Assessing the association of household living arrangements and social care with the health and wellbeing of older people in a high HIV prevalence rural community

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Background

By the end of 2009, globally an estimated 33.3 people were living with HIV (UNAIDS, 2010), which represents a 27% increase from the 1999 estimate of 26.2 million. Sub-Saharan Africa, with its 22.5 million HIV infected people, continues to bear a heavy load of the HIV burden, accounting for 68% of the global total. UNAIDS estimates further show that within sub-Saharan Africa, southern Africa is the hardest hit, with over 50% (11.3 million) of HIV infected people. South Africa has the highest number of HIV infected people in the world, with an estimated 5.6 million living with HIV (UNAIDS, 2010). About 17% of the adult population 15-49 years is HIV infected in South Africa, with KwaZulu-Natal the province with the highest prevalence and the largest population (Shisana et al., 2009). HIV though is not just a disease of young people. According to a study by Wallrauch and colleagues in 2008, the HIV prevalence among older people aged 50 and above in a rural KwaZulu-Natal South African community was 9.5% (8.4-10.7). By age group the HIV prevalence rates for women and men respectively were 17.3%/25.9% (50-54 years), 13.9%/13.5% (54-59 years) and 10.2%/8.0% (60-64 years) (Wallrauch et al., 2010). These estimates are higher than those from a nationally representative survey for South Africa which reported prevalence among older people at 10.4%/10.2% (50 - 54), 6.2%/7.7% (55 - 59), and 3.5%/1.8% (60+) for men and women respectively (Shisana et al., 2009). Differences can be attributed to differences in methodological approaches as well as to geographical location and ethnic heterogeneity in the nature of the HIV epidemic in South Africa (Tanser et al., 2009).

Despite the severe impact of the HIV epidemic on adult mortality in sub-Saharan countries, the proportion of the population aged 50 years and above has increased and is expected to continue to do so for at least another three decades (Kinsella and Ferreira, 1997, United Nations, 2002, Velkoff and Kowal, 2006). The high HIV incidence and prevalence among the adult population in sub-Saharan Africa and the high mortality in this population group in the 1990s and early 2000s (Nyirenda et al., 2007), thrust an increasing proportion of grandparents into a role of care and support of orphaned children and ailing adults (Connolly and Monasch, 2003, Hill et al., 2008). For instance, a study examining the impact of HIV on adult mortality in 22 sub-Saharan countries using Demographic and Health Survey data (DHS) collected between 1991 and 2006 (Kautz et al., 2010), showed that there had been an increase in numbers of older people living in single-person household, older people living in skip-generation household (living with children under 10 only) and an increase of adults aged 18-59 in households with older people. A similar analysis in South Africa found there was a positive relationship between provincial HIV prevalence levels and the proportion of older people living in skip-generation households (Merli and Palloni, 2006). It can be argued therefore that HIV has contributed to the reversal of the intergenerational flow of support from upward (younger to older generation) to downward (older to younger generation) (Ardington et al., 2010). More recently though mortality among the adult population has been declining in high HIV prevalence areas due to the expanding HIV treatment and care programme (Herbst et al., 2009, Jahn et al., 2008), but economic hardships among the adult population still thrust older people into the care giving role. Thus, in many sub-Saharan African countries, the devastating impact of HIV compounded by high unemployment among the adult population has led to many older people assuming the position of household main breadwinner. In South Africa, many older people in such positions rely on government cash transfers, widely referred to as grants, to care for and support their households.

Using mid-year population estimates obtained from the US Census Bureau international population database (U.S. Census Bureau, 2005), the ratio of children per 100 older people aged 60 and above in

South Africa is projected to increase from around 10 in 1985 to about 53 in 2050. This five-fold increase in the ratio of children to older people is likely to impact the care burden on older people. Additional computations from Census Bureau data showed that even the number of adult per 100 older people is projected to increase, though slightly, over the period 1985 to 2050 from around 7 to about 18. Though this increase in adults per 100 older people may be a positive development with regard to dependency ratios, it may further exacerbate the care burden on older people if flow of care is predominantly from parent (older person) to adults and a growing proportion of those adults are in poor health as the case was in HIV severely affected populations pre-antiretroviral (ARV) advent.

The aim of this analysis is to assess how household living circumstances and social caring are associated with the health and wellbeing of older people in rural KwaZulu-Natal. Specifically we investigate whether the care and support roles of older people are associated with their own health and whether this relationship is modified when older people are in receipt of household or state-level support. Data for the analysis come from a population-based surveillance combined with data from a nested study within the surveillance system in rural KwaZulu-Natal.

In South Africa, like in much of the rest of Africa, reliable information on the health and wellbeing of older people is lacking. Several studies on older people in Africa have explored the role of older people as care-givers (Hosegood and Timæus, 2006, Knodel et al., 2003, Ssengonzi, 2007, Hosegood et al., 2007, Urassa et al., 1997, Richter and Desmond, 2008, Zimmer and Dayton, 2003), but relatively few studies have explored the health of older people as a central outcome given this caring role (Kyobutungi et al., 2010, Ice et al., 2008, Ssengonzi, 2007, Grinstead et al., 2003). In addition to this care-giving role, however, older people are increasingly directly affected by HIV infection, either newly sexually acquired or from ageing into old age with HIV acquired in adulthood due to improved longevity as a result of HIV treatment (Nguyen and Holodniy, 2008). In communities severely affected by HIV, older people are thus likely to face the double burden of being care-givers and needing care themselves, but little has been said about how this role and need is related to the physical, mental and wellbeing of older people. According to Ssengonzi (2009), one of a few who has examined the impact of care giving by older people on their health and wellbeing, this care-giving role is likely to result in emotional, physical health and psychological stress on the older people. Ssengonzi, however, only looked at care giving using qualitative data while the present study investigates the relationship between care giving with the health and wellbeing of older people using quantitative data from a cross-sectional study nested within a demographic and health longitudinal surveillance system. The aim of this study is to contribute to our understanding of the health and wellbeing of older people living in a resource-poor rural area with highly prevalent HIV. This study will help to inform priority areas regarding the health and well-being of older people and thus aid in optimal health resource planning in resource-poor setting at local, national and regional levels.

Theoretical perspective

In the Africa Centre surveillance system a household is defined as a social unit of individuals who identify themselves as such through one head of household (Hosegood and Timæus, 2005). These individuals may not necessarily be residing in the same dwelling unit, allowing for non-resident members who still maintain ties to that household. Households are an important socially defined institution in the care and support by and towards older people more so with declining physical functioning and mobility with advancing age (Zimmer and Dayton, 2003). The transfer of care and

support between younger and older generations is dependent among other things on the bonds that tie them together according to the solidarity-conflict model of intergenerational support networks (Bengtson, 1975). In the solidarity-conflict model, solidarity are all those factors that tie families together making intergenerational support possible (Giarrusso et al., 2005). These factors include: affection - the emotional connectedness of the two generations; structural - geographical proximity and frequency of contact between the generations; shared norms, expectations, opinions and values systems particularly with regard to family and support systems. Conflict, in contrast, includes all those factors that cause intergenerational tension and disagreement leading to a breakdown of filial relations. Conflict hinders intergenerational support flows from happening. Both the solidarity and conflict factors are a reflection of cultures, norms and socialisation at individual, family and societal levels (Lowenstein, 2005, Giarrusso et al., 2005).

Modernisation theory has also been used to explain intergenerational support flows. The main tenet of this theory is that as a society becomes industrialised from a traditional state, family bonds are eroded because of an increase in individualism and secularisation (Aboderin, 2005), which ultimately results in a decline of intergenerational support flows. The 'modernisation perspective' can still be thought of within the solidarity-conflict paradigm in that increasing individualism and secularisation may lead to declining affection between the generations and imposing structural constraints pertaining to geographical proximity and frequency of contact. Yet another theoretical caveat to the solidarity-conflict model is the political-economy model (Phillipson, 2005). The central contention of the political-economy perspective is that the flow of intergenerational support is highly dependent on the economic and political constraints imposed on the individual. For instance if a society is faced with high unemployment among the younger generation they may not be able to support the older generation (Aboderin, 2005), likewise older people faced with limited resources may not be able to care for and support the younger generation. The political economy perspective could also be located within the solidarity-conflict model's ambivalence state. This is an intermediate state in which there is both solidarity (affection or desire to provide support) and conflict (for instance political economy imposed structural constraints such as lack of resources) in the intergenerational support system (Lowenstein, 2005, Giarrusso et al., 2005) confounding filial relations and the flow of support between the older and younger generations. This ambivalent state of the solidarity-conflict theory appears to be more plausible in explaining the net flow of support between the younger and older generation in a resource-poor setting such as our study area in rural South Africa where unemployment among the young working age population is high and older people are reliant on state support to care for and support the younger generation.

A study conducted in three urban locations in England to explore changes in family ties over the period 1940 to 1990 (Phillipson et al., 1998), found that family kinships over this period remained largely unchanged and key to social networks between older parents and adult children. A more recent analysis of data from Britain and across Europe found that contrary to popular belief social care to older people was still overwhelmingly provided by family members (Evandrou and Falkingham, 2004). Even in the developing world be it Africa, Asia, Latin America or the Caribbean, as Aboderin (2005) argues, even though family support may have declined, the body of evidence suggests a persistence of family ties and support and that most older people reside with their younger kin be it in two or multi-generation households. In Africa old-age is generally associated with wisdom and as such older people are held in high esteem. There is also a shared value system between the younger and the older generation where it is expected that as a parent begins to get old they are provided with physical,

emotional and monetary support by younger adults or children, consistent with the tenets of the solidarity model. However, conflict may arise within and between families which may cause the flow of support to be hampered. In more recent times, changes in the economic circumstances have also played a part in disturbing the flow of support between the younger and older generation.

Methods

Data source - Africa Centre surveillance system

Data for this analysis come from two independent but linkable sources. The first source of data for this analysis is the longitudinal demographic, social, economic and health data collected in the Africa Centre Demographic Surveillance. The surveillance covers a largely rural area of 435 square kilometres in Umkhanyakude district in northern KwaZulu-Natal, South Africa. At any point in time the surveillance covers approximately 90,000 household members (of whom nearly a third are not resident although they remain members of the household) in over 11, 500 households. There are large variations in population density across the surveillance areas: ranging from 2,660 people/km^2 in the township of KwaMsane to 5 people/km^2 in the more rural and hilly northwest of the surveillance area.

Demographic social and health data have been collected in bi-annual rounds from key household informants since 2000. At these routine household surveillance visits information on age, sex distribution, births, deaths, population mobility and household memberships is collected from a proxy household respondent. Within about six months, for all deaths recorded during the household surveillance, additional detailed information is collected using a validated verbal autopsy (VA) instrument. The VA forms are then given to two independent medical doctors who assign an immediate and an underlying cause of death using the World Health Organisation (WHO) international classification of diseases tenth revision (ICD-10) (WHO, 2004). Also part of the routine household surveillance is the annual collection of household socio-economic information such as asset ownership, access to government cash transfers or grants, employment status, education attainment, sanitation and amenities accessed. A parallel system, which started in 2003, is the individual surveillance in which sexual behaviour and samples for measurement of HIV sero-status data are collected from all adults aged 15 and above (up until start of 2007 these data were collected only for 15-49 women and 15-54 men) (Tanser et al., 2008). Detailed information about the Africa Centre's surveillance system can be found in earlier analyses (Hosegood et al., 2006, Tanser et al., 2007) or by visiting www.africacentre.com.

Data source - nested study of older people

A second source of data comes from a nested study that collected detailed information on the health and wellbeing of older people (WOPS). In this WHO-supported study conducted between March and August 2010 information was collected of a sub-sample of the surveillance population consisting of 422 people aged 50 years and older. Stratified random sampling was used to select these participants. The sample was divided into four groups. The first three groups were selected by first linking information in the Hlabisa HIV Treatment and Care programme to the Africa Centre surveillance. About 40% of the people in the treatment programme are part of the surveillance (Houlihan et al.,

2010). Among people in the HIV Treatment and Care programme residing in the Africa Centre surveillance area, group one was composed of older people who had been on treatment for more than one year and group two of older people on treatment for less than three months. The third group was of older people in the surveillance area with an adult (18-49 years) household member on HIV treatment. The last group was of older people who had a death of an adult household member in the last two years, categorised to be HIV-related in the verbal autopsy (VA) system. The data from the demographic surveillance was linked to the data collected in the WOPS. Individuals selected to participate in the Wellbeing of older people study (WOPS) made up 5% of the total population (n=8,258) of older people aged 50 and above at mid-year 2010 in the Africa Centre's surveillance system. Though participants into the WOPS were selected from very different strata they all came from the same population resident in the surveillance area hence their differences by socio-demographic characteristics are minimal. They were thus pooled as one sample in the analysis although we did adjust for the study group in which they were selected in the logistic regressions to account for differences in the population from which each group was selected. Treating the WOPS sample as one increased the statistical power of the analyses.

Data collection - WOPS

A shortened version of the World Health Organisation (WHO) Study on Global Ageing (SAGE) instrument (WHO) was used to collect data in the Well-Being of Older People study (WOPS) between 1st March and 1st August 2010. This shortened instrument had three main components. First was a detailed questionnaire on basic demographic information, health state including physical functioning assessment (mobility, cognition, self-care, sleep and energy, affect and vision), subjective emotional well-being, health care utilisation, care giving and care receiving, and access to HIV treatment. A second component involved collection of anthropometry data of weight, health and blood pressure; and a third component the collection of a blood specimen for laboratory measurement of haemoglobin levels, high density protein, triglycerides, cholesterol, and cytomegalovirus (CMV), which are bio-markers of cardiovascular diseases, diabetes and hypertension risk. The questionnaire was initially translated by local staff from English to isiZulu, the local language in the study community, and then back-translated several times until an acceptable translated version was obtained. The study questionnaire was piloted in the field with a pilot sample size of 10% of the target sample size for the main study; all participants who participated in the pilot study were excluded from selection for the main study.

To ensure quality control, checks at three levels were undertaken. First, the research nurses were required to cross-check the data they collected before submission of the forms for incomplete or missing information. Second, each form was checked by the two co-principal investigators (MN, PM) for completeness and quality of data. The third level of quality control involved the constraints in-built in the Microsoft access based data entry programme to spot errors and inconsistencies. All errors identified at any of the quality control stages were sent back to the field for the research nurses to revisit the participant and correct the data.

Data entry and analysis

A dedicated Microsoft access data base developed by the senior database scientist at the Africa Centre with input from the co-principal investigator (MN) was used to enter data. The data were exported to

Stata 11.1 (StataCorp, 2009) for analysis. We used logistic regression to assess the association between health status and care giving status adjusting for several demographic and household living arrangement factors. Initially univariate analyses were performed with each of the potential associated factor, followed by multivariable analysis informed by the univariate outcomes.

We first describe and investigate the household living conditions (household size, composition, structure, income sources, socio-economic status) of people aged 50 years and older; household composition will be noted in terms of socio-economic status, household headship and access to government social protection grants. Then we will examine whether older people provide any physical or nursing care; whether they receive any financial assistance, physical or nursing care and source of that care. Care is defined to include help with eating, bathing, dressing, hygiene, moving around and going grocery shopping. We define persons aged 50 years and older as older people in line with other research work on ageing in Africa (Kowal et al., 2010, Hosegood and Timæus, 2006, Ssengonzi, 2007). In multivariable regression analyses we investigate how social caring is related to the health and wellbeing of the older people.

Physical functioning and emotional wellbeing health score derivation

Two measures, physical functioning and emotional wellbeing, were used to describe the health and wellbeing of older people. Physical functioning ability was measured using the World Health Organisation's Disability Assessment Scale (WHODAS) (WHO, 2010). WHODAS measures functional ability from responses to questions on physical functioning of an individual such as standing, walking and self-care. Participants were asked about difficulties with performing these activities of daily living experienced in the last 30 days based on a five-point likert scale with responses of 'none', 'mild', 'moderate', 'severe', and 'extreme/cannot do'. Responses to these items were transformed into a WHODAS disability score with a scale of 0-100, with a high score indicating great difficulty in physical functioning. To make the WHODAS measure consistent with the other two measures of health to be employed in this paper, the WHODAS was inverted (WHODASi) on the same scale of 0-100 but now a low score indicated low physical functioning ability (poor health) and a high score a high functioning ability (best health).

Emotional wellbeing was measured using a WHO Quality of Life (WHOQoL) score (WHOQoL Group, 1993) derived from responses to questions on a person's satisfaction with among other things, their self, health, and personal relationships. WHO defines quality of life as an "individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns." (WHOQoL Group, 1993). There are eight questions used to compute the WHOQoL score, which ranges from 8-40. This was then transformed into a scale of 0-100, where 100 corresponds to best quality of life (best emotional wellbeing). Both the WHODASi and the WHOQoL scores were divided into quintiles, which were then utilised to investigate the relationships between health status and care giving of older people in the study.

Ethical clearance

For household surveillance in the Africa Centre's Demographic Information System (ACDIS), informed consent is obtained orally from the household head or a competent household member. For individual surveillance of sexual behaviour and samples to assess HIV sero-status, written informed

consent is obtained from each individual participant. In the well-being of older people study (WOPS) written informed consent was obtained from all participants; they had to sign or thumb print the consent form. The Africa Centre surveillance was approved by the ethics committee of the University of KwaZulu-Natal, with annual re-certification. For the WOPS, approval for the study was in the first instance obtained from the local community via the community advisory board (CAB) and then the University of KwaZulu-Natal Biomedical Research Ethics Committee (Ref No. BF136/09).

Results

At mid-year 2010 there were 98,292 household members under surveillance, of whom 66% (35,672 female and 29,242 male) were resident in the Africa Centre surveillance area. This analysis is restricted to the population of resident household members. Of the 69,914 resident population, 8,258 (12.7%) were aged 50 years and above (5687 female, 2571 male). Table 1 shows selected socio-demographic characteristics of these older people. The p-values relate to the comparison of older people in the nested study to the rest of older people in the surveillance area. Around 56% of all older people in the study area are aged 60 years and over. Though the majority of older people in the surveillance area were married (38%), close to one in three had never married (27%). There were slightly more married people in the WOPS study than in the rest of older people under surveillance. By education level completed, most of the older people had no formal education; only about one in five of the older people had more than 6 years of schooling. Overall 69% of the older people were not working and heavily reliant on government cash transfers or grants as per popular parlance in South African. Nearly 80% of participants in the WOPS study compared to 46% among the rest of ACDIS population were dependant on disability and old-age grants as the main source of income. Of the characteristics considered in Table 1, only the age distribution did not show statistically significantly differences between ACDIS members and WOPS participants. The median household size among the total resident population in the Africa Centre's surveillance area was 7 (interquartile range 5).

Table 2 presents the overall household characteristics and living arrangements, comparing ACDIS members and WOPS participants. Older people in ACDIS were less likely to belong to households headed by their child or grandchild than WOPS participants, although the majority (60%) of older people among both ACDIS members and WOPS participants were heads of household. This status not only accords older people respect but places some obligation on them to care and provide for their household. Wealth quintile distribution differences were also significant between WOPS participants and the rest of older people under surveillance. The majority of older people belonged to multi-generation households (>86%), though there were slightly a higher proportion of older people in single person households (solo households) among WOPS participants than the rest of older people under surveillance (2.7% vs 6.2%).

The following sections present results of the analysis of data collected in the nested study of the wellbeing of older people (WOPS) supplemented with information pertaining to these study participants collected in the routine surveillance system.

Table 3 shows basic demographic characteristics by whether an older person was giving care to adults or children household members. Overall, 42% of WOPS participants were providing physical or nursing care to adults and 57% to children. Marital status and self-rated financial status were significantly related to care giving status to both adults and to children. Being in receipt of a grant was

significantly associated with care giving to children but not to adults. Table 4 presents household characteristics and living arrangements by care giving status among study participants. Regarding adults only, household wealth quintiles were significantly associated with care-giving status, whereas household headship was not significantly associated with care-giving to children.

Ordered logistic regressions were used to investigate the association of care giving with health status; and associated socio-demographic factors. The association of care giving with two measures of health relating to physical functioning and to self-reported emotional wellbeing was assessed separately for adults and children.

Table 5 shows the unadjusted and adjusted odds of being in a higher physical functioning health quintile given care-giving to adults. In both unadjusted and adjusted analyses, older people who were providing care to adults were significantly more likely to be in a higher physical functioning quintile than those who were not providing care to adults. That is, we found older care givers to be three times more likely to be in better physical health than non-care givers, even adjusting for age, sex, marital status, education, occupational status, receipt of government grants as well as household living arrangement variables. Factors associated with being in higher physical functioning health quintile in univariate analyses were being in study group 2 (HIV but not yet or only shortly on treatment) and 4 (not themselves HIV infected, but with adults HIV death), being in the oldest age group, having attained some level of education compared to none, not working occupational status, and being in receipt of old-age grants. In multivariable analysis, study group, sex, age group, and education level remained significantly associated with the likelihood of being in a higher physical functioning health quintile; being in household wealth quintile 2 or 3 was also found significantly associated with higher odds of being in a higher physical functioning quintile. Regarding the association of care giving to children with physical functioning health status, care giving to children was significantly associated with higher odds of being in a higher physical health quintile, although odds ratios were lower for care-giving to children than for care-giving to adults. Other factors significantly affecting the association of care-giving to children with physical functioning were study group, sex, being in the oldest age group, having some level of education, and self-perceived financial status.

Emotional wellbeing was measured using a WHO quality of life index that utilises responses to questions on whether one has enough energy for everyday life, feelings of being able to control important things in own life, and ones satisfaction with: his/her life, health status, ability to perform daily activities, personal relationships and living conditions. Table 7 presents the association of care giving to adults with quality of life health status. We found in both unadjusted and adjusted ordered logistic regressions that older people who were giving care to adult household members were less likely to be in a higher quality of life quintile. That is, they were less likely to be in a higher emotional wellbeing health status. Study group, sex, being in the oldest-old age group, being divorced, not working, and being in poor self-rated financial status were all significantly associated with lower odds of being in a higher quality of life quintile in both unadjusted and adjusted analyses. In Table 8 just as pertaining to care-giving to adults, we found that older people who were giving care to children were less likely to be in a higher emotional wellbeing health status, although the odds ratios were only significant in unadjusted analyses. WOPS participants who were in group 4, were female, in the oldest age group, divorced or widowed, not working, and in moderate or poor self-rated financial status were all significantly associated with lower odds of being in a higher quality of life health quintile in both unadjusted and adjusted analyses. Whereas having 6 years or less compared to none level of education, being in household wealth quintiles 3 to 5 relative to being in the first wealth quintile were significantly associated with higher odds of being in a higher quality of life quintile even after adjusting for other factors in the ordered logistic model.

Discussion

Older people in African communities have historically played some care-giving role in the family, but with the advent of the HIV epidemic there has been an increased demand for their greater involvement particularly with regard to caring for orphaned children and ailing adults (Ssengonzi, 2007, Hosegood and Timæus, 2006, Nyirenda and Newell, 2010). Findings from this study suggest

older people are highly likely to take up this care giving role especially to adults if they are in good physical functioning health. The majority of older people in our study resided in multi-generation household. A combined total of under 15% were living in households which may be referred to as vulnerable, these being single-person, older-only and skip-generation households. It has been reported elsewhere though that older people were more likely to live in such vulnerable households due to the impact of the HIV epidemic and that females, those with low education, and low household wealth were more likely to be in such vulnerable households (Merli and Palloni, 2006).

We find that a higher proportion of older people were providing some physical and/or nursing care to children under 18 years than to adults. Over 40% of the older people were also found to be providing some physical and/or nursing care to adults aged 18-49 years. Females, those aged 50-59 years, currently married, widowed and those accessing government grants were more likely to be providing care to adults or children. Other than household wealth quintiles, the other household characteristics and living arrangements did not seem to be highly related with the likelihood to be giving care or not.

Older people in South Africa are in a unique position compared to the rest of sub-Saharan Africa because all older persons are eligible for a non-contributory, means tested old-age pension (old-age grant). Previously, the age eligibility was 60+ (women) and 65+ (men), but as of April 2010 both women and men aged 60 and above will be eligible for the grant of R1080 per month (just under 140 US dollars at today's exchange rate). This grant has become a mainstay of many households particularly in rural settings such as our study area (Hosegood and Timæus, 2006, Nyirenda and Newell, 2010, Ardington et al., 2010, Case and Deaton, 1996). Access to these old age grants in South Africa is important in other ways, for instance it facilitates the migration of adult household members to seek employment elsewhere leaving behind young children in a safe environment and under the care of an older person (Ardington et al., 2009). This can be contrasted to places like Kenya where there is no social pension. A study in Nairobi slums showed that over 70% of older people who were giving care to young adults and orphaned children were dependent on trading or informal employment to fulfil those responsibilities (Chepngeno-Langat et al., 2010). Slum dwellers are not likely to have been able to build up entitlement to a contributory state pension and so with no social pension older people have to rely on other livelihood strategies to care and provide for the grandchildren they were supporting. Older people when in good health and with productive means (resources) are likely to be less dependent on young adults and actually be of great benefit to their household's wellbeing (Schröder-Butterfill, 2004). What is less clear is how accessing grants is related with the health of older people. In our study adjusting for care giving to adults or to children, we find older people access old-age grants to be less likely to be in a healthy physical functioning quintile, even though the results were only significant in univariate analyses. These findings may be explained by the fact that most of the participants reported that they used this grant on household requirements rather than on their own needs, which may have been to the neglect of their own health and well-being.

We found in this analysis a very strong association between care-giving and the physical and emotional wellbeing of older people in the study area. Older people who were providing care to adults or children had significantly higher odds of being in higher physical functioning quintiles than those who were not providing any care. On the other hand, care-giving to adults or children was significantly associated with less likelihood of being in higher quality of life health quintiles. That is,

we find care giving to be associated with better physical functioning health but poorer emotional wellbeing. Other factors that appeared to be influencing this relationship between care giving and health status were being female, being in the oldest age group, having a higher level of education, accessing government grants and self-perceived financial status. Our findings suggest that while older people appear to cope well with the physical challenges of care giving, they may not be coping well emotionally. They appear to be highly likely dissatisfied with their health, their life, personal relationships or household living arrangements (factors used to compute the WHOQoL score). A study using nationally representative data in a developed country context found that care-giving grandparents were more likely than non-care giving grandparents to report limitations in 4 of the 5 activities of daily living they had considered and twice as likely to be depressed (Minkler and Fuller-Thomson, 1999). From an African context, Ssengonzi (2009) similarly did show that care giving is likely to lead to emotional, physical health and psychological stress on the older people, those data were from a qualitative study. Our results using quantitative data from a study nested within a longitudinal surveillance system are consistent with the study by Ssengonzi. Our WOPS study which was cross-sectional was, however, not able to show whether care giving is impacting on the health of older people but rather that there appears to be a link between the two. A study that was able to measure the impact of caregiving on the health of Kenyan Lou grandparents using three waves of longitudinal data found that care giving to orphaned children did not impact physical health but had a negative effect on the mental health and self-perceived health (Ice et al., 2010). These results on the negative impact on mental health of care giving are consistent with what we find in our analysis. Differences between our findings and those from the Lou grand parents may be explained by possible differences in the care giving effect on health across populations as well as to the varying methodologies adopted the studies.

Though this WOPS sample size was small in relation to the population under surveillance it allowed us to have detailed information on care giving and receipt not routinely collected in the household surveillance. However, we are limited in making generalisations regarding the population of older people in the surveillance from the findings based on the WOPS data. This is so because the WOPS sub-sample was comparatively more female, married and had better household socio-economic status than the population of older people under surveillance. Findings that care-givers are more likely to be healthy than non-caregivers may have been biased by selection effects since our WOPS sample excluded people who were seriously ill or hospitalised. In this analysis we did not consider the combined effect of care-giving on physical health status and emotional wellbeing of older people because the measures of health we considered do not allow for such an analysis. There is evidence though suggesting older people in perceptible poor physical health tend to report their quality of life as good (Bowling et al., 2007).

Conclusion

In conclusion, we may quote this statement from Schröder-Butterfill (2004) about social caring and the health of older people:

> "The need for physical or instrumental care arguably represents the most extreme form of dependence in old age, but only arises if an older person is ill, frail or handicapped. …[M]ost older people are in good health, their dependency is low and their potential for making contributions high. In addition, if younger family members are non-existent

> or distant, then older people may have no other choices but to remain self-sufficient or suffer declining welfare". (Schröder-Butterfill, 2004).

To provide care older people are highly likely to be in good physical health but the burden of this care giving role may be putting a strain on their emotional well-being. The household as a social institution is an important source of support for older people, particularly as mobility and physical functioning decline with age (Zimmer and Dayton, 2003). There is need to strengthen social support systems and state social protection system as both play an important role in the physical health and emotional wellbeing of older people.

Table 1: Background characteristics of ACDIS and WOPS participants, South Africa 2010

	ACDIS		WOPS		Overall		P-value*
Characteristics	n	%	n	%	n	%	
n	7836	94.9	422	5.1	8258	100	
Sex							= 0.006
Male	2465	31.5	106	25.1	2571	31.1	
Female	5371	68.5	316	74.9	5687	68.9	
Age group							= 0.221
50-59	3403	43.4	188	44.5	3591	43.5	
60-69	2152	27.5	128	30.3	2280	27.6	
70-79	1506	19.2	75	17.8	1581	19.1	
80+	775	9.9	31	7.3	806	9.8	
Marital status							<0.001
Never married	2120	27.1	116	27.5	2236	27.1	
Married	2930	37.4	206	48.8	3136	38.0	
Separated	65	0.8	5	1.2	70	0.8	
Divorced	18	0.2	3	0.7	21	0.3	
Widowed	2536	32.4	91	21.6	2627	31.8	
Don't know/Missing	167	2.1	1	0.2	168	2.0	
Education							<0.001
NFE/AEO	2597	33.1	201	47.6	2798	33.9	
6 years or less	1452	18.5	141	33.4	1593	19.3	
More than 6 years	1211	15.5	80	19.0	1291	15.6	
Don't know/Missing	2576	32.9	0	0.0	2576	31.2	
Occupational status							<0.001
Working	1078	13.8	24	5.7	1102	13.3	
Not working	5310	67.8	397	94.1	5707	69.1	
Missing	1448	18.5	1	0.2	1449	17.5	
Grant receipt							<0.001
None	2761	35.2	82	19.4	2843	34.4	
Disability	840	10.7	114	27.0	954	11.6	
Old Age	2773	35.4	226	53.6	2999	36.3	
Don't know/Missing	1462	18.7	0	0.0	1462	17.7	
Financial status self							<0.001
Better	481	6.1	67	15.9	548	6.6	
No change	4329	55.2	136	32.2	4465	54.1	
Worse	1528	19.5	219	51.9	1747	21.2	
Don't know/Missing	1498	19.1	0	0.0	1498	18.1	

* p-value for differences between ACDIS and WOPS participants

Table 2: Living arrangements of ACDIS and WOPS participants, South Africa 2010

	ACDIS		WOPS		Overall		P-value*
Characteristics	n	%	n	%	n	%	
HH Headship							<0.001
Self	4598	58.7	244	57.8	4842	58.6	
Spouse	1688	21.5	87	20.6	1775	21.5	
Child/grandchild	164	2.1	33	7.8	197	2.4	
Other	1130	14.4	57	13.5	1187	14.4	
Don't know/Missing	256	3.3	1	0.2	257	3.1	
Wealth quintiles							= 0.002
First	1507	19.2	85	20.1	1592	19.3	
Second	1410	18.0	84	19.9	1494	18.1	
Third	1317	16.8	85	20.1	1402	17.0	
Fourth	1249	15.9	84	19.9	1333	16.1	
Fifth	811	10.3	84	19.9	895	10.8	
Non-Resident members in HH							= 0.497
0	1240	15.8	78	18.5	1318	16.0	
1-2	2416	30.8	122	28.9	2538	30.7	
3-4	1897	24.2	103	24.4	2000	24.2	
5+	2283	29.1	119	28.2	2402	29.1	
Household typology[Ψ]							<0.001
Older solo (single-person)	211	2.7	26	6.2	237	2.9	
Older-only (2+ person)	134	1.7	7	1.7	141	1.7	
Older with children only	131	1.7	3	0.7	134	1.6	
Older with adults only	504	6.4	20	4.7	524	6.3	
Multi-generation	6856	87.5	366	86.7	7222	87.5	

[Ψ] Household typology description

Older solo = older person living alone

Older-only (2+ person) = at least 2 older persons living together

Older with children only = older person living only with children aged under 18 years. Also referred to as skip-generation households

Older with adults only = older person living with one or more adults aged 18-49 years.

Multi-generation = older person living in a household with adult and children members

* p-value for differences between ACDIS and WOPS participants

Table 3: Demographic characteristics by care giving status, Umkhanyakude district, South Africa 2010

	Care giver to adults			Care giver to children		
	No	**Yes**	P-value	**No**	**Yes**	P-value
Characteristics	%	%		%	%	
n	247	175		183	239	
Sex			=0.656			<0.001
Male	25.9	24.0		37.7	15.5	
Female	74.1	76.0		62.3	84.5	
Age group			=0.432			=0.190
50-59	47.4	40.6		43.7	45.2	
60-69	29.1	32.0		27.9	32.2	
70-79	15.8	20.6		18.0	17.6	
80+	7.7	6.9		10.4	5.0	
Marital status			<0.001			=0.001
Never married	31.2	22.3		30.1	25.5	
Married	61.5	30.9		56.8	42.7	
Separated	0.4	2.3		1.1	1.3	
Divorced	0.8	0.6		0.5	0.8	
Widowed	6.1	43.4		11.5	29.3	
Education			=0.13			=0.833
NFE/AEO	43.7	53.1		46.4	48.5	
6 years or less	36.8	28.6		33.3	33.5	
More than 6 years	19.4	18.3		20.2	18.0	
Occupational status			=0.701			=0.662
Working	5.7	5.7		6.0	5.4	
Not working	93.9	94.3		94.0	94.1	
Grant receipt			=0.270			=0.031
None	18.6	20.6		14.8	23.0	
Disability grant	30.0	22.9		32.2	23.0	
Old-Age grant	51.4	56.6		53.0	54.0	
Main income source			= 0.653			= 0.103
None	8.5	10.9		6.0	12.1	
Other	12.6	10.9		12.0	11.7	
Grants	78.9	78.3		82.0	76.2	
Financial status self			<0.001			= 0.006
Comfortable	22.7	6.3		22.4	10.9	
Moderate	30.4	34.9		29.0	34.7	
Poor	47.0	58.9		48.6	54.4	

Table 4: Living arrangements by care giving status, Umkhanyakude district, South Africa 2010

	Care giver to adults			Care giver to children		
	No	**Yes**	P-value	**No**	**Yes**	P-value
Characteristics	%	%		%	%	
n	247	175		183	239	
HH Headship			=0.083			=0.439
Self	54.7	62.3		61.7	54.8	
Spouse	21.5	19.4		16.9	23.4	
Child/grandchild	10.5	4.0		7.7	7.9	
Other	13.4	13.7		13.7	13.4	
Wealth quintile			<0.001			=0.009
First	21.1	18.9		25.1	16.3	
Second	15.4	26.3		14.8	23.8	
Third	17.4	24.0		17.5	22.2	
Fourth	19.4	20.6		18.0	21.3	
Fifth	26.7	10.3		24.6	16.3	
Non-Resident members in HH			=0.288			=0.013
0	20.6	15.4		23.0	15.1	
1-2	30.0	27.4		31.7	26.8	
3-4	24.3	24.6		17.5	29.7	
5+	25.1	32.6		27.9	28.5	
Household typology[Ψ]			=0.101			<0.001
Older solo (single-person)	6.9	5.1		7.7	5.0	
Older-only (2+ person)	2.4	0.6		3.3	0.4	
Older with children only	1.2	0.0		1.1	0.4	
Older with adults only	6.1	2.9		9.3	1.3	
Multi-generation	83.4	91.4		78.7	92.9	

[Ψ] Household typology description

Older solo = older person living alone

Older-only (2+ person) = at least 2 older persons living together

Older with children only = older person living only with children aged under 18 years. Also referred to as skip-generation households

Older with adults only = older person living with one or more adults aged 18-49 years.

Multi-generation = older person living in a household with adult and children members

Table 5: Association of care giving with physical functioning - Adults[*]

	OR	[95% C	CI]	aOR	[95% C	CI]
Care giver						
No	1.00			1.00		
Yes	2.93	2.05	4.19	2.56	1.60	4.09
WOPs study group						
1	1.00			1.00		
2	0.44	0.26	0.71	0.43	0.24	0.76
3	0.33	0.20	0.54	0.63	0.35	1.12
4	0.19	0.12	0.32	0.33	0.18	0.59
Sex						
Male	1.00			1.00		
Female	0.30	0.19	0.46	0.21	0.13	0.35
Age group						
50-59	1.00			1.00		
60-69	0.68	0.45	1.04	0.82	0.37	1.81
70-79	0.34	0.20	0.59	0.40	0.15	1.03
80+	0.11	0.05	0.25	0.10	0.03	0.30
Marital Status						
Never married	1.00			1.00		
Married	0.85	0.57	1.29	0.76	0.46	1.27
Separated	1.02	0.20	5.15	1.08	0.20	5.73
Divorced	0.28	0.03	2.81	0.20	0.02	1.99
Widowed	0.75	0.44	1.30	1.66	0.87	3.17
Education level						
NFE/AEO	1.00			1.00		
6 years or less	1.63	1.10	2.42	1.63	1.05	2.50
More than 6 years	2.42	1.49	3.92	2.31	1.30	4.09
Occupational status						
Working	1.00			1.00		
Not working	0.19	0.09	0.44	0.38	0.14	1.02
HH Heads						
Self	1.00			1.00		
Spouse	0.93	0.61	1.44	1.33	0.77	2.31
Son/daughter	0.56	0.29	1.07	0.79	0.38	1.65
Other	0.89	0.52	1.52	0.91	0.49	1.68
Grant received						
None	1.00			1.00		
Disability grant	0.97	0.58	1.64	1.34	0.59	3.05
Old-Age grant	0.45	0.27	0.72	0.76	0.25	2.26
Wealth quintiles						
First	1.00			1.00		
Second	1.32	0.76	2.29	1.86	1.02	3.42
Third	1.66	0.96	2.86	2.05	1.12	3.74
Fourth	1.52	0.88	2.63	1.22	0.68	2.20
Fifth	1.03	0.60	1.77	1.00	0.54	1.83
Household typology						
Older solo (single-person)	1.00			1.00		
Older-only (2+ person)	0.63	0.27	1.47	0.67	0.19	2.43
Older with children only	0.65	0.16	2.67	0.58	0.11	3.08
Older with adults only	1.74	0.25	12.06	1.16	0.13	10.26
Multi-generation	0.71	0.32	1.56	0.60	0.21	1.78

[*] Other factors adjusted for in the model but not shown were self-perceived financial status, number of adults in household, number of children in household, and of non-resident household members. All these factors were not found to be significantly associated with health status.

Table 6: Association of care giving with physical functioning - Children●

	OR	[95%	CI]	aOR	[95%	CI]
Care giver						
No	1.00			1.00		
Yes	1.54	1.09	2.17	1.58	1.02	2.44
WOPs group						
1	1.00			1.00		
2	0.33	0.20	0.54	0.33	0.19	0.58
3	0.30	0.18	0.50	0.63	0.35	1.13
4	0.19	0.11	0.31	0.31	0.17	0.56
Sex						
Male	1.00			1.00		
Female	0.25	0.16	0.39	0.18	0.11	0.31
Age group						
50-59	1.00			1.00		
60-69	0.69	0.45	1.05	0.87	0.39	1.92
70-79	0.36	0.21	0.63	0.44	0.17	1.14
80+	0.13	0.06	0.30	0.11	0.04	0.36
Marital Status						
Never married	1.00			1.00		
Married	0.78	0.52	1.17	0.65	0.39	1.07
Separated	1.50	0.30	7.55	1.45	0.28	7.49
Divorced	0.37	0.04	3.75	0.20	0.02	1.81
Widowed	1.19	0.72	1.99	2.29	1.23	4.27
Education level						
NFE/AEO	1.00			1.00		
6 years or less	1.43	0.97	2.12	1.57	1.02	2.42
More than 6 years	2.19	1.35	3.54	2.42	1.36	4.29
Occupational status						
Working	1.00			1.00		
Not working	0.19	0.08	0.43	0.38	0.14	1.01
HH Heads						
Self	1.00			1.00		
Spouse	0.86	0.56	1.32	1.56	0.90	2.69
Son/daughter	0.42	0.22	0.81	0.68	0.32	1.41
Other	0.92	0.54	1.56	0.89	0.48	1.63
Grant received						
None	1.00			1.00		
Disability grant	0.92	0.55	1.55	1.47	0.64	3.36
Old-Age grant	0.43	0.26	0.71	0.73	0.25	2.15
Self-rated financial status						
Comfortable	1.00			1.00		
Moderate	1.76	1.04	2.97	2.13	1.18	3.82
Poor	1.23	0.76	2.00	1.26	0.71	2.21
Wealth quintiles						
First	1.00			1.00		
Second	1.36	0.79	2.36	1.78	0.97	3.28
Third	1.68	0.97	2.91	2.00	1.09	3.67
Fourth	1.41	0.81	2.44	1.10	0.61	1.99
Fifth	0.86	0.50	1.47	0.88	0.48	1.61
Household typology						
Older solo (single-person)	1.00			1.00		
Older-only (2+ person)	0.80	0.35	1.82	0.86	0.24	3.16
Older with children only	0.63	0.16	2.45	0.73	0.14	3.91
Older with adults only	1.37	0.19	10.16	1.17	0.13	10.51
Multi-generation	0.79	0.37	1.71	0.70	0.24	2.10

● Other factors adjusted for in the model but not shown were number of adults in household, number of children in household, and of non-resident household members. All these factors were not found to be significantly associated with health status.

Table 7: Association of care giving with Quality of life - Adults

	OR	[95%	CI]	aOR	[95%	CI]
Care giver						
No	1.00			1.00		
Yes	0.30	0.21	0.43	0.30	0.19	0.48
WOPs group						
1	1.00			1.00		
2	0.45	0.27	0.75	0.54	0.30	0.97
3	0.70	0.43	1.15	0.89	0.50	1.61
4	0.38	0.23	0.62	0.47	0.26	0.83
Sex						
Male	1.00			1.00		
Female	0.59	0.39	0.88	0.65	0.41	1.05
Age group						
50-59	1.00			1.00		
60-69	1.02	0.67	1.56	0.97	0.44	2.14
70-79	0.64	0.37	1.08	0.56	0.22	1.45
80+	0.19	0.09	0.42	0.17	0.05	0.52
Marital Status						
Never married	1.00			1.00		
Married	1.73	1.14	2.63	1.90	1.17	3.08
Separated	0.63	0.12	3.22	0.53	0.10	2.89
Divorced	0.07	0.01	0.75	0.05	0.00	0.63
Widowed	0.66	0.38	1.14	0.89	0.47	1.68
Education level						
NFE/AEO	1.00			1.00		
6 years or less	1.87	1.25	2.78	1.53	0.99	2.35
More than 6 years	2.36	1.46	3.80	1.49	0.85	2.60
Occupational status						
Working	1.00			1.00		
Not working	0.21	0.09	0.46	0.36	0.14	0.96
HH Heads						
Self	1.00			1.00		
Spouse	1.16	0.75	1.80	0.81	0.47	1.40
Son/daughter	0.48	0.25	0.92	0.62	0.30	1.28
Other	0.92	0.54	1.55	0.92	0.51	1.67
Grant received						
None	1.00			1.00		
Disability	1.23	0.74	2.05	1.52	0.68	3.42
Old Age	0.93	0.57	1.50	1.42	0.48	4.22
Self-rated financial status						
Comfortable	1.00			1.00		
Moderate	0.62	0.36	1.06	0.69	0.38	1.25
Poor	0.35	0.21	0.59	0.39	0.22	0.70
Wealth quintiles						
First	1.00			1.00		
Second	1.05	0.61	1.80	1.77	0.97	3.22
Third	1.55	0.91	2.66	1.97	1.09	3.55
Fourth	2.21	1.30	3.77	1.97	1.10	3.52
Fifth	1.71	1.00	2.91	1.80	0.98	3.27
Household typology						
Older solo (single-person)	1.00			1.00		
Older-only (2+ person)	0.64	0.28	1.45	0.82	0.24	2.88
Older with children only	1.94	0.47	8.06	2.71	0.49	15.00
Older with adults only	1.36	0.24	7.58	0.92	0.12	6.84
Multi-generation	0.95	0.43	2.09	1.04	0.37	2.95

Table 8: Association of care giving with Quality of life - Children

	OR	[95%	CI]	aOR	[95%	CI]
Care giver						
No	1.00			1.00		
Yes	0.63	0.45	0.89	0.78	0.51	1.18
WOPs group						
1	1.00			1.00		
2	0.65	0.40	1.06	0.78	0.44	1.36
3	0.75	0.46	1.23	0.87	0.49	1.55
4	0.43	0.26	0.70	0.51	0.29	0.90
Sex						
Male	1.00			1.00		
Female	0.65	0.43	0.98	0.78	0.48	1.25
Age group						
50-59	1.00			1.00		
60-69	1.06	0.70	1.60	0.96	0.43	2.12
70-79	0.64	0.37	1.08	0.56	0.22	1.44
80+	0.21	0.10	0.45	0.19	0.06	0.58
Marital Status						
Never married	1.00			1.00		
Married	1.86	1.23	2.82	2.19	1.35	3.55
Separated	0.38	0.07	1.99	0.32	0.06	1.75
Divorced	0.09	0.01	0.90	0.07	0.01	0.85
Widowed	0.44	0.26	0.75	0.55	0.30	0.99
Education level						
NFE/AEO	1.00			1.00		
6 years or less	1.98	1.33	2.93	1.55	1.01	2.38
More than 6 years	2.34	1.46	3.75	1.36	0.79	2.36
Occupational status						
Working	1.00			1.00		
Not working	0.25	0.11	0.57	0.37	0.14	0.99
HH Heads						
Self	1.00			1.00		
Spouse	1.19	0.77	1.84	0.64	0.38	1.10
Son/daughter	0.70	0.37	1.32	0.74	0.36	1.52
Other	0.86	0.51	1.47	0.92	0.51	1.65
Grant received						
None	1.00			1.00		
Disability grant	1.32	0.79	2.19	1.49	0.67	3.33
Old-Age grant	1.01	0.63	1.64	1.54	0.52	4.60
Self-rated financial status						
Comfortable	1.00			1.00		
Moderate	0.50	0.29	0.84	0.53	0.30	0.94
Poor	0.28	0.17	0.47	0.33	0.18	0.58
Wealth quintiles						
First	1.00			1.00		
Second	0.92	0.53	1.58	1.71	0.94	3.11
Third	1.51	0.88	2.57	1.90	1.05	3.42
Fourth	2.20	1.29	3.74	2.05	1.15	3.66
Fifth	2.05	1.20	3.49	1.99	1.10	3.60
Household typology						
Older solo (single-person)	1.00			1.00		
Older-only (2+ person)	0.54	0.24	1.21	0.76	0.22	2.63
Older with children only	2.32	0.54	10.02	2.86	0.51	16.14
Older with adults only	1.83	0.31	10.76	1.00	0.13	7.46
Multi-generation	0.99	0.44	2.24	1.05	0.36	3.05

References

ABODERIN, I. 2005. Changing family relationships in developing countries. *In:* JOHNSON, M. L., BENGSTON, V. L., COLEMAN, P. G. & KIRKWOOD, T. B. L. (eds.) *Age and ageing.* Cambridge: Cambridge University Press.

ARDINGTON, C., CASE, A. & HOSEGOOD, V. 2009. Labor Supply Responses to Large Social Transfers: Longitudinal Evidence from South Africa. *American Economic Journal: Applied Economics.*

ARDINGTON, C., CASE, A., ISLAM, M., LAM, D., LEIBBRANDT, M., MENENDEZ, A. & OLGIATI, A. 2010. The Impact of AIDS on Intergenerational Support in South Africa: Evidence From the Cape Area Panel Study. *Research on Aging,* 32**,** 97-121.

BENGTSON, V. L. 1975. Generation and family effects in value socialization. *American Sociological Review,* 40**,** 358-371.

BOWLING, A., SEETAI, S., MORRIS, R. & EBRAHIM, S. 2007. Quality of life among older people with poor functioning. The influence of perceived control over life. *Age and Ageing,* 36**,** 310–315.

CASE, A. & DEATON, A. 1996. Large cash transfers to the elderly in South Africa. National Bureau of Economics Working Paper No. 5572.

CHEPNGENO-LANGAT, G., FALKINGHAM, J., MADISE, N. J. & EVANDROU, M. 2010. Socioeconomic Differentials Between HIV Caregivers and Noncaregivers: Is There a Selection Effect? A Case of Older People Living in Nairobi City Slums *Research on Aging,* 32**,** 67-96.

CONNOLLY, M. & MONASCH, R. 2003. *Africa's orphaned generation,* New York, UNICEF.

EVANDROU, M. & FALKINGHAM, J. 2004. Demographic change in Europe: implications for future family support for older people. *In:* KREAGER, P. (ed.) *Ageing without children: European and Asian perspectives.* New York: Berghahn.

GIARRUSSO, R., SILVERSTEIN, M., GANS, D. & BENGSTON, V. L. 2005. Ageing parents and adult children: new perspectives on intergenerational relationships. *In:* JOHNSON, M. L., BENGSTON, V. L., COLEMAN, P. G. & KIRKWOOD, T. B. L. (eds.) *Age and ageing.* Cambridge: Cambridge University Press.

GRINSTEAD, L. N., LEDER, S., JENSEN, S. & BOND, L. 2003. Review of research on the health of caregiving grandparents. *Journal of Advanced Nursing,* 44**,** 318–326.

HERBST, A. J., COOKE, G. S., BARNIGHAUSEN, T., KANYKANY, A., TANSER, F. & NEWELL, M. L. 2009. Adult mortality and antiretroviral treatment roll-out in rural KwaZulu-Natal, South Africa. *Bulletin of the World Health Organisation,* 87**,** 754-62.

HILL, C., HOSEGOOD, V. & NEWELL, M.-L. 2008. Children's care and living arrangements in a high HIV prevalence area in rural South Africa. *Vulnerable Children and Youth Studies,* 3**,** 65-77.

HOSEGOOD, V., BENZLER, J. & SOLARSH, G. C. 2006. Population mobility and household dynamics in rural South Africa: implications for demographic and health research. *Southern African Journal of Demography,* 10**,** 43-67.

HOSEGOOD, V., FLOYD, S., MARSTON, M., HILL, C., MCGRATH, N., ISINGO, R., CRAMPIN, A. & ZABA, B. 2007. The effects of high HIV prevalence on orphanhood and living arrangements of children in Malawi, Tanzania, and South Africa. *Popul Stud (Camb),* 61**,** 327-36.

HOSEGOOD, V. & TIMÆUS, I. M. 2005. Household Composition and Dynamics in KwaZulu Natal, South Africa: Mirroring Social Reality in Longitudinal Data Collection. *In:* ETIENNE VAN DER WALLE (ed.) *African Households. Census data.* New York: M.E. Sharpe Inc.

HOSEGOOD, V. & TIMÆUS, I. M. 2006. HIV/AIDS and older people in South Africa. *In:* COHEN, B. & MENKEN, J. (eds.) *Aging in sub-Saharan Africa: recommendations for furthering research.* Washinton, D.C.: The National Academic Press.

HOULIHAN, C. F., BLAND, R. M., MUTEVEDZI, P. C., LESSELLS, R. J., NDIRANGU, J., THULARE, H. & NEWELL, M. L. 2010. Cohort Profile: Hlabisa HIV Treatment and Care Programme. *International Journal of Epidemiology*.

ICE, G. H., YOGO, J., HEH, V. & JUMA, E. 2010. The Impact of Caregiving on the Health and Well-being of Kenyan Luo Grandparents. *Research on Aging,* 32**,** 40-66.

ICE, G. H., ZIDRON, A. & JUMA, E. 2008. Health and health perceptions among Kenyan grandparents. *J Cross Cult Gerontol,* 23**,** 111-29.

JAHN, A., FLOYD, S., CRAMPIN, A. C., MWAUNGULU, F., MVULA, H., MUNTHALI, F., MCGRATH, N., MWAFILASO, J., MWINUKA, V., MANGONGO, B., FINE, P. E., ZABA, B. & GLYNN, J. R. 2008. Population-level effect of HIV on adult mortality and early evidence of reversal after introduction of antiretroviral therapy in Malawi. *Lancet,* 371**,** 1603-11.

KAUTZ, T., BENDAVID, E., BHATTACHARYA, J. & MILLER, G. 2010. AIDS and declining support for dependent elderly people in Africa: retrospective analysis using demographic and health surveys. *BMJ,* Online first.

KINSELLA, K. & FERREIRA, M. 1997. Ageing Trends: South Africa. Washington: U.S. Department of Commerce, Bureau of the Census.

KNODEL, J., WATKINS, S. & VANLANDINGHAM, M. 2003. AIDS and older persons: an international perspective. *Journal of Acquired Immune Deficiency Syndrome,* 33 S153-65.

KOWAL, P., KAHN, K., NG, N., NAIDOO, N., ABDULLAH, S., BAWAH, A., BINKA, F., CHUC, N. T., DEBPUUR, C., EZEH, A., XAVIER GOMEZ-OLIVE, F., HAKIMI, M., HIRVE, S., HODGSON, A., JUVEKAR, S., KYOBUTUNGI, C., MENKEN, J., VAN MINH, H., MWANYANGALA, M. A., RAZZAQUE, A., SANKOH, O., KIM STREATFIELD, P., WALL, S., WILOPO, S., BYASS, P., CHATTERJI, S. & TOLLMAN, S. M. 2010. Ageing and adult health status in eight lower-income countries: the INDEPTH WHO-SAGE collaboration. *Glob Health Action,* 3.

KYOBUTUNGI, C., EGONDI, T. & EZEH, A. 2010. The health and well-being of older people in Nairobi's slums. *Glob Health Action,* 3.

LOWENSTEIN, A. 2005. Global ageing and challenges to families. *In:* JOHNSON, M. L., BENGSTON, V. L., COLEMAN, P. G. & KIRKWOOD, T. B. L. (eds.) *Age and ageing.* Cambridge: Cambridge University Press.

MERLI, G. M. & PALLONI, A. 2006. The HIV/AIDS epidemic, kin relations, living arrangements, and the African elderly in South Africa. *In:* COHEN, B. & MENKEN, J. (eds.) *Aging in sub-Saharan Africa: recommendations for furthering research.* Washinton, D.C.: The National Academic Press.

MINKLER, M. & FULLER-THOMSON, E. 1999. The health of grandparents raising grandchildren: results of a national study. *American Journal of Public Health,* 89**,** 1384-1389.

NGUYEN, N. & HOLODNIY, M. 2008. HIV infection in the elderly. *Clinical Interventions in Aging,* 3**,** 453-72.

NYIRENDA, M., HOSEGOOD, V., BÄRNIGHAUSEN, T. & NEWELL, M. L. 2007. Mortality levels and trends by HIV serostatus in rural South Africa. *AIDS,* 21 Suppl 6**,** S73-9.

NYIRENDA, M. & NEWELL, M.-L. 2010. Orphanhood and HIV risk in rural KwaZulu-Natal *In:* NZIMANDE, N. B. (ed.) *State of the population of KwaZulu-Natal: demographic profile and development indicators* Durban: Dept of Social Development/UNFPA.

PHILLIPSON, C. 2005. The political economy of old age. *In:* JOHNSON, M. L., BENGSTON, V. L., COLEMAN, P. G. & KIRKWOOD, T. B. L. (eds.) *Age and ageing.* Cambridge: Cambridge University Press.

PHILLIPSON, C., BERNARD, M., PHILLIPS, J. & OGG, J. 1998. The family and community life of older people: household composition and social networks in three urban areas. *Ageing & Society,* 18**,** 259-289.

RICHTER, L. M. & DESMOND, C. 2008. Targeting AIDS orphans and child-headed households? A perspective from national surveys in South Africa, 1995-2005. *AIDS Care,* 20**,** 1019-1028.

SCHRÖDER-BUTTERFILL, E. 2004. Inter-generational family support provided by older people in Indonesia. *Ageing & Society,* 24**,** 497-530.

SHISANA, O., REHLE, T., SIMBAYI, L. C., ZUMA, K., JOOSTE, S., PILLAY-VAN-WYK, V., MBELLE, N., ZYL, J. V., PARKER, W., ZUNGU, N. P., PEZI, S. & AND THE SABSSM III IMPLEMENTATION TEAM 2009. South African national HIV prevalence, incidence, behaviour and communication survey 2008: A turning tide among teenagers? Cape Town: HSRC Press.

SSENGONZI, R. 2007. The plight of older persons as caregivers to people infected/affected by HIV/AIDS: evidence from Uganda. *Journal of Cross Cultural Gerontology,* 22**,** 339-53.

SSENGONZI, R. 2009. The impact of HIV/AIDS on the living arrangements and well-being of elderly caregivers in rural Uganda. *AIDS Care,* 21**,** 309-14.

STATACORP 2009. Stata: Release 11. Statistical Software. 11.0 ed. College Station, TX: StataCorp LP.

TANSER, F., BÄRNIGHAUSEN, T., COOKE, G. S. & NEWELL, M.-L. 2009. Localized spatial clustering of HIV infections in a widely disseminated rural South African epidemic. *International Journal of Epidemiology,* 38**,** 1008-1016.

TANSER, F., HOSEGOOD, V., BÄRNIGHAUSEN, T., HERBST, K., NYIRENDA, M., MUHWAVA, W., NEWELL, C., VILJOEN, J., MUTEVEDZI, T. & NEWELL, M.-L. 2007. Cohort Profile: Africa Centre Demographic Information System (ACDIS) and population-based HIV survey. *International Journal of Epidemiology***,** 1-6.

TANSER, F., HOSEGOOD, V., BÄRNIGHAUSEN, T., HERBST, K., NYIRENDA, M., MUHWAVA, W., NEWELL, C., VILJOEN, J., MUTEVEDZI, T. & NEWELL, M.-L. 2008. Cohort Profile: Africa Centre Demographic Information System (ACDIS) and population-based HIV survey. *International Journal of Epidemiology,* 37**,** 956-62.

U.S. CENSUS BUREAU 2005. Mid-year population estimates. *International Population Database.* 26-08-2008 ed.

UNAIDS 2010. Global report: UNAIDS report on the global AIDS epidemic 2010. Geneva: Joint United Nations Programme on HIV/AIDS (UNAIDS) and World Health Organization (WHO).

UNITED NATIONS 2002. World population ageing: 1950-2050. New York: Department of Economic and Social Affairs, United Nations.

URASSA, M., BOERMA, J. T., NG'WESHEMI, J. Z. L., ISINGO, R., SCHAPINK, D. & KUMOGOLA, Y. 1997. Orphanhood, child fostering and the AIDS epidemic in rural Tanzania. *Health Transition Review,* 7**,** 141-153.

VELKOFF, V. A. & KOWAL, P. R. 2006. Aging in sub-Saharan Africa: the changing demography of the region. *In:* COHEN, B. & MENKEN, J. (eds.) *Aging in sub-Saharan Africa: recommendations for furthering research.* Washinton, D.C.: The National Academic Press.

WALLRAUCH, C., BÄRNIGHAUSEN, T. & NEWELL, M.-L. 2010. HIV prevalence and incidence in people 50 years and older in rural South Africa. *South African Medical Journal,* 100**,** 812-814.

WHO. *Health statistics and health information systems* [Online]. Available: http://www.who.int/healthinfo/systems/sage/en/index1.html [Accessed 01 March 2011.

WHO 2004. *ICD-10: International statistical classification of diseases and related health problems,* Geneva, World Health Organization.

WHO 2010. Measuring health and disability: manual for WHO Disability Assessment Schedule (WHODAS 2.0) *In:* ÜSTÜN, T., KOSTANJSEK, N., CHATTERJI, S. & REHM, J. (eds.). Geneva: World Health Organization.

WHOQOL GROUP 1993. Study protocol for the World Health Organization project to develop a Quality of life assessment instrument (WHOQoL). *Quality of Life Research,* 2**,** 153-159.

ZIMMER, Z. & DAYTON, J. 2003. The Living Arrangements of Older Adults in Sub-Saharan Africa in a Time of HIV/AIDS. No 169. New York: Population Council.