



Gender differentials in the impact of parental death: Adolescent's sexual behaviour and risk of HIV infection in rural South Africa

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Using data from a longitudinal surveillance study from rural South Africa, we investigated the odds of sexual debut, pregnancy and HIV infection of 15- to 19-year-old adolescents by parental survival. Using descriptive statistics and logistic regressions, we examine the relative risk of orphans compared with non-orphans to have ever had sex, being pregnant and being HIV infected, adjusting for age, sex, socio-economic status, education, being employed and residency. Of 8274 adolescents, 42% were orphaned (one or both parents died). Over 80% of adolescents remained in school, but orphans were significantly more likely to lag behind in grade for age. Female adolescent maternal (aOR 1.32, 95% CI 1.07–1.62), paternal (aOR 1.26, 95% CI 1.06–1.49) and dual (aOR 1.37, 95% CI 1.05–1.78) orphans were significantly more likely than non-orphaned females to have ever had sex; among males it was only paternal (aOR 1.27, 95% CI 1.05–1.53) orphans. Maternal (aOR 1.49, 95% CI 1.03–2.15) and dual (aOR 1.74, 95% CI 1.11–2.73) female orphans relative to non-orphaned females were significantly more likely to be HIV infected; male paternal (aOR 3.41, 95% CI 1.37–8.46) and dual (aOR 3.54, 95% CI 1.06–11.86) orphans had over three-fold the odds of being infected. There was strong evidence that death of mother for girls was associated with increased vulnerability to earlier sexual debut and HIV infection, while fathers appeared to play a significant role in both their son's and daughter's lives.

Keywords: adolescent; vulnerability; orphanhood; maternal; paternal; sexual behaviour; HIV/AIDS

Background

The number of children orphaned because of HIV infection among the adult population has increased substantially over the past decade (Connolly and Monasch, 2003; Leyenaar, 2005). An estimated 48 million children (12 million due to AIDS) aged 0–17 years in 2007 in sub-Saharan Africa had lost one or both parents; in South Africa alone 2.5 million (1.4 million AIDS-related) were orphaned (UNICEF, 2008). In a largely rural KwaZulu-Natal area, with an overall adult HIV prevalence of 22%, between 2000 and 2005 maternal, paternal and dual orphanhood under 18 years increased from 3% to 6%, 6% to 9%, and 1% to 4%, respectively (Hill, Hosegood, & Newell, 2008).

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A number of studies have looked at different aspects of orphaning including school enrolment and attainment (Birdthistle et al., 2009; Case & Ardington, 2006; Oleke, Blystad, Fylkesnes, & Tumwine, 2007), psychosocial impacts (Cluver, Gardner & Operario, 2009), risk for early marriage, sexual debut and teen pregnancy (Palermo & Peterman, 2009; Thurman, Brown, Richter, Maharaj, & Magnani, 2006), nutritional status (Watts et al., 2007) and HIV risk (Birdthistle et al., 2008; Gregson et al., 2005; Operario, Pettifor, Cluver, MacPhail, & Rees, 2007), but few have attempted to investigate whether there is a gender differential in the impact of parental death on the sexual behaviour and HIV risk of adolescent children. In addition, few studies have attempted to systematically study adolescent orphans over 15 years (Skinner et al., 2006).

This study contributes to the orphanhood discourse by exploring the effect of sex-specific parental death on the sexual behaviour and risk of HIV infection of young men and women aged 15–19 years.

Methods

Data setting

Data are from a longitudinal demographic and health surveillance system covering about 90,000 individuals in Hlabisa sub-district of northern KwaZulu-Natal, South Africa. This is a largely rural surveillance site (www.africacentre.com), although with little subsistence farming and very high unemployment. Most people depend on wage income and/or government social grants like old-age pension and child support for daily living.

Since 2000 in bi-annual rounds of demographic surveillance, data on fertility, mortality, migrations and socio-economic characteristics are collected from a key respondent on all registered household members, including the parental survival status for each child. A household is defined as a social unit of individuals who consider themselves as such through one household head. Furthermore since 2003, sexual behaviour and HIV data are collected from adults 15 years and over in one-to-one interviews in an annual individual surveillance. Informed verbal consent is obtained from the household head or proxy respondent for the demographic surveillance, and written consent for the individual surveillance from the individual participant. Ethical approval was granted by the University of KwaZulu-Natal Research Ethics Committee.

These analyses use data from the demographic and individual surveillance of individuals 15–19 years in 2006. Excluded were non-resident household members, those who out migrated or were lost to follow-up. We use 15 years as lower age cut-off because this is the minimum age for eligibility for the Africa Centre's sexual behaviour and HIV surveillance, whereas the upper limit of 19 years was based on this being the age by which most adolescents should have completed secondary schooling. For details about the Africa Centre surveillance systems see Tanser et al. (2008); Hosegood, Benzler, and Solarsh (2006).

Definitions

In this analysis an adolescent is defined as an individual aged 15–19 years; an orphan as an individual with one or both parents deceased; a maternal orphan as one whose mother is deceased and a paternal orphan as one whose father is deceased. The maternal and paternal orphan categories excluded dual orphans (individuals with both parents deceased). Vulnerability is defined as being at higher risk of earlier sexual debut and HIV infection.

Household socio-economic status was determined using a wealth index (Rutstein & Johnson, 2004), constructed using a set of assets a household owns, with ownership of each asset represented by a binary indicator. The wealth index of each household was derived in STATA (StataCorp, 2008) by principal component analysis (Colley & Lohnes, 1971). Each household was assigned a wealth score, the distribution of these scores has mean zero and a standard deviation of one, which were then divided into quintiles. The first (lowest) quintile represents households with the least number of assets (poorest), whereas the fifth (highest) quintile represents households with the most number of assets (very comfortable). The wealth quintiles were calculated using all households under surveillance in 2006 before selecting households with adolescent members for the analyses. We assume for these analyses that wealth quintiles are a proxy for socio-economic status.

The variable 'economic activity' categorised adolescents into employed, unemployed and attending school. Adolescents who were in employment were considered as economically active, whereas those unemployed were classified as economically inactive, and were compared to adolescents attending school. In South Africa a child is expected to start school (grade one) at six years, by age 15 years to have attained grade nine and by age 18 years should have completed high school (obtained a matric). Thus in the schooling status variable, adolescents aged 15 years still in school who had completed at least grade nine were considered to be in the right grade. Similarly, 18-year olds with a matric or currently in grade 12 were considered to be in the right grade if attending school. Those in school but in a grade below the expected grade for their age were classified as below grade. In the variable education attainment, grades one to seven are classified as primary, grades 8–12 as secondary, whereas tertiary comprised attainment of certificates, diplomas and university degrees.

The questions we sought to answer in this study were:

- (1) What are the socio-demographic characteristics of adolescents by orphanhood status?
- (2) Are there gender differentials in the potential impact of parental deaths on the sexual behaviour and HIV risks of adolescents in rural South Africa?

Statistical methods

Given that the risk factors for sexual behaviour and HIV infection were expected to be different for males and females (McGrath, Nyirenda, Hosegood, & Newell, 2009; Pettifor et al., 2005), separate models by sex were run. We take a three-step approach in the analysis. First, using logistic regressions we examine the univariate associations of orphanhood with age, wealth quintiles, self-perceived financial status, education attainment, schooling status, economic activity and place of residency. Second, multiple logistic regressions were used to examine the multivariable associations with orphanhood of these socio-demographic and economic variables irrespective of whether they were statistically significant univariately. Multiple logistic regressions were applied to examine the associations between orphanhood and risky sexual behaviours defined as ever having had sex, ever been pregnant, and being HIV infected adjusting for age, wealth quintiles, education, economic activity and residency. Analyses of ever having had sex and being HIV infected were restricted to adolescents who had ever had sex. Analyses of differences between orphans and non-orphans were of adolescents reporting age difference with the most recent partner. The variables age at first sex and age difference with the most recent partner were used in the logistic regression models as continuous variables. For the multivariable analyses, economic activity was represented within the schooling status variable. Education attainment was dropped from the analyses for females because of collinearity with the

schooling status variable. Schooling status variable was retained in the model because it had more information than the educational attainment variable. We adjust for the above socio-demographic variables in the models because they are frequently mentioned in the discourse on factors influencing vulnerability to sexual behaviour and HIV risk among orphans (Baarøy & Webb, 2008; Birdthistle et al., 2009; Hargreaves et al., 2008).

Both male and female orphans were significantly more likely than non-orphans to have do not know, refused or missing data for education attainment, economic activity (univariable analysis) and schooling status (both univariable and multivariable analyses). Multiple imputations were used to fill in some of these missing data.

Results

In 2006, there were 8560 adolescents aged 15–19 years. Survival status for one or both parents was unknown for 3% ($n = 286$) and these were excluded, leaving 8274 (50.1% male). Overall 41.8% ($n = 3,458$) of adolescents were orphaned, 49% ($n = 1,698$) were female. Among orphans, 25% ($n = 875$) were dual orphans, 20% ($n = 689$) maternal orphans and 55% ($n = 1,894$) paternal orphans. The average household size was seven and eight ($SD = 5$) for non-orphans and orphans, respectively.

Socio-demographic and economic characteristics, females

Table 1 presents selected socio-economic characteristics for 4125 female adolescents and the percentage orphaned in brackets; 41% of all female adolescents were orphaned and 87% of females were known to be attending school (88% among non-orphans and 85% among orphans). Among females, those lagging behind (below expected grade-for-age), and not in school but employed relative to those in correct grade-for-age were significantly more likely to be orphaned, adjusting for age, socio-economic status and rural–urban residency (Table 1). Relative to completing secondary level of education, orphans were more likely than non-orphans to have completed only primary level of education. This is consistent with our other findings that orphans were more likely to be lagging behind in grade for age even among those still in school. Households that contain orphaned adolescents were more likely to consider themselves to have a poor financial status relative to medium status, although wealth quintiles did not indicate statistically significant differences between households with orphans and those without. There were no statistically significant differences between female orphans and non-orphans by age, economic activity and rural–urban residency.

Socio-demographic and economic characteristics, males

Table 2 presents selected socio-economic characteristics for 4149 males with the percent orphaned in each category in brackets; overall 42% were orphaned. Households with orphans were more likely to consider themselves as poor than those without, although from the computed wealth quintiles there were no statistically significant differences between them. About 92% of male adolescents were in school, with very little differences among orphans and non-orphans. However, male adolescents lagging behind in education level were significantly more likely to be orphaned. Relative to being in the right grade-for-age male orphans were significantly more likely than non-orphans to be out of school and unemployed. Males who had completed primary level of education or less were statistically significant more likely to be orphaned than those who had reached secondary level

Table 1. Socio-demographic characteristics by orphan status, females.

	n (% orphaned)	Univariable			Multivariable		
		OR	[95% CI]		aOR	[95% CI]	
Age 2006							
15	838(40.6)	0.96	0.79	1.18	1.02	0.80	1.30
16	886(41.5)	1.00	0.82	1.22	1.13	0.90	1.42
17	867(38.9)	0.87	0.71	1.07	0.95	0.76	1.19
18	817(43.3)	1.07	0.88	1.31	1.11	0.88	1.38
19	717(41.7)	1.00					
Wealth quintiles							
First quintile	670(40.6)	1.00					
Second quintile	748(40.6)	0.93	0.75	1.14	1.04	0.84	1.29
Third quintile	748(42.0)	0.92	0.75	1.13	1.17	0.95	1.46
Fourth quintile	783(42.8)	0.99	0.81	1.21	1.19	0.95	1.48
Fifth quintile	646(36.8)	0.72	0.58	0.90	0.93	0.72	1.20
Self-perceived financial status							
Poor	1332(43.5)	1.00					
Medium	1916(39.5)	0.82	0.72	0.95	0.82	0.71	0.96
Comfortable	320(37.5)	0.76	0.59	0.97	0.83	0.63	1.11
Don't know/Refused/Missing	27(29.6)	0.54	0.23	1.24	0.55	0.24	1.28
Education attainment							
Secondary	2607(38.4)	1.00					
LOY/NWS	21(57.1)	1.77	0.72	4.39			
Primary	642(44.4)	1.33	1.11	1.59			
Tertiary	22(40.9)	1.10	0.47	2.58			
Don't know/Refused/Missing	833(46.9)	1.42	1.21	1.66			
Economic activity							
In school	2888(39.2)	1.00					
Not in school, but employed	20(50.0)	1.56	0.64	3.81			
Not in school & unemployed	431(43.6)	1.18	0.95	1.46			
DKN/RFS/MIS	786(46.7)	1.34	1.14	1.57			
Schooling status							
Right grade	1781(37.3)	1.00					
LOY/NWS	8(50.0)	1.67	0.42	6.70	1.79	0.44	7.27
Below grade	1062(42.0)	1.27	1.08	1.50	1.20	1.02	1.43
Unemployed (not in school)	20(50.0)	1.65	0.68	4.03	1.69	0.69	4.14
Employed (not in school)	431(43.6)	1.27	1.02	1.58	1.27	1.02	1.59
DKN/RFS/MIS	823(46.9)	1.49	1.26	1.76	1.78	1.39	2.29
Place of residency							
Urban	260(40.8)	1.00					
Rural	3865(41.2)	0.97	0.74	1.28	1.23	0.82	1.86

Note: The referent group are adolescents who have lost one or both parents (orphaned) compared to those with both parents alive (non-orphaned). LOY/NWS = Less than one year/Never went to school; DKN/RFS/MIS = Don't know/refused/missing.

of education. Residing in rural or urban area was not significantly associated with orphanhood among males.

Associations of mother's death with daughter's sexual debuting and HIV risk

Table 3 presents associations between orphanhood and sexual experience among females, adjusted for age, economic status, education attainment and residency. Around 47% (1959/4215) of the female adolescents had participated in the sexual behaviour surveillance,

Table 2. Socio-demographic characteristics by orphan status, Males.

	n (% orphaned)	Univariable			Multivariable		
		OR	[95% CI]		aOR	[95% CI]	
Age 2006							
15	848 (39.9)	0.97	0.79	1.18	0.90	0.71	1.14
16	922 (43.8)	1.11	0.91	1.35	1.04	0.83	1.30
17	860 (42.8)	1.08	0.89	1.32	1.13	0.91	1.41
18	780 (43.8)	1.11	0.90	1.36	1.11	0.89	1.38
19	739 (41.7)	1.00					
Wealth quintiles							
First quintile	598 (44.3)	1.00					
Second quintile	793 (43.1)	1.02	0.82	1.26	1.08	0.87	1.34
Third quintile	778 (42.8)	1.05	0.85	1.30	1.14	0.91	1.42
Fourth quintile	812 (41.5)	0.92	0.74	1.13	1.00	0.80	1.25
Fifth quintile	647 (39.4)	0.86	0.69	1.07	1.02	0.79	1.32
Self-perceived financial status							
Poor	1321 (46.1)	1.00					
Medium	1986 (39.8)	0.76	0.66	0.88	0.77	0.66	0.90
Comfortable	289 (41.5)	0.83	0.64	1.07	0.89	0.67	1.19
Don't know/Refused/Missing	32 (37.5)	0.64	0.30	1.34	0.61	0.29	1.29
Education attainment							
Secondary	2272 (39.3)	1.00					
LOY/NWS	34 (52.9)	1.84	0.94	3.60	2.22	0.49	10.04
Primary	1075 (44.5)	1.33	1.14	1.55	1.27	1.09	1.49
Tertiary	16 (25.0)	0.52	0.17	1.62	3.97	1.37	11.44
Don't know/Refused/Missing	752 (48.9)	1.54	1.30	1.82	1.08	0.83	1.41
Economic activity							
In school	3140 (41.0)	1.00					
Not in school, but employed	16 (68.7)	3.67	1.28	10.54			
Not in school & unemployed	276 (40.6)	1.00	0.78	1.29			
Don't know/Refused/Missing	717 (48.5)	1.38	1.17	1.62			
Schooling status							
Right grade	1538 (38.5)	1.00					
LOY/NWS	7 (57.1)	2.10	0.47	9.45	2.22	0.49	10.04
Below grade	1573 (43.4)	1.29	1.11	1.51	1.27	1.09	1.49
Unemployed (not in school)	16 (68.7)	3.97	1.38	11.41	3.97	1.37	11.44
Employed (not in school)	276 (40.6)	1.11	0.86	1.45	1.08	0.83	1.41
Don't know/Refused/Missing	739 (48.6)	1.58	1.32	1.89	2.53	1.90	3.38
Place of residency							
Urban	214 (37.4)	1.00					
Rural	3935 (42.7)	1.26	0.95	1.68	1.25	0.82	1.92

Note: The referent group are adolescents who have lost one or both parents (orphaned) compared to those with both parents alive (non-orphaned).LOY/NWS = Less than one year/Never went to school; DKN/RFS/MIS = Don't know/refused/missing.

of whom 51% ($n = 995$) reported ever having had sex. Of the female adolescents who had ever had sex 33% ($n = 327$) had ever been pregnant. There were, however, no statistically significant differences in ever having been pregnant by orphanhood status (Table 3). The median age at first sex among those who reported ever having had sex was 17 years. Maternal, paternal and dual female orphans were all significantly more likely to have ever had sex than female non-orphans.

Median age at death of the mother was 13 years, and median age at death of the father was 12 years. Age at maternal orphaning was strongly associated with early age at sexual

Table 3. Multivariate analysis of sexual behaviour patterns and risks by orphan type, Females.

	Maternal			Paternal			Dual		
	N (% orphan)	aOR (95% CI)	N (% orphan)	aOR (95% CI)	N (% orphan)	aOR (95% CI)	N (% orphan)	aOR (95% CI)	
Ever had sex	455 (28)	1.32 (1.07–1.62)	560 (41)	1.26 (1.06–1.49)	403 (18)	1.37 (1.05–1.78)			
Regular partner	598 (28)	1.23 (0.98–1.53)	735 (42)	1.29 (1.07–1.54)	523 (18)	1.22 (0.92–1.61)			
Casual partner	27 (30)	1.36 (0.59–3.14)	32 (41)	1.21 (0.59–2.47)	23 (17)	1.21 (0.40–3.63)			
Ever Pregnant ^a	247 (29)	0.97 (0.67–1.38)	301 (42)	1.00 (0.74–1.35)	219 (20)	0.89 (0.57–1.39)			
HIV unknown	1048 (24)	0.99 (0.82–1.19)	1228 (35)	0.91 (0.78–1.06)	935 (14)	1.01 (0.79–1.28)			
HIV positive	158 (30)	1.49 (1.03–2.15)	190 (42)	1.22 (0.90–1.67)	139 (21)	1.74 (1.11–2.73)			
HIV negative	1638 (23)	0.67 (0.47–0.97)	1989 (36)	0.82 (0.60–1.11)	1461 (13)	0.57 (0.37–0.90)			

Note: Table presents multivariate analyses of each variable adjusted for age, economic status, educational attainment, and residency. Reference category is non-orphans (both parents alive) in all cases.

^aAmong those who have ever had sex.

debut. Females who lost their mother before age 15 years were significantly more likely to have had first sex before age 15 years (OR 5.13, 95% CI 1.01–6.06) than females who lost their mother later in adolescence (15–19 years). There was, however, no evidence that age at paternal orphaning was strongly associated with early sexual experience among female adolescents who lost their father before age 15 years (OR 0.22, 95% CI 0.05–1.09) relative to those who lost their father later during adolescence.

Among sexually active adolescents, female paternal orphans had a statistically significant higher likelihood of being currently in a regular partnership. Few reported their most recent partner as a casual partner, and there were no statistically significant differences between non-orphans and orphans with regard to having had a casual partner. 92% of females reporting the age difference with the most recent partner reported having had an older partner. Only about 0.8% of the females reported having a younger partner. There was no significant difference in partner age between female orphans and non-orphans in multivariable logistic regressions adjusting for age, household wealth quintiles, education attainment and place of residency (aOR 0.98, 95% CI 0.92–1.05). Female orphans reported an average age difference with the most recent partner of 2.9 years compared with 3.1 years among non-orphans.

The HIV status was known for 57% (2336/41259) of female adolescents, of whom 9% ($n = 205$) were HIV infected. There was further evidence of associations between a mother's death and a daughter's HIV risk, as female maternal orphans were 50% more likely to be HIV infected than non-orphaned females. Female adolescents who had lost both their mother and father had significantly increased likelihood of being HIV infected.

Associations of father's death with son's sexual debuting and HIV risk

Table 4 presents associations between orphanhood and sexual experience among males, adjusted for age, economic status, education attainment and residency. About 48% (1982/4149) of male adolescents had participated in the sexual behaviour surveillance, of whom 34% ($n = 683$) reported ever having had sex.

The median age at sexual debut was 16 years among those who had ever had sex; median age at death of mother was 13 years and of the father was 12 years. Age at paternal orphaning was strongly associated with early age at sexual debut among males. Relative to non-orphans, only male paternal orphans were statistically significantly more likely to have ever had sex (Table 4), adjusted for age, socio-economic status, education attainment and rural–urban residency.

The mean age at first sex of males who lost their father before adolescence was 16.1 years compared with 16.3 years of males whose father died during adolescence; mean age at first sex for males who became maternal orphan before age 15 was 16.1 years and males maternal orphaned after 15 was 16.2 years. Males paternal orphaned before age 15 years had higher odds to have ever had first sex by age 15 years (OR 1.15, 95% CI 0.57–2.30) compared with males paternal orphaned in their adolescence (15–19 years). Males maternal orphaned before age 15 than males maternal orphaned aged 15–19 were similarly more likely to sexual debut early (OR 1.37, 95% CI 0.82–2.31), though these odds ratios did not reach statistical significance.

Male paternal orphans were statistically significantly more likely to report having had a most recent casual partner than non-orphans. Among males reporting age difference with the most recent partner, 9% ($n = 47$) had an older partner, whereas 64% had a younger partner. On average age difference with most recent partner was 1.6 years for orphans and 1.7 years among non-orphans, though these differences were not statistically

Table 4. Multivariate analysis of sexual behaviour patterns and risks by orphan type, Males.

	Maternal			Paternal			Dual		
	<i>N</i> (% orphan)	aOR (95% CI)	<i>N</i> (% orphan)	aOR (95% CI)	<i>N</i> (% orphan)	aOR (95% CI)	<i>N</i> (% orphan)	aOR (95% CI)	
Ever had sex	396 (28)	1.16 (0.93–1.46)	495 (42)	1.27 (1.05–1.53)	346 (17)	1.21 (0.91–1.61)		1.21 (0.91–1.61)	
Regular partner	176 (26)	1.01 (0.71–1.45)	210 (38)	0.99 (0.74–1.33)	156 (16)	1.03 (0.65–1.62)		1.03 (0.65–1.62)	
Casual partner	12 (42)	2.15 (0.67–6.91)	21 (67)	3.35 (1.34–8.37)	11 (36)	3.17 (0.90–11.17)		3.17 (0.90–11.17)	
HIV unknown	1149 (24)	0.91 (0.76–1.09)	1331 (34)	0.87 (0.75–1.01)	1011 (13)	0.83 (0.65–1.04)		0.83 (0.65–1.04)	
HIV positive	13 (46)	2.39 (0.77–7.37)	22 (68)	3.41 (1.37–8.46)	12 (42)	3.54 (1.06–11.86)		3.54 (1.06–11.86)	
HIV negative	1739 (25)	0.42 (0.14–1.29)	2084 (38)	0.29 (0.12–0.73)	1542 (16)	0.28 (0.08–0.95)		0.28 (0.08–0.95)	

Note: Table presents multivariate analyses of each variable adjusted for age, economic status, educational attainment, and residency. Reference category is non-orphans (both parents alive) in all cases.

significant in multivariable logistic regressions adjusting for age, wealth quintiles, education attainment and place of residency (aOR 0.88, 95% CI 0.69–1.13).

The HIV status was known for 55% (2276/4149) of males, of whom under 1% ($n = 23$) were HIV infected. Male paternal and dual orphans had over three-fold increased likelihood of being HIV infected compared with non-orphaned males, adjusted for age, economic status, education attainment and residency (Table 4).

Discussion

In this largely rural area, with a high overall adult HIV prevalence, over 40% of adolescents aged 15–19 years were orphaned. We find no evidence of statistically significant differences in the socio-economic status of households with orphans compared with those without. In African societies caring for children of extended family members is commonplace (Urassa et al., 1997) and may start even before death of the child's parents particularly if they had chronic illnesses (Hosegood, McGrath, Herbst, & Timæus, 2004). In South Africa, access to widely available government foster care, care dependency and child support grants (Muhwava, 2008) appears to play an important role in mitigating against poverty in the households that foster orphaned children. These factors may explain our findings and challenge the widely advanced discourse that children whose parents have died are more likely to live in poorer households (Case & Ardington, 2006; Ford & Hosegood, 2005). In this predominantly rural community, orphans are not living in disproportionately poorer households, even though on average they belong to larger households.

In KwaZulu-Natal, orphans were more likely to have ever engaged in sex, and at an earlier age (Thurman et al., 2006). In our study, females who had lost their mother before age 15 years were significantly more likely to be sexually experienced by age 15 years (OR 5.13, 95% CI 1.01–6.06). These findings are in line with an earlier larger analysis from the same population that discussed in greater detail factors associated with age at sexual debut using a survival analysis among 12- to 25-year-old men and women (McGrath et al., 2009). The results are also in line with results from a cross-sectional study in urban Zimbabwe among 15- to 19-year-old female adolescents that found maternal and dual orphans more likely to be sexually active (Birdthistle et al., 2008) and females under 12 years at the time their mother died more likely to initiate sex than those whose mother died later.

Maternal and dual female orphans were significantly more likely to be HIV infected than non-orphans; whereas among males, paternal and dual orphans were over three times more likely to be HIV infected. These HIV risk findings are consistent with findings elsewhere (Birdthistle et al., 2008; Gregson et al., 2005; Kang, Dunbar, Laver, & Padian, 2008). Findings from this study regarding the increased vulnerability of female maternal and male paternal orphans with regard to sexual behaviour and HIV risk highlight potential gender differentials in the impact of parental death. In addition they provide some evidence to support findings from other studies (Montgomery, Hosegood, Busza, & Timæus, 2006) regarding the potential role fathers play in the lives of their male children. Our findings also provide some evidence to suggest that mothers play a potential role in the sexual lives and HIV risk of their female children. Fathers though seem to play a role in both their male and female children's lives.

Consistent with findings from elsewhere (Pettifor et al., 2008), we found very little evidence of a strong association between the socio-economic and socio-demographic individual level factors with HIV infection (data not shown). Although the numbers were small, and the estimated effect somewhat unreliable, the differences between male and

female orphans with regard to being more likely to be out of school but unemployed (males) and employed (females) highlight the potential challenges that male adolescents who drop out of school may face. Although female dropouts may easily find work as domestic workers in the nearby suburb, male dropouts do not have many such opportunities.

Others have singled out education as a factor that might compound the effect of orphanhood on sexual behaviour and HIV risk (Birdthistle et al., 2009; Case & Ardington, 2006; Oleke et al., 2007). From our data however, adjusting for age, place of residency and socio-economic status, there was little change in the estimates of the effect of orphanhood on sexual behaviour or HIV risk. None of the socio-demographic or economic factors considered in this study could fully explain the associations of mothers' death on daughters and fathers' death on sons' sexual behaviour and HIV risk. The mechanisms through which this operates may be couched within a psycho-socio paradigm, which was beyond the scope of this analysis. Thus an opportunity exists for further research to examine why there might be gender differentials in the impact of parental death on sexual behaviour and risk of HIV infection.

Limitations

Our analysis assumes HIV-infected adolescents were infected because of their own sexual behaviour and risks. It is possible that a few adolescents were HIV infected through mother-to-child transmission of HIV, but the likelihood of our results being influenced by this group is very small given most children infected vertically would have died by age five years (Newell et al., 2004). There was considerable missingness for certain variables such as education and employment with a potential for bias in our results, as the employed are more likely to be missed from the household socio-economic module. To retain as many variables as possible, multiple imputation techniques were used (Carlin, Li, Greenwood, & Coffey, 2003; Royston, 2005) to fill some of the missing data; this did not result in substantially different changes in the results or interpretations.

Excluding adolescents with missing parental survival status may have biased the results. However, because this was a very small percentage, this is unlikely to have had a significant impact. Historically in our area fathers have generally not been resident with their children as a legacy of apartheid (Posel, 1991), and presently the area remains characterised by high out-migration particularly among males (Muhwava & Nyirenda, 2008). Absence because of death is, therefore, not the only scenario likely to impact on sexual behaviour and HIV risks of adolescents. Our analyses did not capture this nuance.

A further potential limitation relates to the sensitive sexual behaviour questions. The sexual behaviour outcomes we report in this analysis were self-reported and may thus suffer from recall and reporting bias, which could have affected the proportion who have had sex and the age at first sex, but would have unlikely to have affected the associations presented here.

Conclusions

We find orphans to be more likely out of school and for those still in school to lag behind non-orphans of the same age. There is therefore need for targeted programmes to keep orphans in school and for those that drop out of school; programmes that will help them to generate an income would be helpful as studies from elsewhere have shown a strong association between orphanhood and poverty and economic constraints (Baarøy & Webb, 2008; Cohen, Farley, Taylor, Martin, & Schuster, 2002; Lloyd, 2005).

Our results demonstrate the vulnerability of orphans to ever have had sex and sexual debut earlier, and to be at increased HIV risk. Although others show the increased odds of young South Africans (15–24 years) with one or both parents deceased to be sexually active and HIV infected (Operario et al., 2007), we highlight the impact of death of a parent of the same sex on the sexual behaviour and HIV risks of adolescents. Understanding this gender differential merits further investigation.

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