The dynamic role of household structure on child mortality in southern and eastern sub-Saharan Africa

Ashira Menashe-Oren[1], Philippe Bocquier[1, 2], Carren Ginsburg[2], Yacouba Compaore[1, 3] and Mark Collinson[2]
[1]Université Catholique de Louvain, [2]University of Witwatersrand, [3]Univeristé de Ouagadougou

Introduction

Factors associated with mortality decline include increases in maternal education, improved sanitation, and better access to medical interventions (Akinyemi, Afolabi Bamgboye, & Ayeni, 2012). However, other factors are also likely at play. In this study, we consider the role of household structure in child mortality in sub-Saharan Africa (SSA), where child mortality remains high in compared to other regions of the world (You et al., 2015). Households are the centre of multiple processes including childbearing and health care. They protect their members using psychological, social and economic resources. It is not surprising then to consider them as important for children. Children are dependent on kin or other adults they live with, for essential care, economic support and socialisation (Sear & Coall, 2011). Commonly parents provide these resources, namely time and money, both of which are invaluable to child wellbeing (Thomson, Hanson, & Mc Lanahan, 1994). Thus, considering the presence of parents and other household members in children's everyday life is essential. In this study, we delimit households to individuals who live in the same residence, de facto, whether kin or not. This builds on the idea that co-residents are present in the day-to-day life of children. It does not mean however that non-household or de jure members do not affect child well-being.

Previous research has mostly focused on the association between household composition and child survival (an ultimate indicator of health). Composition refers to the presence of specific individuals in the household such as grandparents or siblings, whereas household structure refers to features of the household such as sex of household head, or whether the household is extended laterally or vertically. The little evidence on household structure and child health and mortality suggests that in some settings, like Nigeria, children in nuclear and three-generational households tend to be worse off than in laterally extended households (Gage, Sommerfelt, & Piani, 1997). In contrast, children post- infancy in extended family households in rural sub-Saharan Africa face a higher risk of death (Akinyemi, Chisumpa, & Odimegwu, 2016). What may actually be detrimental to child survival is not the *status*, but rather the instability, or *transition* from one household structure to another (Lawson & Gibson, 2018; Lee & McLanahan, 2015).

In this study, we examine structure based on the number of household members, by age and sex. This structure is essentially the sum of all the compositional effects such as the number of siblings and the presence of grandparents, but it does not account for kin relations. Rather, it indicates the presence of people, women or men, young or old, living with a child. Moreover, we examine household structure as an elastic entity. Households are dynamic and vary over time – older siblings transition into adulthood and may leave the household, younger siblings are born, parents may divorce, relatives may stay for extended periods of time. Yet little research considers these changes over time. Using longitudinal data, we can account for stability of the household, and examine de facto household structure at the time of a child's death – rather than at the time of data collection, as done with survey data. Longitudinal data also reduces selectivity, for example by including children whose mothers may have died (Lloyd & Desai, 1992).

Data and methodology

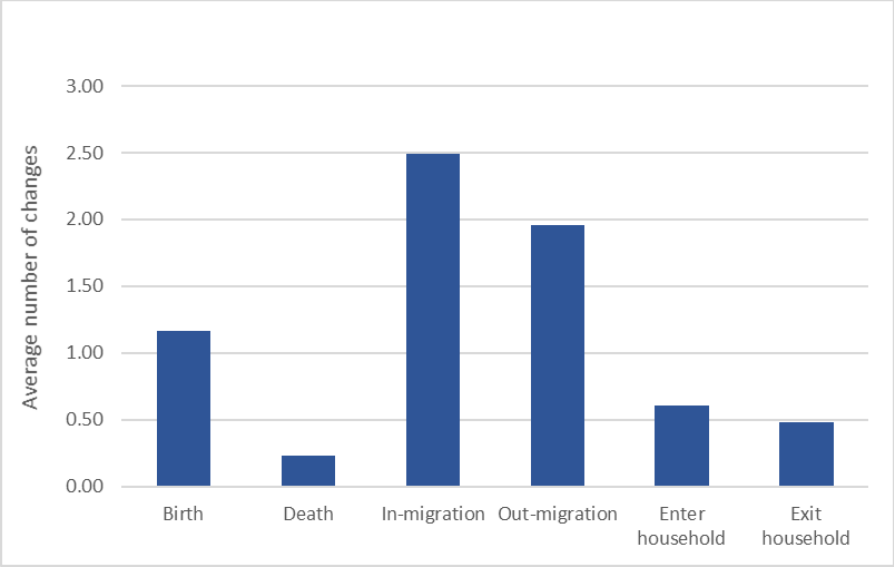
We examine the effect of household structure on child mortality between 1990 and 2016 in five countries in south and eastern sub-Saharan Africa using readily available data from sixteen Health and Demographic Surveillance Systems (HDSS) available through the INDEPTH network (INDEPTH, 2017). The HDSS cover entire populations in delineated areas, and follow demographic events of these populations including births, deaths and migrations. We pool the data from all sites, to create a dataset that includes 625,048 under-five year olds, in 259,281 households.

We use three measures of household structure: household size (the total number of people living with a child), number of members by age and sex and a typology of household structure (eg. With only one female adult, or with multiple elderly dependents). We use Cox proportional hazard models, controlling for site and period effects, to evaluate the impact of household structure on under-five mortality. By controlling for site-periods in the model we essentially capture the non-observed variation between the HDSSs.

Preliminary Results

On average, children under five in south and eastern Africa live in households of 6.3 members, including themselves. These households generally also have a relatively high number of under-fifteen year old children, averaging 4.2 across sites. In the two urban sites, households are smaller, averaging 3.6 in Nairobi and 4.6 in Harar. We find that on average across the HDSS sites a child experiences six changes in household structure before he reaches age five. These changes are mostly through in- and out-migration (Figure 1). However, births also contribute considerably to changes in the household structure.

Figure 1: Average number of changes in household composition with under-five year old children by type of event

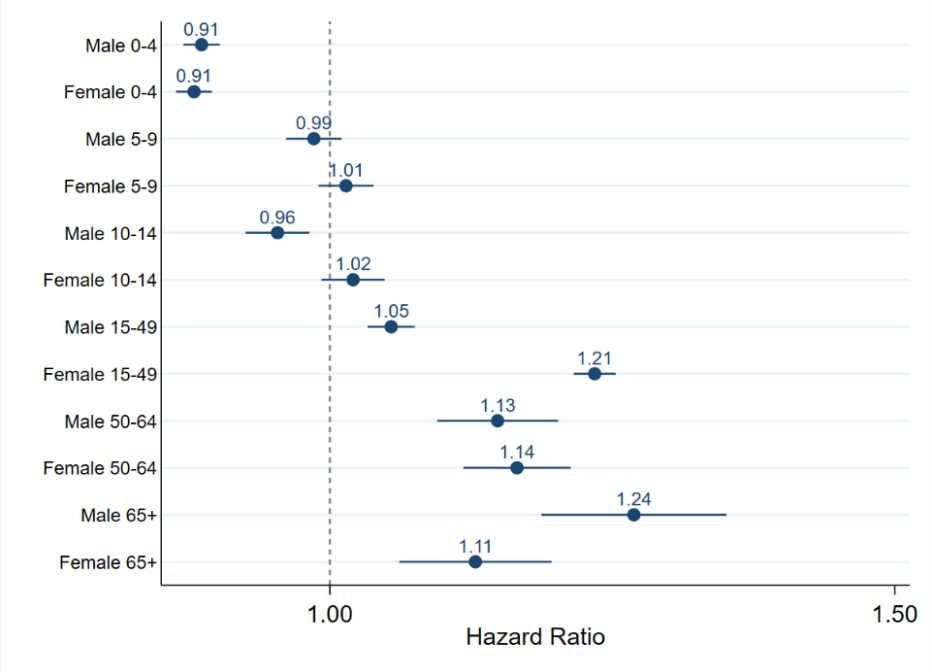


When we consider the relationship between household structure and child risk of death using Cox models and controlling for index child sex and HDSS site and years, we find that the presence of under five year olds, regardless of sex, reduces the risk of mortality (Figure 2). In contrast, presence of children aged 5-9

does not seem to be related to child mortality. Male young adolescents, aged 10-14, marginally reduce the risk of under-five mortality by 4%, or between 1% and 6% (HR: 0.96, 95% CI: 0.94-0.99). This is not the case for female young adolescents in the household, for whom we cannot conclude an effect on child survival. Overall, the effects of 5-14 year olds members of the household are negligible.

When we consider adults, the strongest effect is the presence of a female between ages 15-49 in the household, including mothers - the HR is 1.21 and the confidence intervals are narrow (Figure 2). For every additional working aged women in the household, the risk of child death increases by at least 20%. This finding is contrary to expectations, but may be explained by two scenarios. One, an extra woman of reproductive ages in the household could be indicative of polygynous marriages, where resources may be stretched thin, and rivalries may exist. Two, an extra woman in the household could be indicative of a single mother who has been absorbed into the household, and whose status, with poorer socioeconomic grounding, may impact the household. The HR of the presence of men aged 65 and above is similarly high to that of women aged 15-49, but the confidence intervals are much wider. We conclude that over 65 year olds in the household can be unfavourable for child survival, whether the elder person is male or female. Having older adults in the household who are economically dependent, and possibly also in poor health, means that there is competition with under-five year olds for resources and care. In further analysis, where we examine child survival according to a typology of household structures (results not shown), we find that in households of three generations or with multiple adults of both sexes and other children, under-five year olds face higher risk of death as compared to households with a couple with up to four children in the household.

Figure 2: Association between household size (excluding index child), and child mortality ($_5q_0$) across all sites



Note: Exponentiated coefficients with 95% confidence intervals; 0-4 year olds does not include the index child

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