in attitudes about household formations. But, the perspective has been relatively unsuccessful in explaining change in household formation across much of the developing world. In contrast, change has been increasingly thought to conform to an 'altruistic' model, which assumes that the well-being of the totality of family members takes precedence over any individual member (Becker 1974). Families therefore adopt strategies in the face of social change that allow for its survival. This would explain the continued popularity of coresidence between an older adult and their children in rapidly developing parts of Asia. A 'demographic' perspective, which states that households respond to demographic realities, has also been popular (Kojima 1989; Martin 1989; Wolf and Soldo 1988). This perspective is useful for making predictions about possible changes in living arrangements at a macro level that occur as a reaction to socio-demographic change. For instance, the perspective would suggest that a reduction in the availability of children, which occurs as fertility declines, or perhaps in the African case deaths to children due to the AIDS epidemic, would decrease the probability that older adults live with children because of changes in supply.

Unfortunately, sub-Saharan Africa has been almost completely ignored in empirical and theoretical efforts and even descriptive studies are few in number. As such, it is difficult to compare levels, draw conclusions about national or regional patterns, or establish whether and how social changes taking place in the region are influencing living situations and subsequently the well-being of older adults. This is not to say that there has been no research on the subject, and the modest amount of investigation that has been conducted suggest some important differences that may exist between the sub-Saharan African region and the rest of the developing world (Adamchak et al. 1991; Albert and Cattell 1994; Apt 1992; Bongaarts and Zimmer 2002; Cattell 1990; Hoddinott 1993; Kinsella 1992; Peil 1985; Thomas 1995; United Nations 2005; Zimmer and Dayton 2005). While coresidence with adult children and other family members is clearly common in the region, living with grandchildren appears to be quite widespread and living with an adult child somewhat less frequent. Bongaarts and Zimmer (2002), for instance, in their examination of forty-three developing countries using earlier DHS data found coresidence with an adult child to be least common in sub-Saharan Africa in comparison to other developing regions, while being most common in Asia. Zimmer and Dayton (2005) showed 46% of older adults live with a grandchild, and about 14% live in a skipped generation household, that is, with a grandchild but no

adult children. Indeed, research on children in sub-Saharan Africa has indicated child fosterage to be normative, with children living with grandparents while their own parents are living elsewhere for work purposes (Isiugo-Abanihe 2002; Lloyd and Desai 1992).

HIV/AIDS and living arrangements of older adults

There is certainly a growing concern that older people across sub-Saharan Africa are being adversely affected by the HIV/AIDS epidemic in a number of fundamental ways (Barnett and Blaikie 1992, Hunter and Williamson 1998, Merli and Palloni 2006; National Research Council 1996, World Bank 2000). It is adults in their most productive years (age 15 to 50) who are likely to contract HIV. Their older parents may be deeply involved in caretaking during the period of acute illness, which normally occurs during the very last stage of the disease when full-blown AIDS has developed. While this may have a psychological impact on older adults, there may also be a related financial burden in paying for health care costs, subsequent funeral costs, as well as the loss of any support that was coming from the affected individual. AIDS victims then often leave behind dependents such as orphaned children. High and increasing rates of orphanage could be subsequently contributing to the emergence of households consisting of only the older grandparent (aged over 60) and a grandchild under 15, with no members of the so-called "middle generation," a situation that would additionally strain older adults. Therefore, AIDS could potentially impact on the living situation of older adults in a number of ways. As the demographic argument suggests, it could reduce the supply of children with whom to live, thus reducing the tendency to coreside with adult children. It could increase the supply of grandchildren who require support, and as the altruistic argument suggests, increase the caretaking obligations of grandparents. For those who do live with grandchildren, it could change the balance from coresiding due to a fostering arrangement to coresiding due to death to the grandchildren's parents.

Although these concerns are well-founded, and similar types of influences have been identified in Asia (Knodel et al. 2001; Knodel and VanLandingham 2002; Knodel, Watkins and VanLandingham 2003; Knodel et al. 2007; VanLandingham et al. 2000), there is little broad-based evidence for sub-Saharan Africa. Examples of the limited amount of research on the topic include Ainsworth and Dayton (2003), Hosegood and Timaeus

(2006), Ingstad, Bruun and Tlou (1997), Merli and Palloni (2006), Mupedziswa (1997), Ntozi et al. (1999), Ntozi and Nakayiwa (1999), and World Health Organization (2002). Studies from Tanzania, Uganda and Zimbabwe, three countries that have experienced severe AIDS epidemics, have found that terminally-ill patients are often cared for by their older parents, that the care that is provided can cause financial burden, and there may be some health effects of the epidemic on older adults (Ainsworth and Dayton 2003; Ntozi and Nakayiwa 1999; World Health Organization 2002). Hosegood and Timaeus (2006) and Merli and Paloni (2006) examined the situation in South Africa for a book published by the National Academies Press (Cohen and Menken 2006). Results were mixed. Using projection models that account for both the impact of AIDS as well as the availability of adult children, Merli and Paloni (2006) found that the loss of children due to AIDS could leave the elderly with fewer children with whom to coreside, influence the propensity to live with children, and at the same time, increase the propensity to live with grandchildren. They noticed an increase in the proportion of older adults living with grandchildren in some areas within the country that experienced fast growth in HIV prevalence, although in other areas the evidence was less conclusive. In contrast, using census and other demographic household data, Hosegood and Timaeus (2006) did not find much evidence that deaths of adult children leave older adults vulnerable to living alone or in skipped generation households. Both of these papers suggest that one reason for a lack of robust findings in changes in living situations may be the short time between onset of a serious HIV epidemic and measurement, which is to say that the epidemic may not yet have had time to work its way through with sufficient force. Moreover, as noted above, older adults commonly play important roles in the upbringing of grandchildren, and therefore skipped generation households may be common regardless of whether a child of an older adult has died.

Thus, HIV/AIDS is likely to impact on the living situation of older adults, but past research in sub-Saharan Africa has had difficulty pinpointing exactly how. The actual amount of time during which an adult is seriously ill from AIDS is short, and so the period during which care is provided is limited. Thus, at any one point in time, the number of households containing an older adult as caretaker of a child with AIDS is not likely to be substantial even in high prevalence societies. Moreover, the disease takes years to manifest, and the time from HIV infection to full-blown AIDS can be ten years or longer. This means that the

prevalence of an epidemic may not translate immediately into changes in living arrangements. Yet, the demographic and altruistic perspectives may provide some basis on which to assemble hypotheses about how a severe AIDS epidemic might eventually impact the living arrangements of older adults. AIDS deaths should decrease the number of available children thus decreasing the probability of living with children and in arrangements that involve children, such as in three generation households. If the family works together as a unit to overcome an AIDS-related death, older adults should find themselves more often living with and providing a caretaking role for orphaned grandchildren.

The current study attempts to advance the discourse in a number of ways:

1) It examines living arrangements of older adults across a wide swatch of countries in sub-Saharan Africa with very different experiences of HIV/AIDS. Analyses associate specific living arrangements with magnitude of the epidemic within the country. However, rather than using prevalence rates to indicate magnitude, it employs a measure that takes into consideration the cumulative number of deaths that have occurred due to AIDS. The analyses test the hypothesis that cumulative number of deaths will correlate negatively with living arrangement measures that indicate living with children, and positively with measures that indicate living with grandchildren and living in situations where a grandchild is present and a parent is absent.

2) The examination pinpoints the reason that the parents of a child are absent from an older adult's household. Specifically, it examines whether it is because they are alive and living elsewhere or whether it is because they are deceased. The analyses test the hypothesis that cumulative number of deaths will correlate positively with living with a grandchild whose own parents are both deceased. Although cause of death of a deceased parent of a coresident grandchild is uncertain, cases where both parents have died is good candidate for representing AIDS related morality (Zimmer and Dayton 2005). In contrast, there may not necessarily be any association between cumulative number of deaths and living with a grandchild whose parents are alive and living elsewhere, since the latter situation is thought to be common across the region.

3) Changes in living arrangements over time in a limited number of countries are examined. Analyses test the hypothesis that those countries that have had higher AIDS prevalence rates will have experienced

greater decline with respect to living arrangement measures that indicate living with children, and greater increase with respect to measures that indicate living with grandchildren and living in situations where a grandchild is present and a parent is absent.

Methods

Data

The Demographic and Health Survey (DHS) is a nationally representative large sample household survey regularly conducted across a range of developing countries. Each year, a DHS takes place in several different countries. The samples are cross-sectional, but there is a longitudinal component, with surveys repeated in a country about every five or so years. Although this component does not include a panel, repeated surveys are normally representational of the population. At the time of writing, the DHS website listed almost 200 surveys in over 70 countries conducted from the early 1990s through 2006 (Measure DHS 2007). The DHS was a descendent of World Fertility Surveys that were most conducted in the 1970s and 1980s, and as such, the original intent was to collect information on the reproductive health behavior of women aged 15 to 49. However, the survey increasingly includes additional components and modules that make it useful for a host of other purposes. Since the early 1990s, DHS data has been used in literally thousands of social, economic and demographic studies of populations in developing countries. In his address to the Population Association of America, Albert Hermalin noted that the DHS is a valuable but greatly underused resource for examining living arrangements of older adults around the world (Hermalin 1993). Unfortunately, the number of studies that have exploited the data for these purposes is still very modest (examples include Ayakan and Wolf 2000; Bongaarts and Zimmer 2002; Zimmer and Dayton 2005).

DHS samples normally consist of 5,000 households or more. Each survey commences with the completion of a household roster, and this information is available for each country as separate data files. The current study utilizes household roster data files from all 22 sub-Saharan African countries that had a DHS completed between the years 2000 and 2005. Figure 1 graphically identifies the countries in the current study by HIV prevalence rates observed in the year of the DHS, and the countries are listed in Table 1. This

current study also utilizes longitudinal results from 9 of these countries that had a DHS completed in 1993 or earlier and had comparable household roster information collected in the earlier survey, specifically from Burkina Faso, Cameroon, Ghana, Kenya, Malawi, Namibia, Senegal, Tanzania, and Zambia. The 22 recent DHS countries used in the current study together represent about two-thirds of the population of sub-Saharan Africa, and since the DHS is a probability survey, it is possible to conclude that the composite of these surveys, when properly weighted, allow for generalization to a large part of the region. The one obvious omission is South Africa, which contains a large population but did not conduct a DHS since 2000. Table 1 displays some basic information about each country, like its population size, and about each DHS, like the number of households that were sampled.

Measures and analysis

The outcome measures are obtained from the DHS household roster, which contains data on age and sex of each household member, their relationship to the household head, and importantly for this study, for those 15 years of age or under, the presence and survival status of their parents. The latter information is particularly useful since it allows for the determination of whether an older adult lives with grandchildren whose own parents are present or absent from the household. If parents are absent, the household roster contains information on survival status, allowing for the determination of whether a coresident grandchild is an orphan or whether the parents simply live elsewhere. Specifically, this study focuses on several living arrangements indicators that are of importance to older adults in developing countries and have implications for quality of life. For instance, the study considers whether older adults live with a child, a grandchild, in a skipped generation household, a three generation household, with a double-orphaned grandchild, and with a grandchild whose own parents live elsewhere.

A skipped generation household consists of at least one grandchild but no own children, while a three generation household consists of at least one grandchild and at least one own child, although these two coresidents are not necessarily parent and child. Living with a double-orphaned grandchild means living with a grandchild whose own parents are deceased. It does not necessarily mean living in a skipped generation

household since other own children may be present. The same is true for living with a grandchild whose parents live elsewhere. This may indicate a fostering situation whereby the older adult is serving as primary caretaker; although there may also be other own children in the household that take part in the grandchild's care. Of course, grandchildren may be conversely serving as caretakers of the older adults. Unfortunately, the DHS roster does not provide a chance for investigating such intricate details that are often of interest to those that study living arrangements of older adults since information that is normally available in surveys geared specifically toward the elderly (see, for example, Hermalin 2002), such as the number of children living elsewhere and exchanges taking place between parents and children, is unavailable. However, the DHS still represents the best and indeed only data source for descriptively identifying key living arrangement situations across a broad range of countries in the sub-Saharan African region, and given the longitudinal nature of the DHS program, for estimating changes that have occurred together with changes in the AIDS epidemic.

Relationships in the DHS household roster are coded using the household head as the reference. Since the older person under consideration is often not the household head, determining whether an older adult lives with an adult child or a grandchild requires running computationally time consuming programs that reconstruct relationships with respect to any older adult. Although it is sometimes difficult to reconstruct exact relationships, spousal, parent-child and grandparent-grandchild ones are relatively easy to identify without error. The DHS asks about both de facto residence (that is, who is in the household at the present) and de jure residence (that is, who is usually in the household). This study uses the latter definition.

The study proceeds first by considering the individual as the unit of analysis and looking at descriptive results showing living arrangement indicators among older adults across the region. A set of population weights are applied that result in the cumulative sample being representative of older adults living in the countries included in this study. While this makes the data representative, it gives high weight to those living in countries with large populations of older adults (for example, Nigeria) and low weight to those living in countries with small populations (for example, Namibia). Therefore, some additional results are presented that are unweighted but averaged across the 22 countries.

The investigation then switches to considering the country as the unit of analysis and macro-level indicators are estimated. For instance, for each country, the percent living with a child or a grandchild is determined. Associations are shown between the magnitude of the epidemic within a country and specific living arrangement indicators. Past analyses assessing impact of HIV/AIDS on living situations indicate that it may take time for prevalence rates to work their way through a population to eventually cause enough mortality which in turn leads to changes in household dynamics (Hosegood and Timaeus 2006; Merli and Palloni 2006). Since the accumulation of mortality is likely the impetus for changes in living arrangements on a country-wide level, the magnitude of the epidemic is measured according to the Cumulative Crude Death Rate due to AIDS (CCDR). These rates are estimates of the total number of deaths ever occurring in a country due to AIDS, expressed per 1,000 individuals living in the country in the year of the latest DHS. Cumulative deaths are estimated using UNAIDS data (UNAIDS 2000, 2002, 2004, 2006) and population size in the year of the DHS is estimated using United Nations data (United Nations 2007).

There are, of course, strong associations between AIDS prevalence rates and CCDRs, but how close these two are related depend on several factors, including, the rate at which AIDS incidents in a country result in deaths, changes in AIDS prevalence from year to year, and the year in which the DHS was conducted. For instance, Uganda is a country that had an extremely severe HIV/AIDS epidemic in the past but has seen sharp declines in recent years. Estimates from UNAIDS indicate that Uganda had an HIV prevalence rate of 9.5 in 1997 but only 5.1 in 2001, the year of the latest DHS. High prevalence rates from past years would result in a larger number of deaths being accumulated over time than might be assumed given a current prevalence rate. Thus, the association between the magnitude of the epidemic and living arrangements may be more robust when examining the impact of the accumulation of deaths in Uganda rather than a prevalence rate since the latter does not take into account the deaths that likely occurred as a result of prevalence rates that were higher in earlier years.

Finally, the investigation focuses specifically on 9 countries that have comparable DHS data from both the early 1990s (specifically 1991 to 1993) and later (specifically 2000 to 2005). If AIDS deaths result in changes in living arrangements, this should provide a long enough period of time for these changes to appear.

Change in living arrangements over time is estimated as the average annual percent change using a standard exponential equation, as follows:

$$\Delta = [LN(p_2/p_1)/t] \text{ X } 100$$

where Δ indicates the average annual percent change, p_2 and p_1 are point estimates from the latest and earlier DHS, and t is the number of years between the two surveys. The average annual percent change is then correlated by the AIDS prevalence rate in 1997 as reported by UNAIDS. This is roughly a mid-period year for each of the countries and is a good indicator of the average long-term impact of the epidemic. A CCDR is not used for the examination of changes over time since cumulative death estimates are not available starting from specific years in the early 1990s.

Results

Individual-level results

An older adult for this study is defined as someone at least 60. Table 1 indicates that 4.7% of the population across the 22 countries is an older adult. However, about one in four households contains an older adult. Across the countries considered in this study, the greatest proportion of households containing someone 60 and older is in Senegal (about 43%), Guinea (about 34%) and Lesotho (about 32%). The total sample size, when collapsing individual-level data across the 22 countries, is almost 58,000.

Table 2 displays living arrangement indicators in two panels. The upper panel considers regionally weighted results that can be generalized to the total population of older adults living in the 22 countries included in the study. Unweighted averages for the 22 countries are presented in the bottom panel. Since there is very little difference between the results in the top and bottom panels, for instance, the percent living alone is 8.8% across the region when regionally weighted, and the average across the countries is 8.9%, discussion will focus on the regionally weighted results. Overall, the table highlights the importance of living with children and grandchildren, and the extent to which older adults live with grandchildren whose own parents are absent. The average household size for older adults across the region is about 5.6. A little less than 9% live alone. Most live with at least one child, who is usually at least 15 years of age. Across the

region, about 46% live with a grandchild – almost as many as live with a child. About 14% live in a skipped generational household, that is, with at least one grandchild but with no own children. About one in three live in a three generation household, which includes both a grandchild and an own child.

The final several rows of findings, which take advantage of DHS household roster information on the presence of the parents of household members under age 15, suggest just how common it is to live with a young grandchild whose parents live elsewhere. About 12% of older adults across the region live in a household with at least one grandchild under age 15 and both of the grandchild's parents, about 15% live with a grandchild that has one absent parent, and about one in four live with a grandchild with two absent parents. Hence, it is much more common for an older adult to be living with a grandchild who has absent parents than one who has both of their own parents present. It is likely then, that many of the three generation households include grandchildren that are not offspring of coresident children. By far, the father is more likely to be absent than the mother. For instance, about 3% of older adults live with a grandchild with a father present and a mother absent, and more than 12% live in a situation where a grandchild is in the household whose mother is present and father is absent.

The table also shows indicators divided into male and female elderly living in rural versus urban areas. There are some notable differences by age and place of residence. Women in rural areas are much more likely than others to be living alone (about 12%), while it is men in rural areas who are least likely to be living alone (less than 6%). But, perhaps the most noticeable difference is that women are much more likely to be living with grandchildren, while men are more likely to be living with own children. In turn, women are more likely than men to be living in skipped generation and three generation households. The differences between genders translate into women being more likely to be living with a grandchild whose parents are present and whose parents are absent. In short, they seem to be more likely to be living with any type of grandchild. There is somewhat less difference across rural and urban areas, but generally, household sizes are larger in urban areas as is the tendency to live with a child. One parent is more likely absent in urban areas, while both parents are more likely absent in rural areas.

Table 3 investigates the issue of absence of a coresident grandchild's parents further by looking at the reason for absence, showing regionally weighted results. The DHS household roster allows for the determination of whether parents of household member under age 15 live elsewhere, they are deceased, or their status is unknown. Note that it is possible that an older adult lives in more than one of these situations. For instance, an older adult may live with one grandchild whose both parents are present, another whose both parents are deceased, and a third that has a parent that is present and a parent living elsewhere. Thus, there may be several grandchildren within a household that have absent parents. In addition, living with a grandchild with absent parents does not necessarily mean that the older adult lives in a skipped generation household since other own children, that are not the parents of the coresident grandchild, may be present.

It is clear from the table that the most common reason for the absence of a parent of a coresident grandchild is that they are alive and living elsewhere, confirming the importance of fostering, although in a fair number of cases, a parent is deceased. The top rows look at the situation where one parent is absent and the other is present. A little over 2% of older adults live with a grandchild whose one absent parent is deceased and almost 13% live with a grandchild whose one absent parent lives elsewhere. A half of a percent live with a grandchild whose one absent parent has an unknown status. It is quite possible that a proportion of these parents are also deceased. The bottom rows examine the situation where both parents are absent. About 2% live with at least one double-orphaned grandchild, and about 5% live with a child that has one deceased parent and one parent living elsewhere. A little more than 18% live with a grandchild whose both parents are alive but living elsewhere, and 0.5% lives with a grandchild where the status of both parents is unknown. Looking at the distributions by sex and place of residence, older women are generally more likely to be in all of these living situations. Those in rural areas are more likely to be living with grandchildren whose both parents are deceased or are living elsewhere.

Country-level cross-sectional results

The remainder of the results considers the country as the unit of analysis. Table 4 displays the percent of older adults within each country who live with at least one child, at least one grandchild, in a three

generation household, a skipped generation household, with at least one double-orphaned grandchild and at least one grandchild who has two parents that are alive but living elsewhere. Countries are organized from top to bottom by CCDRs. Figures 2 to 7 plot the relationships between CCDR and the percent of older adults living in the specific situation. Each figure includes the linear regression trend-line, the Pearsons' correlation coefficient (indicated as r) and the p-value for r.

Examining the figures, despite a few outliers, three associations are particularly robust. Older adults living in countries with high CCDRs are much less likely than those in other countries to live with one of their own children (Figure 2), much more likely to live in a skipped generation household (Figure 5), and much more likely to live with a double-orphaned grandchild (Figure 6). Each of these findings is consistent with the notion that AIDS deaths influence availability of children and promote caretaking obligations of orphaned grandchildren. Looking at the specific country data, the percent that live with a child ranges from a high of about 70% or more in Senegal, Guinea and Burkina Faso to a low of 42% or less in Lesotho, Uganda, Malawi and Gabon. Three of the latter four countries have very high CCDRs. The percent in a skipped generation household ranges from less than 10% in Senegal, Mali, Gabon, Nigeria, Burkina Faso and Congo to highs from 20% to 30% in Zambia, Uganda, Lesotho, Malawi, Rwanda and Namibia. Except for Rwanda and Namibia, all the countries have high CCDRs. The percent living with a double-orphaned grandchild is around or below 2% in most countries, but reaches 4% or higher in Uganda, Lesotho, Kenya and Rwanda, and more than 8% in Malawi and Zambia. Except for Rwanda, high percents living with a double-orphaned grandchild are found in the high CCDR countries.

The percent living with a grandchild is generally higher, and the percent living in a three generation household is generally lower, in the high CCDR countries (Figure 3) although these associations are less robust. There is a contrast to be drawn between results shown in Figures 6 and 7. Both the percent of older adults living with a grandchild with both parents deceased and with both parents alive but living elsewhere increase with the CCDR. The latter association is less robust and not statistically significant, however, it is being influenced by a severe outlier, Namibia, a country where about 40% of older adults are living with a child whose both parents are living elsewhere, likely the result of fostering arrangements as individuals find

work elsewhere. The contrast between these two associations may suggest that some of the same forces are at work in both cases. There may be a complex set of associations between fostering as normative behavior within sub-Saharan African culture, magnitude of the AIDS epidemic, and living arrangement patterns. For instance, where fostering is culturally accepted, adults are likely to leave their children with grandparents. They migrate for work while at the same time may adopt sexual practices away from home that increases their likelihood of contracting HIV. This leads to higher AIDS-related mortality rates and in turn alters the availability of children and the long-term needs of grandchildren.

Country-level longitudinal results

The cross-sectional country-level results are suggestive of an AIDS impact on some of the living situations. However, a causal connection is difficult cannot be assumed without longitudinal data since there are numerous intervening mechanisms that may be influencing associations, and deaths may be the result of other causes, not necessarily AIDS. The final portion of the analysis provides some evidence of a causal connection by considering only countries that completed DHS surveys in the early part of the 1990's as well as since 2000 and have available data from the earlier survey that allows for examination of key living arrangement indicators.

Table 5 shows the percent of older adults living in specific situations estimated from the earlier and latest DHS as well as the average annual percent change. Figures 8 through 13 plot the average annual percent change by estimated AIDS prevalence in 1997. Although it is difficult to make definitive conclusions given the sum of nine observations, the figures are consistent with the cross-sectional country-level data. That is, there is a strong and statistically significant association between AIDS prevalence and the average annual change in the percent living with a child, in a skipped generation household and with a double-orphaned grandchild, with each association supporting the hypotheses. As an example, consider the percent living in a skipped generation household. The data in Table 5 indicate substantial increases occurred in Zambia and Namibia, the two countries with the highest AIDS prevalence. Specifically, there was a 4.5% average annual increase in Zambia and a 6.4% average annual increase in Namibia. Consider also the percent

living with a double-orphaned grandchild. Table 5 indicates at least a four-fold overall increase in Namibia, Zambia and Kenya, which are 3 of the 4 highest AIDS prevalence countries. The average annual change in is 19% in Namibia and over 20% in Kenya and Zambia. In contrast, there are weaker associations with other living arrangement indicators. It is particularly noticeable that the percent living with a grandchild with both parents alive and living elsewhere does not change much across countries (Figure 13). This is telling since it suggests that the importance of fostering has remained or even increased over time regardless of the status of the AIDS epidemic.

Discussion

This study examined the extent to which older adults in sub-Saharan Africa live in several key living arrangements and how the percent living in these arrangements differs across countries and over time by magnitude of the HIV/AIDS epidemic. In a number of sub-Saharan African countries, the HIV/AIDS epidemic is severe, and as such has potentially far-reaching influences on both quantity and quality of life. For instance, in Southern Africa, where the epidemic is most severe, people live on average 10 years less than they would without the epidemic (World Health Organization 2004). According to UNAIDS, two million adults and children died of AIDS across sub-Saharan Africa in the year 2005 alone (UNAIDS 2006). As of 2005, more than 23 million people deaths have been accumulated as a result of AIDS in the 22 countries that were part of the current study, and this omits one-third of the region including South Africa where hundreds of thousands die of AIDS every year (UNAIDS 2006). To imagine that such a massive health phenomenon would not have influences that filter down and effect older people is unrealistic. Older adults in the region are reliant upon family, which often translates into being dependent on adult children for physical, material, and other types of support. When one of their children contracts HIV, the older adult is often the main administrator of care (Knodel and VanLandingham 2002; Knodel et al. 2003; World Health Organization 2002). When one of their children dies due to AIDS, the older adult may lose an important source of support while at the same time ending up being the caretaker and pseudo-parent of orphans left behind (Knodel and VanLandingham 2002; Knodel et al. 2003; Ntozi et al. 1999). A growing series of publications have been

highlighting the seriousness of the orphan situation that is being created by the accumulation of AIDS mortality in the region (Bicego, Rutstein and Johnson 2003; Case, Paxson and Ableidinger 2002; Foster 1999; Jacques 1999; Madhavan 2004; Nyambedha, Wandibba and Aagaard-Hansen 2003; Nyamukapa, Foster and Gregson 2003). In a sense, older adults are orphans as well when the lose the support that was provided by those that died. Yet, partly because of a lack of available data and partly because of the complexity of the dynamics associated with the disease, such as the length of time that it takes for HIV prevalence to result in an accumulation of deaths, it has been difficult to pinpoint with much accuracy how the epidemic has changed the lives of older adults.

Although overall the HIV/AIDS epidemic is severe across sub-Saharan Africa, there is also much variation. Severe epidemics resulting in massive numbers of deaths are found in, for instance, Malawi, Zambia and Lesotho. Countries with epidemics of a slightly lesser magnitude, or epidemics that were very severe and have seen a decline in prevalence in recent years, include Uganda, Kenya and Tanzania. In contrast, comparatively low rates of HIV are found in, for instance, Ghana, Mali and Nigeria. It is difficult to show assuredly that the magnitude of the epidemic on a country level results in living arrangement changes since there are numerous intervening factors that could be at play. Nonetheless, it is at least possible to demonstrate that associations exist that are consistent with hypotheses that are often tossed about. Specifically, conforming to a 'demographic' perspective, hypotheses suggest that high rates of HIV prevalence, and ensuing high rates of AIDS-related mortality, result in reductions in the availability of children, which in turn lessen the probability of living with a child. Hypotheses that conform to an 'altruistic' perspective suggest that orphaned grandchildren often end up living in households with older adults, who act as caretakers of these youngsters.

Considering recent DHS data from 22 countries and longitudinal DHS data from 9 countries, the current study tested and generally supported the above hypotheses. In a longitudinal analysis with a small number of countries, countries with high HIV prevalence rates were more likely to witness sharp increases in the percent living with a child and sharp decreases in the percent living in a skipped generation household and in the percent living with a double-orphaned grandchild. While the magnitude of the epidemic appears to be

related to changes in the probability of living with grandchildren whose both parents are deceased, it does not appear to be related to changes in the probability of living with grandchildren whose both parents are alive but living elsewhere, a comparison that further supports the idea that it is the epidemic rather than normative family behaviors that is responsible for changes in living arrangements. The magnitude of the epidemic was also not as closely associated with living with grandchildren or in three generation households, suggesting the continued importance of fostering arrangements across all countries. Cross-sectional analyses at the country-level showed strong associations between a measure that accounts for the accumulation of AIDS deaths and the percent of older adults living with a child, in a skipped generation household and with a double-orphaned grandchild. In a more general sense, the study found that about one in four older adults across the region live with a grandchild whose own parents are absent. In most of these cases, parents of the grandchildren are alive but living elsewhere, but in a not unsubstantial number of cases, one or both of the absent parents are deceased. This result alone, which is rarely highlighted, at least from the perspective of the older adult, suggests the important role that older adults play as caretakers of grandchildren regardless of the level of HIV/AIDS. Women are more likely to live with grandchildren, a result that may be in part a function of age, since women live longer than do men, and in part a function of their perceived role as caretaker.

There are certainly a number of limitations related to this study that should be emphasized. First and foremost is the limitation with respect to depth of measurement using DHS data. This necessitates that the analyses be relatively descriptive. Unfortunately, the DHS is not geared toward the older population; they are present in the data only because of the collection of information for a household roster. Yet, there is at present little alternative with respect to data for studying living arrangements of older adults on a regional or even sub-regional basis. Second, the study showed associations between HIV/AIDS indicators and living arrangements on a country level, but there is wide regional variation within countries that is untapped. Third, the limited number of data points available for examining change over time is a serious limitation. Yet, despite a small number of observations, fairly robust associations appear. As more DHS data becomes available, it should be possible to widen the comparison. Fourth, this study focused on the entire region and not on individual countries. This was done purposively, in order to be able to examine the more general

situation across a large number of countries, but it does result in some minimization of particular events that may be influencing living arrangements of older adults in specific countries and sub-regions within countries. Fifth, and related to the last point, the study is limited in that no direct information is available that links deaths specifically to AIDS. This study simply shows is that there are associations with the magnitude of the epidemic on a country level that appear conspicuous.

As for the latter points, examining some countries specifically shows how vulnerable this analysis can be to spuriousness. Rwanda has an HIV prevalence rate that, while very large in a global sense, is relatively small for the region (see Table 1). Yet, Rwanda has among the highest proportion of older adults living with a double-orphaned grandchild and in a skipped generation household (see Table 4). Rwanda is clearly an outlier, a result that can be explained by their civil war and genocide in the 1990s that killed a large proportion of their population. This genocide may have had a similar impact on living situations of older adults as has had the AIDS epidemic in the high AIDS-mortality countries. Namibia is a country that currently has one of the highest HIV prevalence rates in the world. Yet, in comparison to some other countries, there are a moderate proportion of older adults living with double-orphaned grandchildren or in a skipped generation household, and almost 60% still live with an own child (see Table 4). The most recent DHS data from Namibia was collected in 2000, and as such, there was less time for the HIV epidemic to convert into a large accumulation of AIDS-deaths, which, as is argued in this paper, is a main factor that impacts on living arrangements. Large increases in the percent living with double-orphaned grandchildren and in skipped generation households were found in both Senegal and Cameroon (see Table 5), although the magnitude of the epidemic in these countries is relatively small. But, both countries recorded unusually low proportions for these indicators in the early 1990s and therefore increases may be a function of a small number of deaths, which may also be due to other causes.

These limitations aside, the current study has a number of implications. First, data on living arrangements and other social conditions among older adults is currently not readily available across the sub-Saharan African region. The current study has therefore made some progress by presenting regionally generalizable results that can be used to highlight the important social role that older adults may play within

the sub-Saharan African family. That a quarter are living with a grandchild whose own parents are absent is potentially important, suggesting that older adults are very involved in fostering young grandchildren, a fact that cannot be ignored when considering the well-being of both old and young in the region. Second, while earlier writings have conjectured that older adults may be impacted upon by the HIV/AIDS epidemic, this study provided empirical evidence of an association between the magnitude of the epidemic and living arrangements. As such, it suggested that the AIDS epidemic may be influencing fundamental social, familial and household dynamics across a wide swatch of sub-Saharan African countries, and with the continued prospects of high prevalence rates and accumulations of AIDS-related mortality, it might be expected that the impact will become even more apparent as time goes on. Third, given the reliance that older adult have on their children and family for support, the associations found in this study between levels of HIV/AIDS, living with children, double-orphaned grandchildren and in skipped generation households give rise to the notion that quality of life for older adults is being negatively influenced by the epidemic.

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Figure 1: Countries in study by AIDS prevalence rates

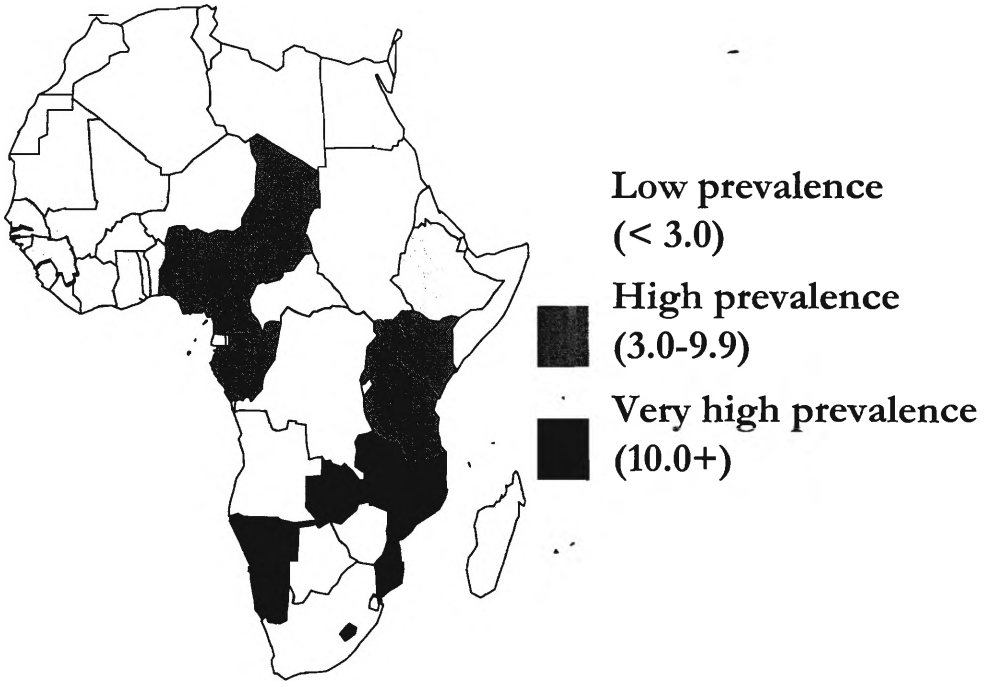

Table 1. Selected characteristics of sub-Saharan African countries and DHS samples used in the current study

Country	Year latest of DHS survey	Population (millions)[1]	AIDS prevalence rate in year of DHS[2]	Total Number of households covered in DHS[3]	Sample aged 60+[3]	% population 60+[1]	% households with someone 60 + present[4]
Total/Average	2000-2005	489.7[5]	2.3[6]	188,963[2]	57,765[2]	4.7[6]	24.1[6]
Benin	2001	7.5	1.9	5,769	1,793	4.3	26.4
Burkina Faso	2003	13.1	2.1	9,097	3,668	4.6	28.6
Cameroon	2004	17.4	5.5	10,462	3,058	5.4	23.4
Chad	2004	9.8	3.5	5,369	1,300	4.7	20.9
Congo	2005	3.6	5.3	5,879	1,421	5.0	20.8
Ethiopia	2005	79.0	2.2	13,721	3,860	4.6	25.8
Gabon	2000	1.2	5.6	6,203	2,994	6.9	26.2
Ghana	2003	21.5	2.3	6,251	1,926	5.5	25.1
Guinea	2005	9.0	1.5	6,282	2,706	5.0	34.1
Kenya	2003	33.8	6.8	8,561	1,849	4.0	18.8
Lesotho	2004	2.0	23.5	8,592	3,314	6.8	32.1
Madagascar	2004	18.1	0.5	8,420	1,903	4.8	18.5
Malawi	2004	12.9	14.2	13,664	3,368	4.6	19.7
Mali	2001	10.3	1.9	12,331	3,794	5.3	24.9
Mozambique	2003	19.6	16.0	12,315	3,323	5.0	21.7
Namibia	2000	1.9	20.4	6,392	2,198	5.0	30.1
Nigeria	2003	134.5	3.7	7,225	2,349	4.6	25.0
Rwanda	2005	9.2	3.1	10,272	2,152	3.7	17.8
Senegal	2005	11.8	0.9	7,412	4,472	6.2	43.3
Tanzania	2004	37.5	6.6	9,735	2,944	4.6	23.6
Uganda	2001	25.5	5.1	7,885	1,562	4.0	19.3
Zambia	2001	10.6	16.7	7,126	1,811	4.5	19.9

Notes:

1 In year of DHS survey. Source: United Nations 2007.

2 Estimated cumulative deaths up to the year of latest DHS, measured per 1,000 population in year of latest DHS. Sources: UNAIDS 2000, 2002, 2004 and 2006; United Nations 2007.

3 Unweighted from latest DHS survey.

4 Weighted from latest DHS survey.

5 Total for countries in the current study.

6 Weighted average (weighted by population size) across countries in the current study.

Table 2. Living arrangement indicators for older adults in 22 sub-Saharan African countries

	Total (N=57,765)	Men		Women	
		Rural (N=21,717	Urban (N=6,963)	Rural (N=21,596)	Urban (N=7,489)
Regionally weighted					
Average household size	5.57	5.64	6.31	5.18	5.88
Percent living…					
alone	8.8	5.6	7.0	12.5	9.9
with at least one child	60.9	68.9	72.6	50.2	55.2
with at least one adult child[3]	53.3	55.0	64.3	48.1	53.6
with at least one grandchild	45.7	36.1	37.5	56.0	55.4
with at least one young grandchild[4]	41.6	33.9	34.2	50.6	47.8
in skipped generation household[5]	14.1	9.5	7.3	20.4	16.9
in three generation household[6]	31.6	26.6	30.2	35.6	38.5
Percent living with at least one grandchild under 15 where…					
both parents are present	11.9	7.7	6.2	17.5	14.7
one parent is absent	14.7	11.3	16.0	16.4	20.7
- father is present, mother is absent	2.8	1.4	1.8	4.1	4.4
- mother is present, father is absent	12.4	10.2	14.6	12.8	17.3
both parents are absent	24.0	21.5	20.4	27.6	24.8
Unweighted average					
Average household size	5.69	5.76	6.31	5.32	6.14
Percent living…					
Alone	8.9	6.8	7.7	11.8	8.2
with at least one child	57.5	63.9	67.7	48.5	55.7
with at least one adult child[3]	50.5	51.1	59.2	46.1	54.2
with at least one grandchild	49.4	40.6	41.6	56.9	59.7
with at least one young grandchild[4]	44.9	38	38.2	51.3	52.2
in skipped generation household[5]	16.0	11.3	8.2	21.5	17.8
in three generation household[6]	33.4	29.3	33.4	34.0	42.0
Percent living with at least one grandchild under 15 where…					
both parents are present	11.2	7.5	7.1	15.7	15.3
one parent is absent	18.1	15.1	19.6	18.7	18.7
- father is present, mother is absent	2.9	1.7	2.4	3.7	4.5
- mother is present, father is absent	15.8	13.9	17.9	15.7	20.4
both parents are absent	27.6	24.8	23.1	30.5	28.0

Notes: N's are unweighted. Regional weights use population weights making results representative of the cumulative population aged 60+ across the 22 countries included in the study. Unweighted averages report the means across the 22 countries. An adult child is aged 15 and older. A young grandchild is under aged 15. A skipped generation household contains a grandchild but no own children. A three-generation household contains a grandchild and an own child.

Table 3. Distributions for reasons for absence of one or both parents of a coresident grandchild of older adults in 22 sub-Saharan African countries

		Men		Women	
	Total	Rural	Urban	Rural	Urban
Reason for the absence of one parent of a coresident grandchild:					
Percent of older adults living with at least one grandchild where…					
- One parent is present and the other is deceased	2.4	1.3	2.3	3.2	3.8
- One parent is present and the other is alive living elsewhere	12.8	10.1	14.5	13.8	17.8
- One parent is present and the status of the other is unknown	0.5	0.5	0.3	0.6	0.6
Reason for the absence of both parents of a coresident grandchild:					
Percent of older adults living with at least one grandchild where…					
- both parents are deceased	2.2	1.9	1.3	2.8	1.9
- both parents are alive and living elsewhere	18.2	16.5	16.1	20.6	18.8
- status of both parents is unknown	0.9	0.7	0.9	1.0	1.3
- one parent deceased and one alive living elsewhere	4.8	3.9	3.9	5.9	5.5
- one parent deceased and status of one parent is unknown	0.2	0.2	0.0	0.2	0.1
- one parent alive and living elsewhere and status of one parent is unknown	0.5	0.5	0.2	0.6	0.4

Notes: N's as per Table 2. All results are regionally weighted.

Table 4: Country-level showing Cumulative Crude Death Rate due to AIDS (CCDRs) and living arrangements indicators

Country	CCDR	Percent living with a child	Percent living with a grandchild	Percent living in a three generation household	Percent living in a skipped generation household	Percent living with a double-orphaned grandchild	Percent living with a grandchild whose both parents live elsewhere
Madagascar	1.1	56.6	54.8	36.0	18.9	2.4	21.8
Senegal	3.1	80.2	70.1	61.8	8.3	1.2	20.0
Benin	4.8	65.8	45.5	34.2	11.2	0.4	16.1
Mali	7.8	61.1	28.7	19.6	9.1	1.2	13.3
Guinea	8.2	72.8	50.3	40.0	10.3	1.5	17.8
Gabon	11.0	41.4	37.0	27.8	9.2	0.4	14.2
Nigeria	14.1	66.0	37.9	29.2	8.6	0.5	13.3
Ghana	15.7	56.7	47.5	31.4	16.0	0.7	20.4
Chad	15.8	63.0	44.5	32.3	12.1	1.4	15.5
Namibia	21.2	56.0	65.7	43.6	22.1	2.8	42.2
Cameroon	23.2	53.8	43.8	31.3	12.6	1.1	19.1
Ethiopia	27.6	69.0	44.0	29.9	14.0	2.5	17.7
Burkina Faso	33.5	72.0	41.5	34.0	7.5	1.0	13.2
Rwanda	42.4	58.7	55.5	30.3	25.1	7.7	25.0
Mozambique	43.3	48.3	45.3	27.4	18.1	1.9	18.8
Congo	44.7	62.7	56.9	47.1	9.8	2.2	22.8
Kenya	45.0	50.7	46.0	27.7	18.3	3.8	15.6
Tanzania	50.8	56.3	53.8	37.4	16.4	2.1	25.5
Malawi	76.9	40.9	55.4	25.2	30.1	8.1	28.5
Lesotho	78.0	39.0	53.2	26.7	26.5	6.9	20.8
Uganda	87.9	41.8	51.8	25.7	26.0	7.0	27.9
Zambia	91.0	53.2	58.0	36.3	21.7	8.1	21.7

Notes: Source for Cumulative Crude Death Rate due to AIDS as per Table 1.

Figure 2: Percent of older adults in 22 sub-Saharan African countries living with a child by Cumulative Crude Death Rate due to AIDS (CCDR)

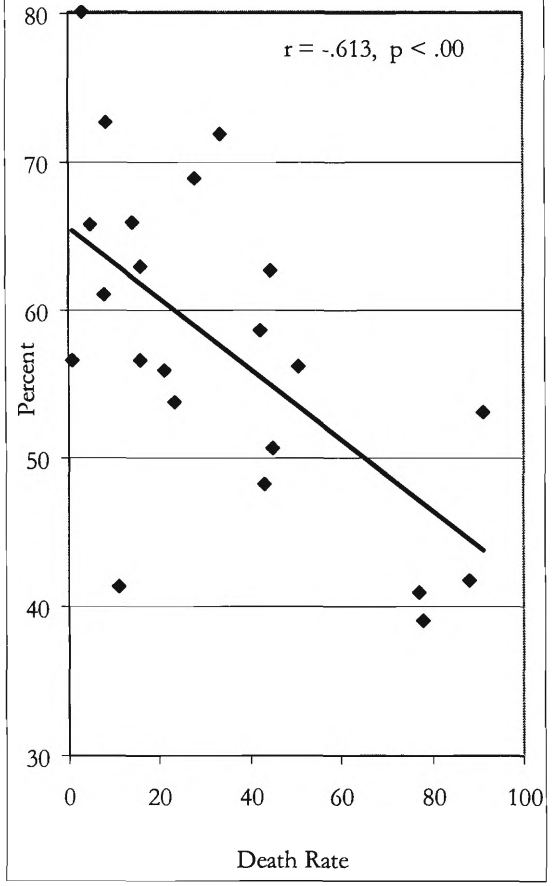

Figure 3: Percent of older adults in 22 sub_Saharan African countries living with a grandchild by Cumulative Crude Death Rate due to AIDS (CCDR)

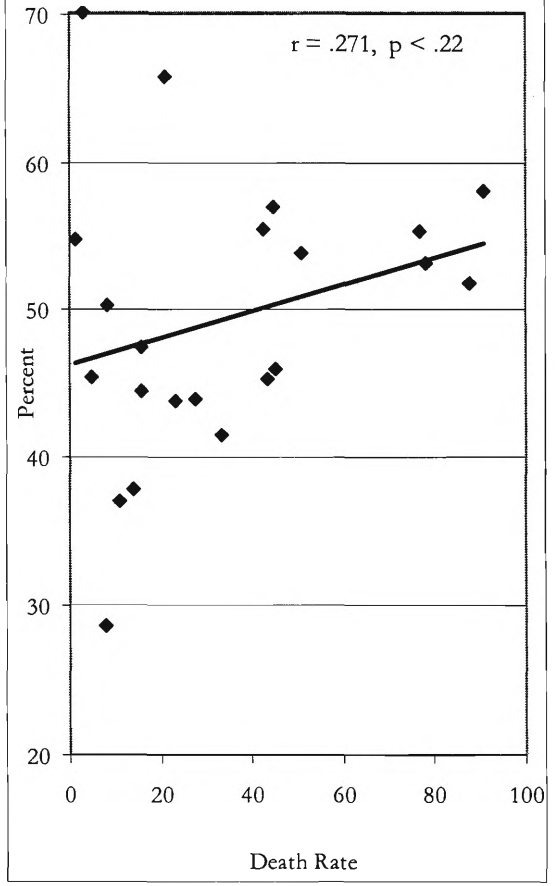

Figure 4: Percent of older aduts in 22 sub-Saharan African countries living in a threegeneration household by Cumulative Crude Death Rate due to AIDS (CCDR)

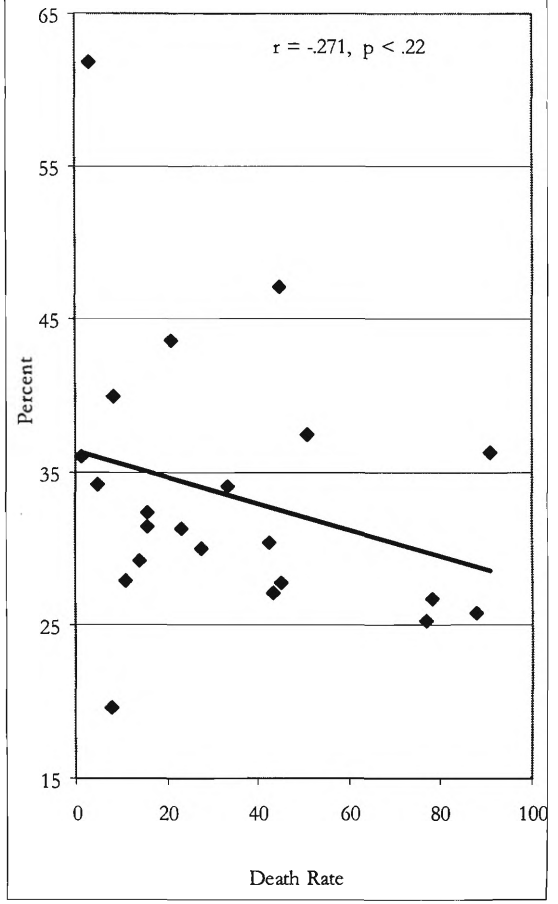

Figure 5: Percent of older adults in 22 sub-Saharan African countries living in a skipped generation household by Cumulative Crude Death Rate due to AIDS (CCDR)

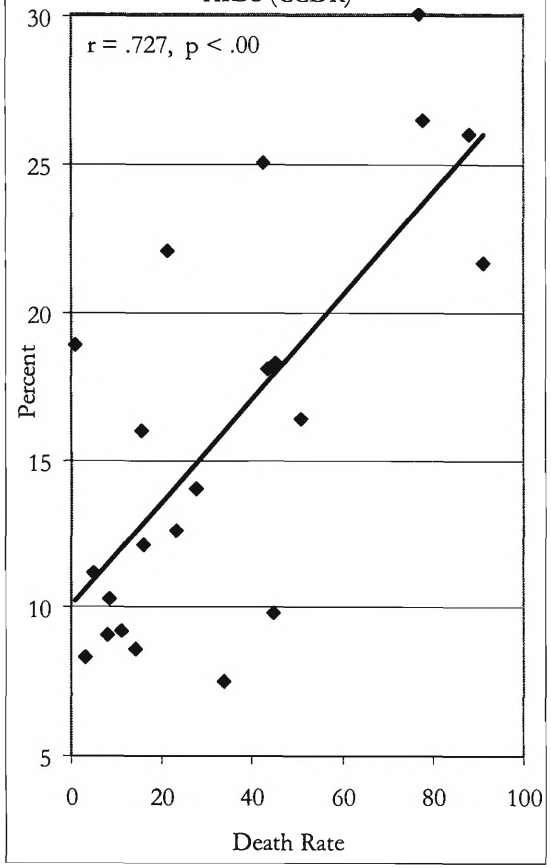

Figure 6: Percent of older adults in 22 sub-Saharan African countries living with a double-oprhaned granddchild by Cumulative Crude Death Rate due to AIDS (CCDR)

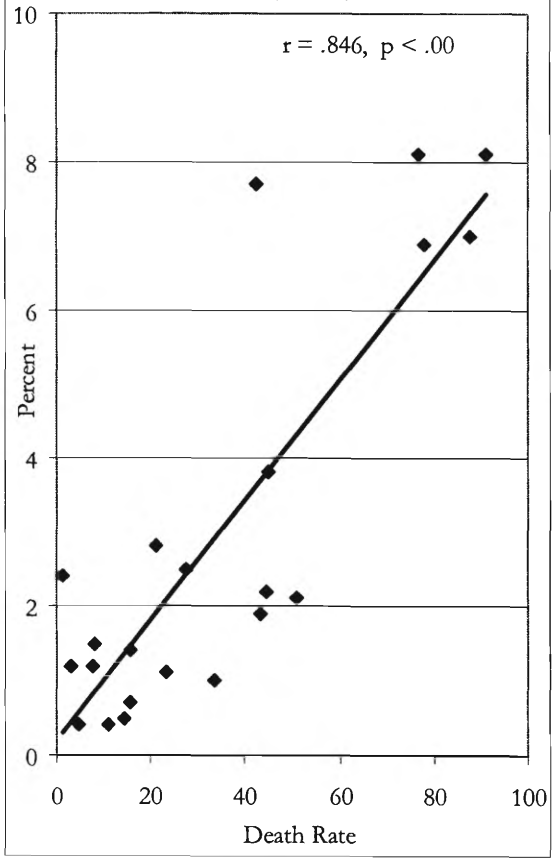

Figure 7: Percent of older adults in 22 sub-Saharan African countries living with a granddchild with parents living elsewhere by Cumulative Crude Death Rate due to AIDS (CCDR)

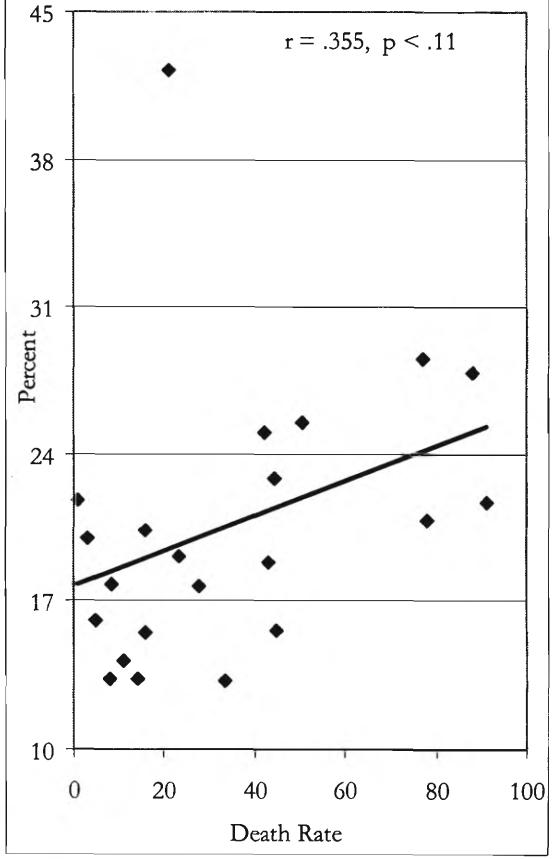

Table 5: Country-level results showing change in the percent of older adults living in specific living arrangements, organized by 1997 AIDS prevalence rate

	Senegal	Ghana	Cameroon	Burkina Faso	Tanzania	Kenya	Malawi	Zambia	Namibia
Earlier survey year	1992	1993	1991	1992	1992	1993	1991	1992	1992
Latest survey year	2005	2003	2004	2003	2004	2003	2004	2001	2000
1997 AIDS prevalence rate	1.8	2.4	4.9	7.2	9.4	11.6	14.9	19.1	19.9
% living with a child									
- Earlier survey	72.4	45.4	52.5	70.1	59.2	52.0	49.8	55.6	57.0
- Latest survey	80.2	56.7	53.8	72.0	56.3	56.7	40.9	53.2	56.0
Average annual percent change	+0.8	+2.2	+0.2	+0.2	-0.4	+0.9	-1.5	-0.5	-0.2
% living with a grandchild									
- Earlier survey	60.1	37.9	38.6	41.7	50.5	47.2	50.1	49.8	54.6
- Latest survey	70.1	47.5	43.8	41.5	53.8	46.0	55.4	58.0	65.7
Average annual percent change	+1.2	+2.3	+1.0	-0.0	+0.5	-0.3	+0.8	+1.7	+2.3
% living in three generation household									
- Earlier survey	53.4	20.0	30.3	34.3	37.1	29.0	28.1	35.3	41.3
- Latest survey	61.8	31.4	31.3	34.0	37.4	27.7	25.2	36.3	43.6
Average annual percent change	+1.1	+4.5	+0.2	-0.1	+0.1	-0.5	-0.8	+0.3	+0.7
% living in skipped generation household									
- Earlier survey	6.7	17.8	8.4	7.4	13.4	18.3	22.0	14.5	13.3
- Latest survey	8.3	16.0	12.6	7.5	16.4	18.3	30.1	21.7	22.1
Average annual percent change	+1.6	-1.1	+3.1	+0.1	+1.7	0.0	+2.4	+4.5	+6.3
% living with double-orphan grandchild									
- Earlier survey	0.4	1.4	0.4	1.5	0.7	0.5	3.5	1.1	0.6
- Latest survey	1.2	0.7	1.1	1.0	2.1	3.8	8.1	8.1	2.8
Average annual percent change	+8.5	-6.9	+7.8	-3.7	+9.2	+20.3	+6.5	+22.2	+19.3
% living with a grandchild with both parents living elsewhere									
- Earlier survey	14.4	20.3	14.9	14.0	22.1	17.3	23.3	20.8	32.7
- Latest survey	20.0	20.4	19.1	13.2	25.5	15.6	28.5	21.7	42.2
Average annual percent change	+2.5	+0.0	+1.9	-0.5	+1.2	-1.0	+1.5	+0.5	+3.2

Notes: Source for 1997 AIDS prevalence rate as per Table 1.

Figure 8: Average annual percent change in the percent of older adults living with a child in 9 sub-Saharan African countries by HIV prevalence rate

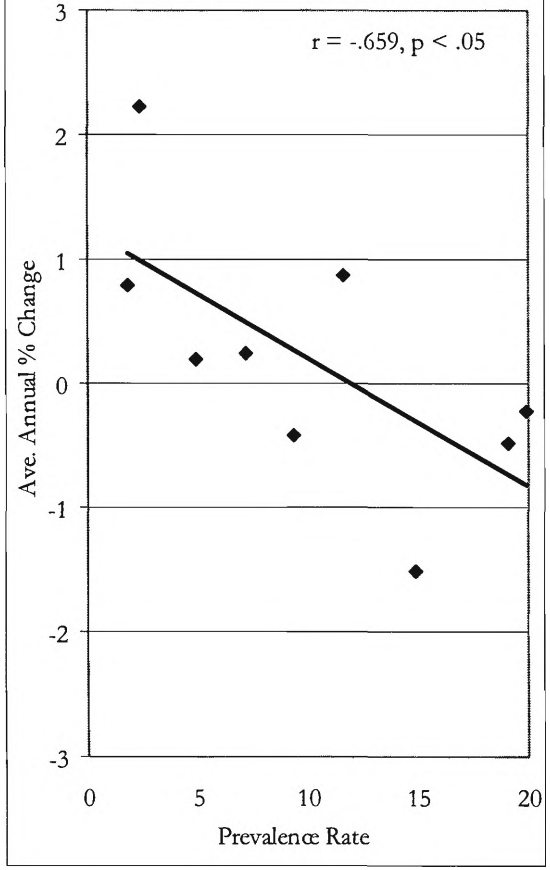

Figure 9: Average annual percent change in the percent of older adults living with a grandchild in 9 sub-Saharan African countries by HIV prevalence rate

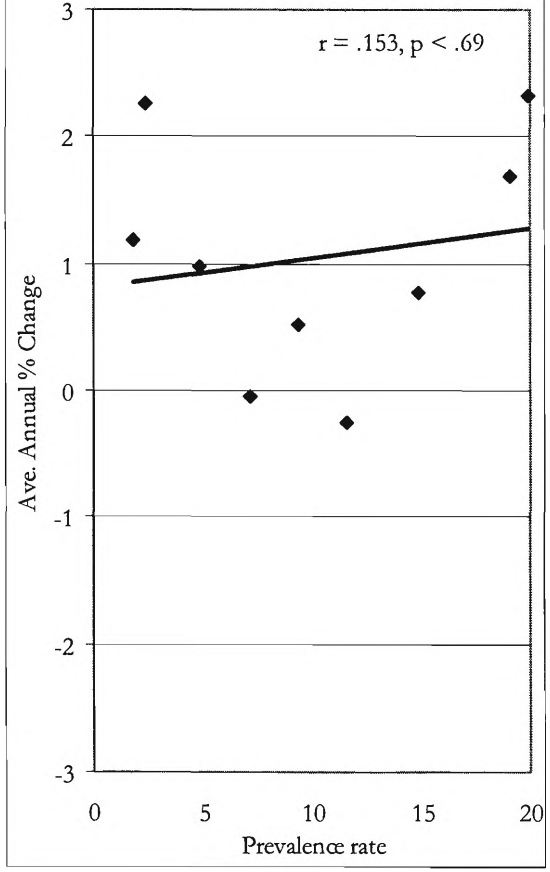

Figure 10: Average annual percent change in the percent of older adults living in a three generation household in 9 sub-Saharan African countries by HIV prevalence rate in 1997

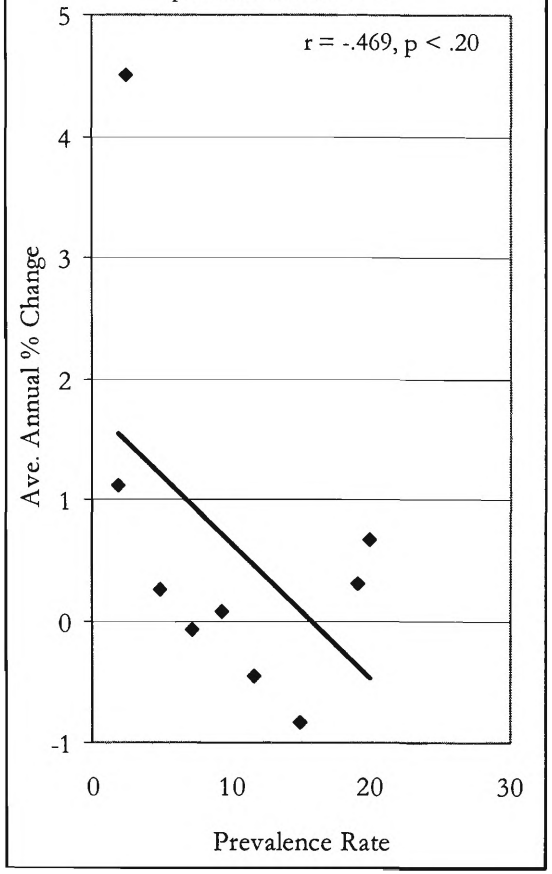

Figure 11: Average annual percent change in the percent of older adults living in a skipped generation household in 9 sub-Saharan African countries by HIV prevalence rate

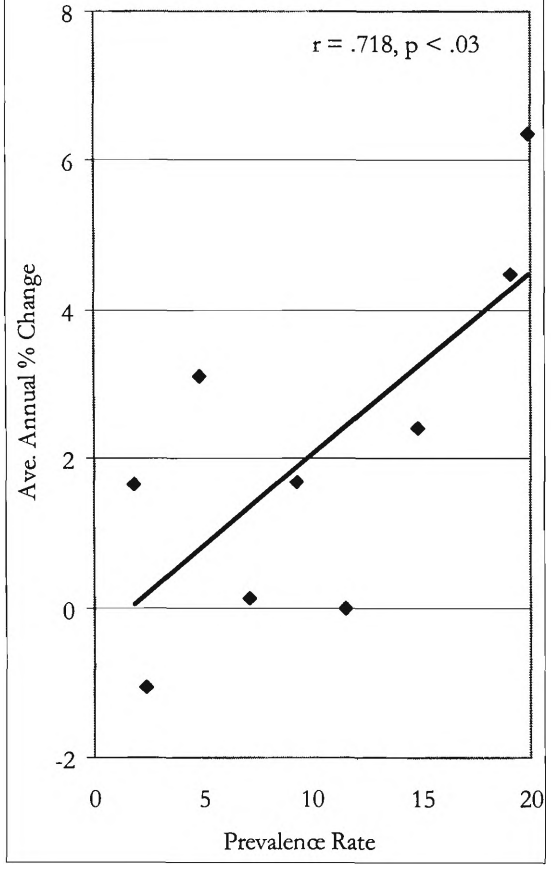

Figure 12: Average annual percent change in the percent of older adults living with a double-orphaned grandchild in 9 sub-Saharan African countries byHIVprevalence rate

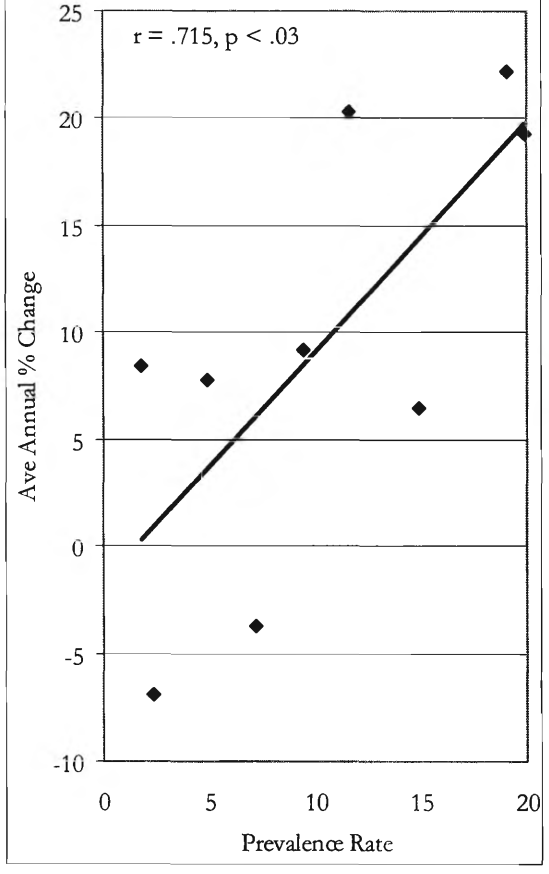

Figure 13: Average annual percent change in the percent of older adults living with a grandchild with parents living elsewhere in 9 sub-Saharan African countries by HIV prevalence rate