Magnitudes and trends in orphanhood among younger persons in the era of HIV/AIDS in South Africa, 2001-2015

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Abstract

Information on the magnitude of orphanhood is important from various perspectives. Though not designed for that purpose, orphanhood questions have been used by some studies to infer the magnitude of orphans due to AIDS among younger persons. This study provides an historical overview of the orphanhood questions and estimates the magnitude of orphans in the era of HIV/AIDS in South Africa using an epidemiologic and demographic model. The results suggest that the number of orphans in South Africa may increase to about 1.9 million by 2015 if current trends continue. These figures are lower than estimated by some previous studies.

Key Words: HIV/AIDS, orphanhood, maternal, paternal, African, Coloured, Indian, White, South Africa, population groups.

Introduction

Information on the magnitude and trends in orphanhood is important for several reasons. From a demographic standpoint, it provides an indication of the force of adult mortality – a component of general mortality in the population and hence a partial determinant of the growth and structure of a population. From an epidemiological standpoint, it provides an indication of the magnitude of the outcome of the burden of diseases among adults in the population. In the context of AIDS, it provides an indication of the contribution of the impact of AIDS on adult mortality. From a social welfare perspective, information on the magnitude of orphans in general, and AIDS orphans in particular, provides an indication of the burden of orphans on the working population, thus provides evidence-based information for policy and programme intervention in the management of orphans.

In the absence of a vital registration system information on survivorship of adults is usually obtained indirectly from censuses and surveys through orphanhood reports. The orphanhood method was developed before the advent of HIV/AIDS, to estimate adult mortality (Brass 1971) based on two questions asked of every person enumerated in a census or survey, namely:

Is (the person's) own biological mother/father still alive? (Used to estimate maternal orphanhood).

Is (the person's) own biological

father still alive? (Used to estimate paternal orphanhood).

The time location and hence the trends in the mortality estimates can be obtained for about 5-17 years before the census or survey (Brass & Bamgboye 1981).

There are a number of issues in the application of the method, but only a few that are relevant to the current study will be highlighted. Regarding maternal orphanhood, the mortality estimates derived from the younger respondents especially persons 0-5 and 5-9 age groups are usually biased downward due to the "adoption" effect – in many African populations, women often report children of relatives they have adopted after the death of the mother as their children (Brass 1971). It is usually a relative, who may or may not be married, who adopts the child of the deceased mother. In a polygynous situation (especially among Africans) where one wife dies, the co-wives may regard the children of the deceased wife as their own. In view of this, the reports from younger respondents are usually ignored in the estimation of adult female mortality using the orphanhood method (Brass & Hill 1973). A similar situation is often found in paternal orphanhood.

Applications of the orphanhood method in various African contexts have confirmed the adoption effect (United Nations 1984; Hill 1977; Blacker 1977 Timeaus 1991). In the context of South Africa Mandela has noted that Africans generally do not have half-brothers or half sisters and regard a mother's sister as mother, an uncle's son as a brother and a brother's child as son and daughter (Mandela 1994).

It is clear from the above that: (1) one cannot accept at face value the number of orphans reported among younger persons in a census or survey. (2) The orphanhood questions were not designed for the purpose of obtaining the number of orphans especially below the age of 15 years. Despite this, some studies (Makumbi *et al.* 2005; Operario *et al.* 2007; Ardington 2008) estimate the magnitude of orphans among younger persons as well as infer orphanhood due to AIDS mortality from the orphanhood questions. The 2007 censuses in Ethiopia and Swaziland included questions on orphanhood but were asked of persons below the age of 18 years. Some studies have estimated massive numbers of orphans in South Africa. For example a study (Dorrington *et al.* 2002) using the ASSA model projected the number of maternal orphans below the age of 15 years in South Africa in 2010 as 1,770,870. In another study four years later by some of the same authors (Dorrington *et al* 2006) in the 2002 study, and also using the ASSA model projected the number of maternal orphans below the age of 18 years in South Africa in 2010 as 2,123,286. It is against this background that the present study is designed.

The objectives of this study are to attempt to (1) quantify the magnitude of under- or over-reporting of mother, father dead among persons less than 18 years of age in a census (or survey) among South Africa's main population groups that consist of Africans, Coloureds, Asians and Whites; (2) Estimate the magnitude and trends in maternal, paternal orphanhood, 2001-2015 among persons less than 18 years of age

due to AIDS in South Africa's population groups; (3) Provide probable implications of the trends in AIDS orphanhood in South Africa.

As a legacy of apartheid, persons are classified as either African, or coloured (persons of mixed descent) or Indian/Asian or white in official statistics in South Africa. Official figures suggest that currently Africans constitute about 79.8%, coloureds 10.5%, Asians 2.2%, and whites 7.5% of South Africa's population (Udjo & Van Aardt 2008).

Data

The sources of data for this study are the 1996 and 2001 South Africa's population censuses as well as the 2007 Community Survey (Statistics South Africa 1998, 2003, 2007). These sources included the orphanhood questions. The base population for the study is the 1996 census population, while the 2001 census was used as a benchmark for assessing the magnitude of under- or over-reporting of orphanhood. The 2007 Community Survey provided the most recent large-scale survey (sample size was 250,348 households), in South Africa to estimate the pertinent marriage parameter for the orphanhood estiamtes.

Methods

An orphan in this study is a person less than 18 years of age who has lost either of one biological parents while a dual orphan is a person less than 18 years of age who has lost both biological parents. The methods of estimation employed consisted of the following.

Base population

Since the period of interest in this study is 2001-2010 and since the model used in estimating orphanhood provides estimates starting five years after the base population, the base period of the estimates is 1996. South Africa's official estimate of the population in October 1996 was 40.6 million (Statistics South Africa 1998). In view of the controversy around the 1996 census, revised estimates of the population in mid-1996, disaggregated by age and sex as well as by population group were used as the base population for the study (Udjo 2001).

Estimating the population less than 18 years of age

Estimating the population less than 18 years of age consisted of a cohort component method. In populations where HIV/AIDS prevalence is high (such as South Africa), the mortality component is estimated to include the impact of HIV/AIDS. The cohort component method entails estimating historical and current mortality,fertility and net as well as projecting these by age and sex to a desired period (Preston *et al* 2001).

Incorporating HIV/AIDS

Emerging evidence from population-based HIV surveys indicate that antenatal data tend to show higher prevalence of HIV (Boerma *et al* 2003) than in the general population. In view of this, HIV/AIDS was incorporated into the population estimates using a procedure that calibrates national antenatal HIV prevalence downward to national population-based HIV prevalence (Rehle & Shisana). In the present study, however, the calibration was done at the population group level. The antenatal HIV prevalence rates were obtained from South Africa's Department of Health's

HIV prevalence surveys (National Department of Health 2008) while the population-based HIV prevalence rates by population group were obtained from the Human Sciences Research Council's study (Human Sciences Research Council (2002). (The Human Science Research Council has carried out two other studies [Human Sciences Research Council 2005, 2008] but some of the results of the latter studies are inconsistent with those of 2002 especially among the white population group. Furthermore, the response rate among whites in the latest study was only 59%). The estimation was aided using the Futures Group Estimation Projection Package (UNAIDS 2003).

Estimating maternal, paternal orphanhood

Period estimates of the magnitude of overall orphanhood as well as orphanhood due to AIDS were based on the method developed by Grassly and Timaeus (2005). According to them, maternal AIDS orphans can be estimated using the following equation:

$$\Omega'_{t,a,\tau} = \sum_{i=15}^{49} [(\mu'_{t-\tau,i+a-\tau})] \sum_{S=0}^{n} [(\{m_{i,s,t-a})] Y_S * (\varepsilon_s l'_a + (1-\varepsilon_s) l_a \})$$

Where $\Omega'_{t,a,\tau}$ is the number of maternal AIDS orphans of exact age *a,* at time t whose mother died years τ ago, $\mu'_{t,i}$ is the number of women of age *i* who died from AIDS at time *t,* $m_{i,s,t-a}$ is the fertility rate of women of age *i* in HIV stage *s* at time *t-a* (Grassly & Timaeus 2005).

For paternal AIDS orphans the equation is:

$$x'_{t,a,\tau} = \sum_{i=15}^{79} v'_{t-\tau,i+a-\tau} \sum_{r=0}^{n} \left[\left(\{ Y_{r(a-t)} \}]^* \sum_{s=0}^{n} P(s/(r,t-a) k_{r,s}) \varphi_{it-a} [\varepsilon_s l'_a + (1-\varepsilon_s) l_a] \right\}$$

Where $x'_{t,a,\tau}$ is the number of children of exact age *a* who at time *t* whose father died of AIDS τ years ago, $v'_{t,i}$ is the number of men of age *i* who died of AIDS at time *t,* $Y_{r(a-t)}$ is the proportion of proportion of male adults who died of AIDS τ years ago in stage *r* of HIV infection at the time of the child's birth, $P(^s/_{r.t-a})$ is the probability that a pregnant woman is in HIV stage *s* if the father is in stage *r* at time *t-a*, $\varphi_{t,\tau-\alpha}$ is the fertility of uninfected men aged *i* at time *t-a*, and $k_{r,s}$ is the relative fertility of a man in HIV stage *r* with a partner in stage *r* (Grassly & Timaeus 2005).

The covariates most likely to affect the excess risk of dual orphanhood in a population according to Grassly's and Timaeus' model include the ages of the children's parents, the severity of the AIDS epidemic in the country and the background level of mortality. As proxies for the ages of the children's parents, two indices of marriage patterns: the proportion of women aged 15-19 years who are married, and the proportion of married women in monogamous unions, were used in the model

(Grassly & Timaeus 2005). In the present study, these indicators were obtained from the 2007 Community Survey. The period estimates of the magnitude of orphanhood were aided using AIM in the SPECTRUM package (Stover 1999).

Comparison of model orphanhood estimates with reported orphanhood

To enable a comparison of the results from the model estimates for the periods 2001 and 2007 with reported values, orphanhood prevalence was computed. Orphanhood prevalence was defined as the number of orphans less than 18 years of age as a percentage of the population less than 18 years of age thus:

$$\frac{O_{m,f(0-17)} = n_{m,f(0-17)}}{P_{(0-17)}}$$

Where $O_{m,f(0-17)}$ is the estimated or reported maternal or paternal orphanhood prevalence among persons less than 18 years of age, $n_{m,f(0-17)}$ is the estimated number or reported number of maternal or paternal orphans less than 18 years of age, and $P_{(0-17)}$ is the estimated number or reported population less than 18 years of age.

The measure controls for differences in population size over time between and within population groups. From the prevalence estimates, percentage under- or over-reporting of mother or father dead was estimated as:

$$U_{m,f(0-17)} = \left[\frac{r_{m,f(0-17)} - \delta_{m,f(0-17)}}{\delta_{m,f(0-17)}}\right]^{*} 100$$

Where $u_{m,f(0-17)}$ is the estimated percent under- or over-reporting of mother or father dead, $r_{m,f(0-17)}$ is the observed maternal or paternal orphanhood prevalence among persons less than 18 years of age and $\delta_{m,f(0-17)}$ is the estimated maternal or paternal orphanhood prevalence among persons less than 18 years of age. Thus $u_{m,f(0-17)}$ is an indication of the magnitude of bias in the reporting of orphanhood.

Although the argument in the literature regarding the adoption effect is generally with regard to persons under the age of 20, the above formula uses persons less than 18 years of age. This is due to evidence from survey and census data on South Africa suggesting that above the age of 14 years, the adoption effect may not be as marked as compared with persons younger than 14 years (Udjo 2005). Furthermore, the focus on persons less than 18 years of age is consistent with certain constitutional definitions in South Africa, for example, South Africa's Children's Act of 2005 (Act No. 38 2005) defines children as persons under the age of 18 years and is in line with section 28 (3) of South Africa's constitution (Govender & Masango 2007).

Results

Bias in reporting of mother, father dead

If there were perfect agreement between the model estimates, observed values of $u_{m,f(0-17)}$ would tend toward zero, assuming the model estimates are reasonably robust. Negative

values of $u_{m,f(0\text{-}17)}$ suggest under-reporting while positive values indicate the opposite. Table 1 shows the estimated percentage under- or over-reporting of mother or father dead. The results suggest that maternal orphanhood tends to be under-reported and were substantial among coloureds, Indians and whites in 2007. The results suggest that among whites it was as much as 60% in 2007. It is not clear why the magnitude was so large among whites, but one might speculate that it may partly be a reflection of lack of access to white households by field-workers during fieldwork. White households in South Africa are known to be more difficult than other population groups to access by fieldworkers during censuses. Fieldworkers are therefore inclined to drop the questionnaires in the post boxes of such households, which may compromise the quality of completed questionnaires.

Two patterns emerge from the results in Table 1 regarding paternal orphanhood: probable exaggeration of orphanhood among Africans and coloureds, and under-reporting among Indians and whites. This may be due to economic benefits that accrue to AIDS orphans among Africans and coloureds, and possibly issues of stigma among Indians and whites (who may have their own support systems). Overall, the magnitude of the estimated bias in paternal orphanhood reporting is least among coloureds compared with the other population groups. For example, during the 2007 Community Survey, coloureds appear to have exaggerated paternal deaths by 13% while Africans on the other hand appeared to have exaggerated paternal deaths by 100%. These results are consistent with earlier findings in the analysis of orphanhood reports and estimation of adult mortality from the 1996 South African population census (Udjo 2005).

Table 1 Estimated under- or over-reporting of maternal, paternal orphanhood, 2001 and 2007 by population group

	Percent under- or over-reporting	
	2001	**2007**
African		
Maternal	8.1	-6.8
Paternal	101.6	100.9
Coloured		
Maternal	-15.6	-18.8
Paternal	4.4	12.9
Indian		
Maternal	-51.8	-35.7
Paternal	-20.9	-16.1
White		
Maternal	-28.2	-59.9
Paternal	-40.1	-41.6

It is also evident from Table 1 that the magnitude of under-reporting of orphanhood is not uniform from one survey to another. This may be a reflection of differences in the quality of the census/survey fieldwork. In view of these results, one may ask: what is the implication of under- or over-reporting for inferences on orphanhood in South Africa? As seen from the results, inferences drawn from reports on orphanhood that do not take into account biases in reporting would probably understate maternal orphanhood due to AIDS, as well as probably exaggerate paternal orphanhood due to AIDS in South Africa as a result of compositional effect. (Africans currently constitute close to 80% of South Africa's population).

Overall trends in orphanhood

The absolute number of orphans should increase with increasing numbers of adult deaths due to increasing population size. The effect of varying population sizes was controlled by computing orphanhood prevalence, which, as indicated above, is the number of orphans as a percentage of the size of the population at a given point in time. This enables a clearer examination of overall trends in orphanhood. It also enables international and sub-national comparisons with varying population sizes. The results are shown in Figures (1) and (2).

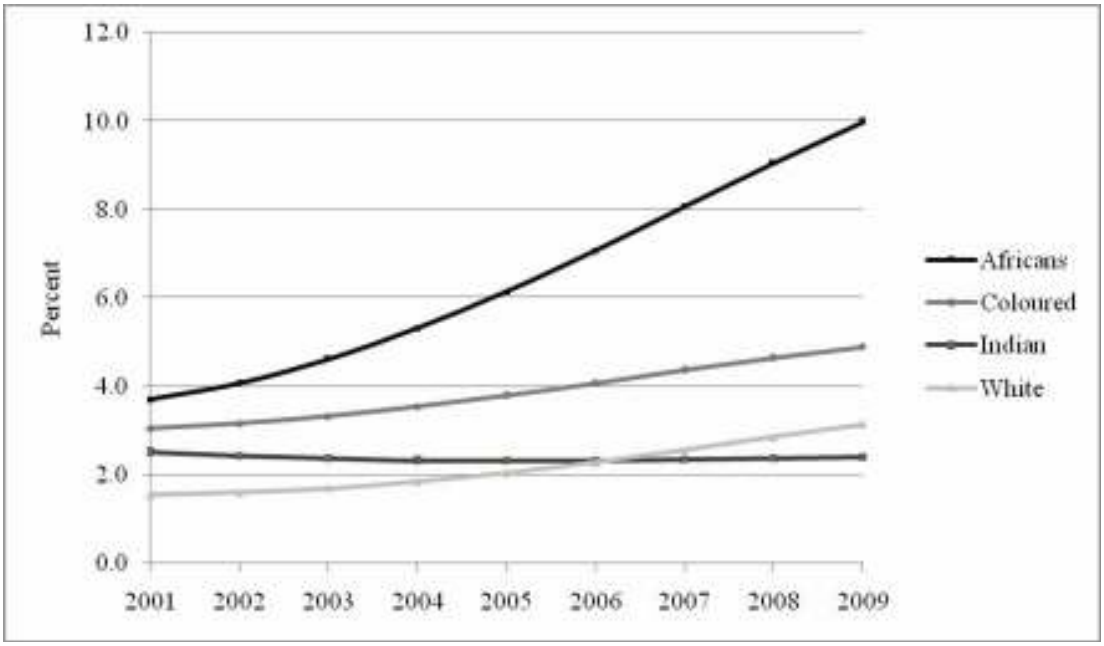

Figure 1 Prevalence of maternal orphanhood by population group, 2001-2009

As seen in the graphs, there has been an upward trend in orphanhood since 2002 among Africans and coloureds. For example, whereas the prevalence of maternal orphanhood in 2002 was estimated as less than 4% among Africans and coloureds in 2001, by June 2009 the prevalence had increased to an estimated 10% among Africans and 5% among coloureds.

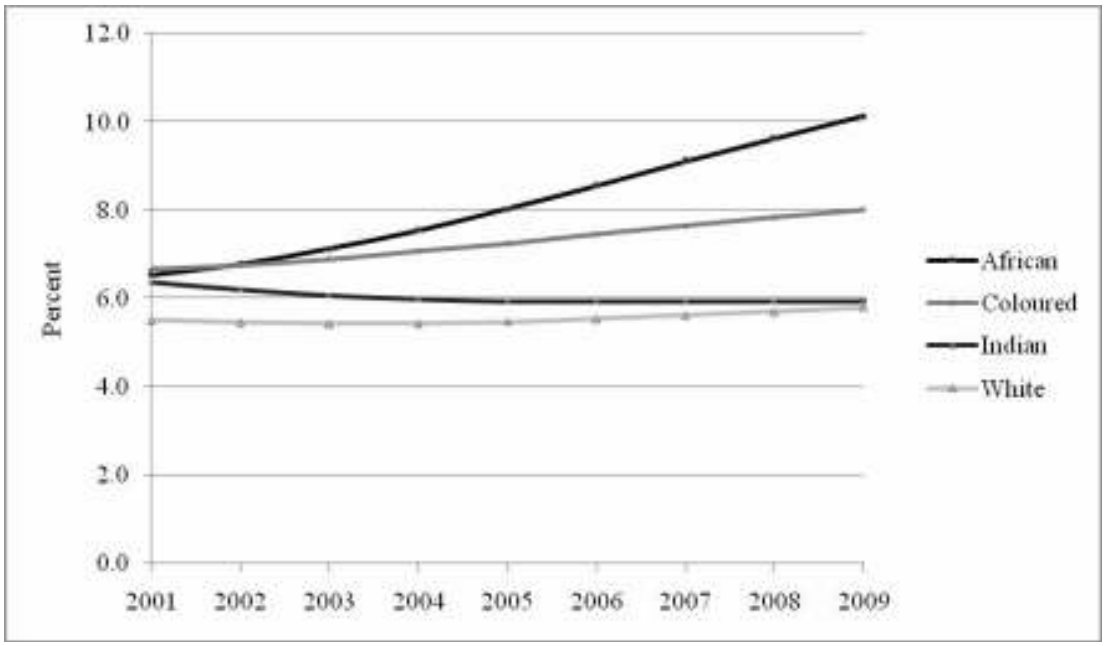

Figure 2 Prevalence of paternal orphanhood by population group, 2001-2009

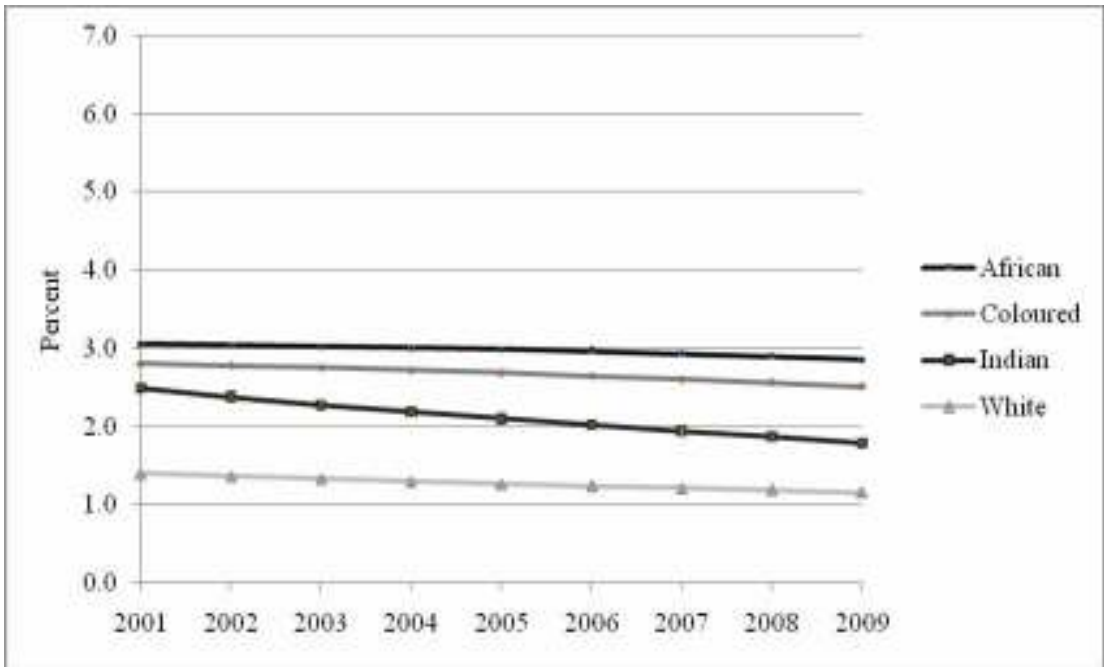

Figure 3 Non-AIDS maternal orphanhood prevalence by population group, 2001-2009

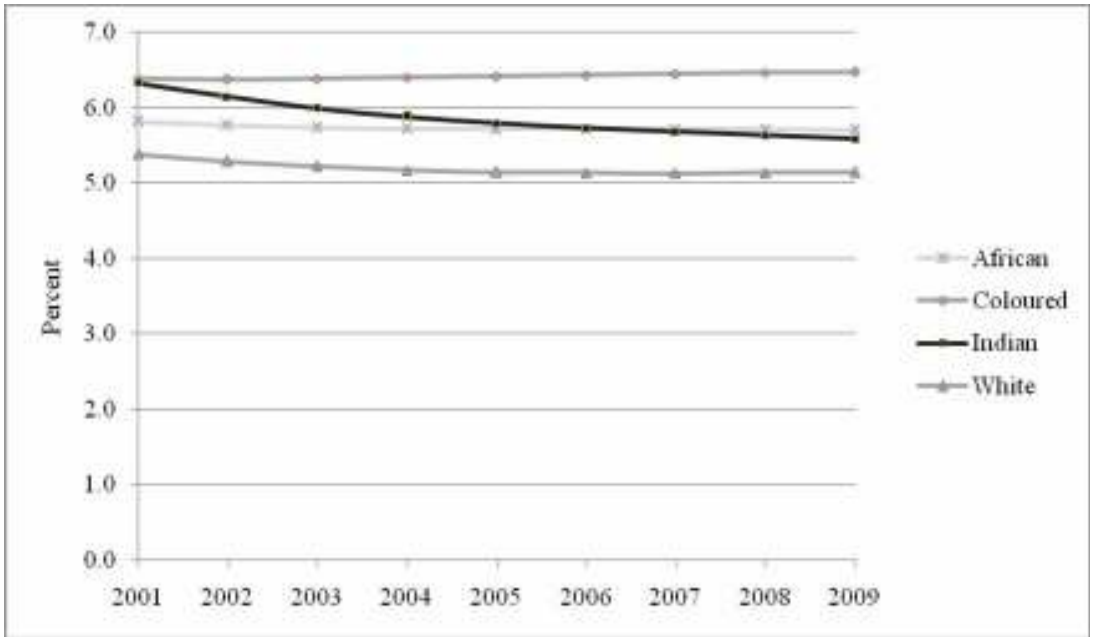

Figure 4 Non-AIDS paternal orphanhood prevalence by population group, 2001-2009

Trends in non-AIDS orphanhood

Figures (3) and (4) suggest that the rising trend in orphanhood among Africans and coloureds is not due to increase in non-AIDS adult mortality as the trends in non-AIDS orphanhood have remained more or less stable over time.

Trends in AIDS orphanhood

The rising trend in overall orphanhood is due to the trends in AIDS orphanhood. As seen in Figures (5) and (6) the prevalence of both maternal and paternal AIDS has been rising since 2002. Among Africans and coloureds the trend in AIDS orphanhood is almost similar to the trend in overall orphanhood depicted in Figures (1) and (2). The tempo of the increase in AIDS orphanhood among Africans is moderately high. For example, the prevalence in maternal orphanhood increased from an estimated 0.7% in 2001 to an estimated 6% in 2008. The tempo of the increase is lower among the other population groups and is a reflection of the lower intensity of the HIV/AIDS epidemic in these groups. For example, the latest national population-based HIV prevalence survey in South Africa suggests that HIV prevalence among persons aged 2 years and over in 2008 was 13.6% among Africans, 1.7% among coloureds and 0.3% among Indians and whites (Human Sciences Research Council 2008).

Figures (5) and (6) also suggest that for each of the population groups, the prevalence of maternal AIDS orphanhood is almost twice the prevlance of paternal AIDS orphanhood.

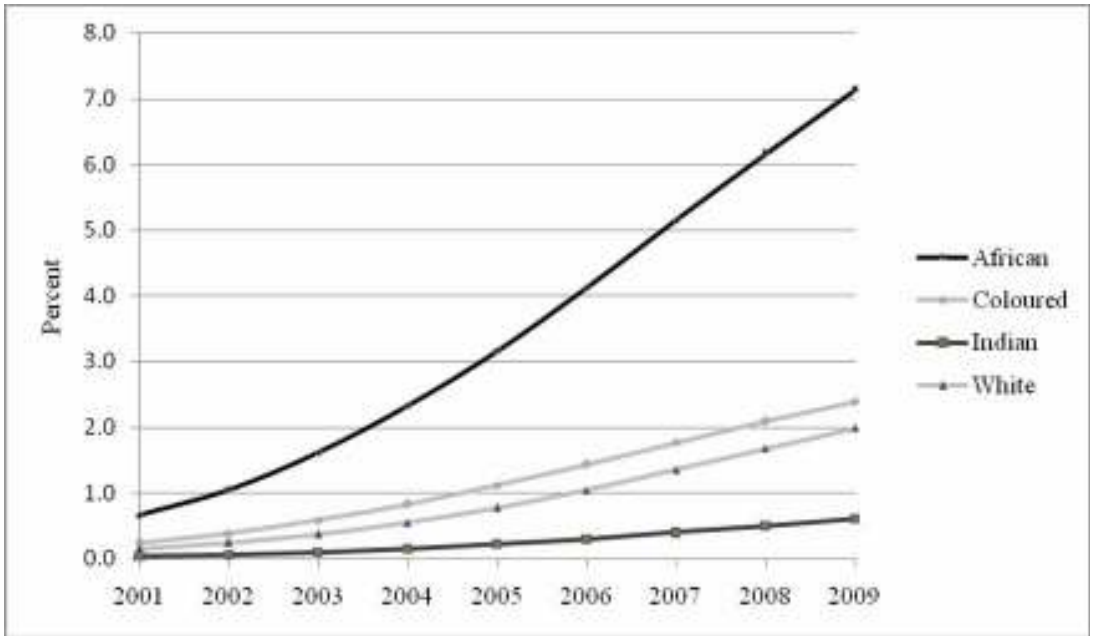

Figure 5 Prevalence of maternal AIDS orphanhood by population group, 2001-2009

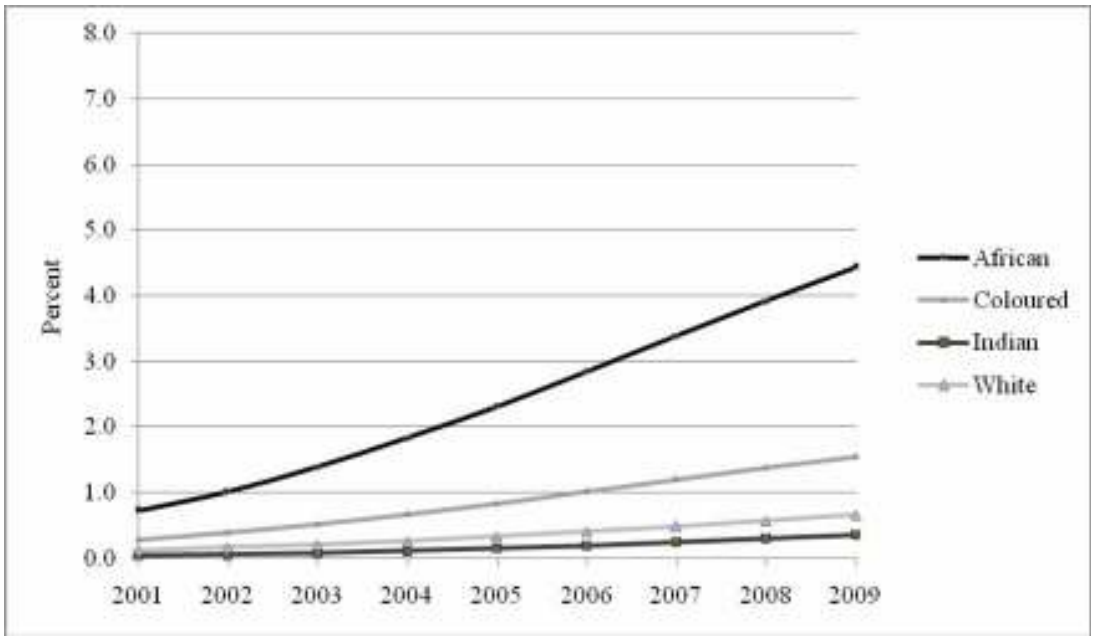

Figure 6 Prevalence of paternal AIDS orphanhood by population group, 2001-2009

Magnitude and trends in absolute size of orphanhood

The absolute size of orphanhood in population sub-groups is not only influenced by the force and specific causes of adult mortality, but also by the population size of the sub-group at a given point in time. Hence, comparisons of absolute size of orphanhood among sub-groups at different points in time may be inappropriate. Nevertheless, absolute numbers of demographic and epidemiological phenomena in sub-groups of a national population are often needed to inform program interventions. In view of this, Tables 2-5 present the estimated number of overall as well as AIDS orphanhood by population group at different points in time. The estimates assume that nearly half the number of adults needing anti-retroviral treatment will have access to such treatment by 2015. This assumption is based on extrapolation of observed trends in anti-retroviral roll-out in South Africa.

As seen in the tables, since Africans constitute the largest population group the largest number of orphans is among Africans. The results in Table 2 suggests that among Africans, the total number of orphans probably increased from about 1.4 million in 2001 to about 2.4 million in 2009. Furthermore, the results suggest that by 2015 there may be about 2.8 million orphans of whom 1.8 million may be AIDS orphans and of these, about 782,000 may be dual AIDS orphans.

Table 2 Estimated and projected number of orphans, African

ALL ORPHANS				
Year	**Maternal orphans**	**Paternal Orphans**	**Dual Orphans**	**Total Orphans**
2001	529,358	934,285	109,965	1,353,678
2005	899,423	1,176,963	258,530	1,817,856
2009	1,466,081	1,489,317	541,204	2,414,194
2010	1,588,970	1,558,703	619,651	2,528,022
2015	1,862,623	1,751,970	847,428	2,767,165
AIDS ORPHANS				
Year	**Maternal orphans**	**Paternal Orphans**	**Dual Orphans**	**Total Orphans**
2001	93,787	102,797	24,859	180,315
2005	462,639	339,604	174,193	664,608
2009	1,046,816	651,338	458,561	1,317,885
2010	1,177,866	723,923	538,204	1,450,945
2015	1,513,834	971,879	781,992	1,809,523

Among coloureds the results suggest that by 2015 there may be a total of 194,000 orphans of whom about 72,000 may be AIDS orphans and of these about 20,000 may be dual AIDS orphans (Table 3). Of the projected

27,000 orphans among Indians by 2015, an estimated 5,000 may be AIDS orphans of whom 750 may be dual AIDS orphans (Table 4). Among whites, of the projected 95,000 orphans by 2015, an estimated 36,000 may be AIDS orphans of whom about 7,000 may be dual AIDS orphans (Table 5).

Table 3 Estimated and projected number of orphans, Coloured

ALL ORPHANS				
Year	**Maternal orphans**	**Paternal Orphans**	**Dual Orphans**	**Total Orphans**
2001	47,530	103,770	9,774	141,526
2005	59,804	114,200	14,970	159,034
2009	77,341	126,505	21,639	182,207
2010	80,724	129,009	23,243	186,490
2015	85,821	134,681	26,915	193,588
AIDS ORPHANS				
Year	**Maternal orphans**	**Paternal Orphans**	**Dual Orphans**	**Total Orphans**
2001	3,831	4,290	947	7,538
2005	17,566	13,133	6,392	25,786
2009	37,729	24,332	13,367	51,747
2010	41,979	26,900	15,073	57,189
2015	52,186	35,996	19,837	72,405

Table 4 Estimated and projected number of orphans, Indian

ALL ORPHANS				
Year	**Maternal orphans**	**Paternal Orphans**	**Dual Orphans**	**Total Orphans**
2001	9,801	24,712	2,090	32,423
2005	9,028	23,165	1,786	30,407
2009	9,074	22,496	1,807	29,762
2010	9,071	22,311	1,814	29,568
2015	8,201	20,532	1,581	27,152
AIDS ORPHANS				
Year	**Maternal orphans**	**Paternal Orphans**	**Dual Orphans**	**Total Orphans**
2001	142	140	31	263
2005	853	569	259	1,224
2009	2,298	1,346	1,807	3,232
2010	2,641	1,525	632	3,707
2015	3,441	1,994	750	4,885

Table 5 Estimated and projected number of orphans, White

ALL ORPHANS				
Year	**Maternal orphans**	**Paternal Orphans**	**Dual Orphans**	**Total Orphans**
2001	20,735	73,599	3,757	90,576
2005	25,838	69,276	4,987	90,127
2009	36,876	68,023	7,330	97,569
2010	39,024	67,606	7,891	98,739
2015	40,786	63,018	9,104	94,700
AIDS ORPHANS				
Year	**Maternal orphans**	**Paternal Orphans**	**Dual Orphans**	**Total Orphans**
2001	2,046	1,653	349	3,483
2005	9,834	4,123	2,239	12,275
2009	23,323	7,699	5,023	27,288
2010	26,071	8,466	5,680	30,297
2015	30,858	10,880	7,369	36,078

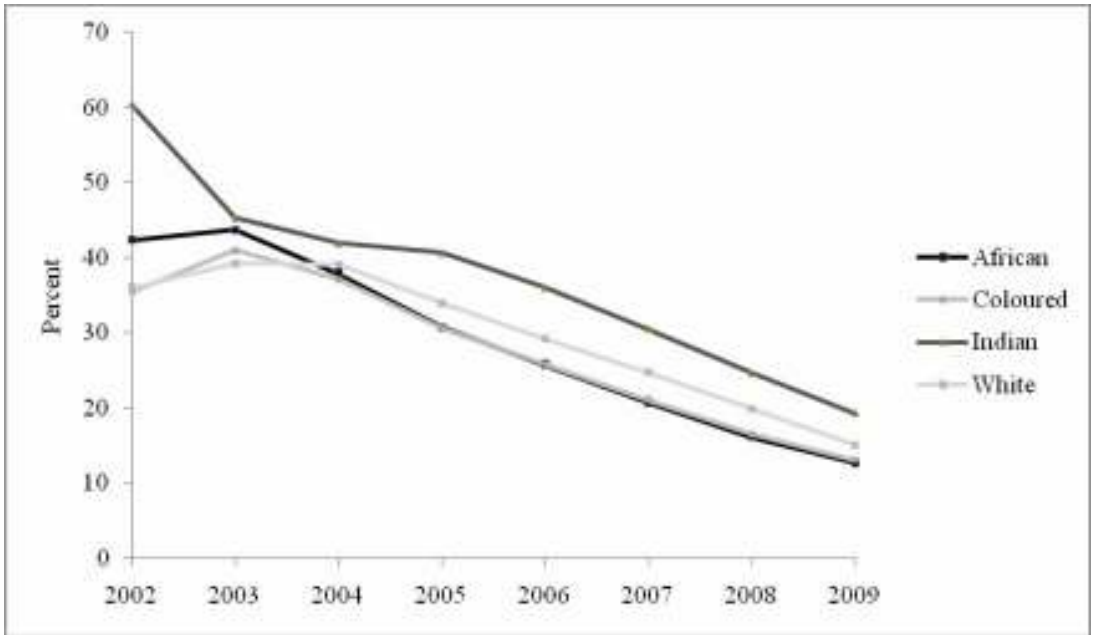

Figure 7 Percent annual growth rate in total AIDS orphans by population group, 2001-2009

Annual increase in orphanhood

The percentage annual increases in the number of AIDS orphans are shown in Figure (7). The results depicted in the graph suggest that Indians and whites have a higher annual percentage increase in the number of AIDS orphans compared to Africans and coloureds, although Indians and whites have smaller absolute numbers of AIDS orphans. However, there is a downward trend in the percentage annual increases in the number of AIDS orphans despite the increases in the absolute numbers of AIDS orphans. The downward trend in the percentage increases is largely a reflection of declining trends in fertility in the population groups.

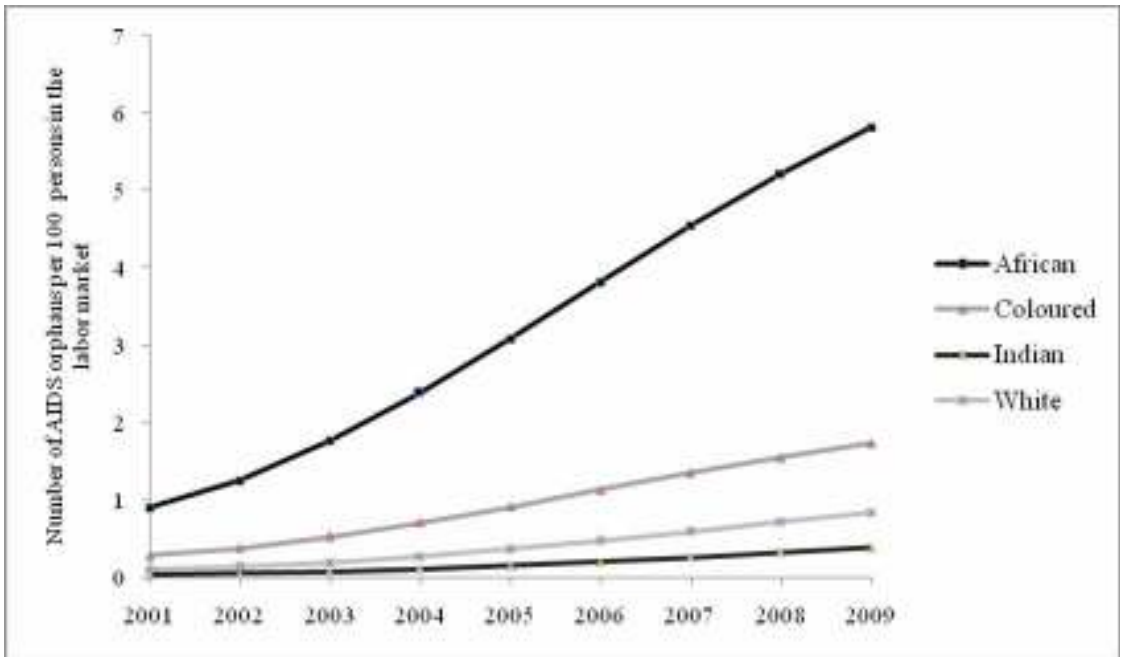

Figure 8 AIDS orphanhood dependency burden by population group, 2001-2009

Dependency burden due to orphanhood

Orphanhood dependency may be used as a measure of the burden of orphans on the working population. In this study, AIDS orphanhood dependency burden was defined as the number of AIDS orphans per 100 persons in the working age group. It was computed as the ratio of the total number of AIDS orphans less than 18 years of age in a population group, to the number of persons aged 15-64 years in the population group multiplied by 100. It is a proxy indicator of the economic burden on the population of orphaned children due to AIDS related mortality of either one of the biological parents. The results depicted in Figure 8 suggest that the economic burden of AIDS orphanhood is highest among Africans and lowest among Indians. For exam-

ple, as of mid-2009, whereas among Africans there were probably an estimated 9 African AIDS orphans for every 100 Africans in the working age group, it was probably 0.4 Indian orphans for every 100 Indians in the working age group. Figure (8) also suggests that the magnitude of AIDS orphanhood dependency has increased over time and the tempo of the increase is highest among Africans compared with the other population groups.

Discussion and conclusion

The reported number of orphans among persons less than 18 years of age from questions on orphanhood in censuses and surveys are prone to under- or over-reporting. The results of this study suggest that the magnitude of the under- or over-reporting is large and not stable over time. In South Africa, while the adoption effect tends to bias the reported numbers of maternal orphans downwards, the reported numbers of paternal orphans tend to be biased upwards due to the absence of fathers. (Some fathers who were alive were reported as dead as they had not been around and taken responsibility for looking after their children after their birth).

In view of these biases, estimation of the number of orphans among younger persons and especially in the context of HIV/AIDS needs to use other approaches. Using the approach developed by Grassly and Timaeus (2005), this study shows that the prevalence of orphanhood is increasing with varying intensity among the population groups in South Africa. The differences in the tempo of the increase are due to the varying intensity and maturity of the HIV/AIDS epidemic among the population groups. Because Africans constitute the largest population group and because the intensity of the epidemic is more marked among Africans, the number of AIDS orphans is highest among Africans compared with the other population groups.

The study estimates that as of mid-2009 there were probably about 1.3 million AIDS orphans among Africans and may increase to about 1.8 million by 2015 if current trends continue. For the country as a whole, the study estimates that there were probably about of 1.4 million AIDS orphans as of mid-2009 and may increase to about 1.9 million by 2015 if current trends continue.

The results also appear to suggest that the magnitude of AIDS orphanhood, though disconcerting, may not be as large as previously estimated by some studies. For example, the United Nations' (2008) estimate puts the figure of AIDS orphans in South Africa as 1.2 million in 2005) compared with this study's estimate of 698,000 for the same period. Rehle and Shisana (2003) projected there would be more than 2.5 million AIDS orphans around 2015 compared with this study's estimate of 1.9 million for the same period. Metropolitan Holding (2006), on the basis of the Actuarial Society of South Africa's (ASSA) 2002 model, projected that the number of maternal AIDS orphans alone, would be between 2.2 million and 2.4 million by 2015 compared with this study's estimate of 1.6 million for the same period. In view of the efforts of South Africa's Government to make anti-retroviral therapy available to those who need it, we must

assume that anti-retroviral therapy will be made available for more people over the next many years, thereby decreasing the estimates of AIDS orphans.

Sources of differences in the various estimates include the base population figures, HIV prevalence figures and the mortality levels as well as the model life tables used in the estimates. In the light of recent evidence, it would appear that the mortality assumptions (attributable to AIDS) were too high in some of the estimates. For example, life expectancy at birth in South Africa in the Rehle and Shisana (2003) study was estimated as 45.2 years in 2005. A number of studies have revised their previous estimates of life expectancy at birth in South Africa slightly upward, (see Vass 2003; Metropolitan Holdings). Contrary to previous estimates, a recent study (Udjo 2008) suggests a life expectancy at birth of 56.4 years in South Africa in 2006. However, in view of the diversity of the estimates of the magnitude of AIDS orphans, further studies are required to better inform policy.

Although exact numbers may be contestable, the increasing but varying magnitude of AIDS orphans among the population groups in South Africa noted in this study has implications for different sectors of the population. For example, in the social welfare sector increasing numbers of AIDS orphans increases the burden of children on the social grant system. An annual increase of AIDS orphans in 2008-2009 was estimated in this study as 13% among Africans and coloureds, 15% among Indians and 19% among whites. This has budgetary implications for the provision of welfare grants to AIDS orphans. It is doubtful whether national annual budgetary allocation to the department responsible for social grants (Department of Social Development) can keep pace with the increase. Estimates derived from figures from the National Treasury (2008) indicate that the annual increase in total budgetary allocation from the National Treasury to the Department of Social Development in South Africa has been declining when inflation is taken into account (see Table 6).

Table 6 Budget vote/estimate from the National Treasury to the Department of Social Development

Fiscal year	Budget vote/ estimate (Million Rands)	Budget vote/estimate at 2004 constant prices (Million Rands)	Percent annual increase in budget vote/ estimate at 2004 prices
2004/05	47,766.3	47,766.3	
2005/06	55,067.8	53,278.1	11.5
2006/07	61,676.1	58,942.6	10.6
2007/08	67,232.1	62,735.5	6.4
2008/09	76,008.0	68,186.8	8.7

Source: [**35**]

Sufficient resources may therefore not be available to the Department of Social Development to maintain present standards in meeting the basic needs of orphans. Thus, in the medium- to long-term, the welfare of AIDS orphans is

likely to be compromised as the burden of AIDS orphans increases especially among Africans.

In the education sector, the increasing trend in orphanhood may exacerbate the magnitude of drop-outs from the primary and secondary education system as orphans may not be able to afford the cost of education. They may be compelled to do odd jobs in order to take care of their younger siblings. This may, in turn, exacerbate the vulnerability of orphans vulnerable to exploitation, abuse, crime and consequently compromising their welfare.

At a micro level in the media sector, the size of the media market at any point in time is partly determined by the number of survivors in the adult population. Trends in orphanhood due to AIDS impact directly on the size of the market for certain types of products. Increasing trends in AIDS orphanhood implies increasing adult mortality due to AIDS and, consequently, shrinkage of the market size for certain types of products. In the context of the present study, the marked trend in AIDS orphanhood implies that the size of the African market for certain kinds of media products will increasingly be down-sized.

It is clear from the results of this study that the magnitude of AIDS orphanhood is not uniform across the population groups in South Africa. Interventions designed to mitigate the socio-economic consequences of AIDS orphanhood therefore need to take into consideration the varying intensity of AIDS orphanhood among the population groups to enable a targeted response.

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