The more the merrier? Accounting for the dynamic role of household composition in child mortality in sub-Saharan Africa

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Introduction

Households are the backbone of societies. They are at the centre of a myriad of processes including childbearing, labour force participation, consumption and health care. Understanding the dynamics of household composition is thus important, yet little research has examined the implications of household structure in sub-Saharan Africa. Furthermore, research that does refer to households often pertains to them as static even though households are notably elastic - changing in size and composition due to births, deaths and migrations, as well as marriages, visitors and temporary absences. Research addressing shifts in household composition have found for example that children experience considerable household instability (Raley et al. 2019), that parental migration and union dissolution are more likely to change household composition than parental death (Gaydosh 2015), or that smaller households are related to the presence of orphans (Weinreb et al. 2008). Households are determined by both biological and demographic constraints relating to the number and type of persons (often relatives), but also by economic constraints including the availability of resources (Burch 1979; Winters et al. 2009).

In the 1990s the average household size in developing countries was five - with little variation between regions of the world. In some places the household size has since declined – though there is limited evidence of convergence to a nuclear household system in sub-Saharan Africa (Bongaarts 2001). Differences in household size and composition could therefore play a role in shaping child development and health beyond parental effects. Indeed, the presence of a related adult in the household has been found to have a protective effect by reducing child mortality dependent on the adult relationship to child (Houle et al. 2013; Sear et al. 2002).

Family structure can impact health, nutrition and survival of children (Desai 1992; Lloyd and Desai 1992; Sastry 1996; Sear et al. 2002). The presence of parents has been found to be critical for children (Madhavan et al. 2017; Townsend et al. 2002). With extended kin, the effects could be diverse. On the one hand, older adults, especially grandmothers, have been found to be a support mechanism for orphaned children in sub-Saharan Africa (Madhavan et al. 2012; Zimmer and Dayton 2005). On the other hand, co-residence with older persons is relatively common in sub-Saharan Africa, and increases the proportion of dependents in the household, increasing demand for resources (United Nations 2017). Co-residence with an uncle may be an extra source of financial support and discipline on the one hand, but on the other bring to the household

cousins who could be role models or compete with the children for attention. Each person in the household could bring with them constraints or opportunities to his/her relationship with the child (Madhavan et al. 2017).

We examine the relationship between household composition and child mortality in sub-Saharan Africa in particular since under-five mortality remains highest in this region of the world (UN IGME 2018; You et al. 2015). Furthermore, sub-Saharan Africa has relatively larger households and proportions of dependents (United Nations 2017). Understanding the mechanisms that drive child mortality, including living arrangements, is an important step in forming healthcare polices and reducing child mortality.

Based on the literature, we hypothesize that in sub-Saharan Africa, a) the larger the household size, the lower the under-five mortality risk for the child, b) the presence of the mother in the household has a stronger effect on under-five mortality than the presence of a father, c) the higher the proportion of women in the household the lower under-five mortality, and d) children in households with adolescent women or women over age 60 (grandmothers) have lower risk of mortality.

Methodology

It is important to note here that what we call "household" broadly refers to domestic organization, or homesteads. Households are not a universal category and can be diverse and complex arrangements of sharing rooves, space and meals (Russell 1993). Moreover, the definition of household can differ across sites. However, in all sites, the household indicates the presence of people - mostly of relatives – who may be available to help with child care, with bringing resources to the residential unit and essentially help in preventing child mortality. Thus when we refer to household effects we are concerned with both structure (generational contours and extent of nucleation) and composition (the individuals in household- such as siblings, aunts) (Madhavan et al. 2017).

We analyse the impact of household composition on all-cause under-five mortality using data from 27 Health and Demographic Surveillance Sites (HDSSs) in sub-Saharan Africa from 1990 to 2015. The data is freely available from the International Network for Demographic Evaluation of Population and Their Health (INDEPTH) iShare (INDEPTH 2017; Sankoh and Byass 2012) and includes details on all births, deaths and migrations in the populations under surveillance. The data offers a unique opportunity to examine household composition as a time-varying component, following the changes in households and the balance of the population by residential unit. We estimate size of household, the ratio of men to women in the household, as well as the presence of specific members who we would expect have an influence on child mortality through the care they may give, such as grandmothers.

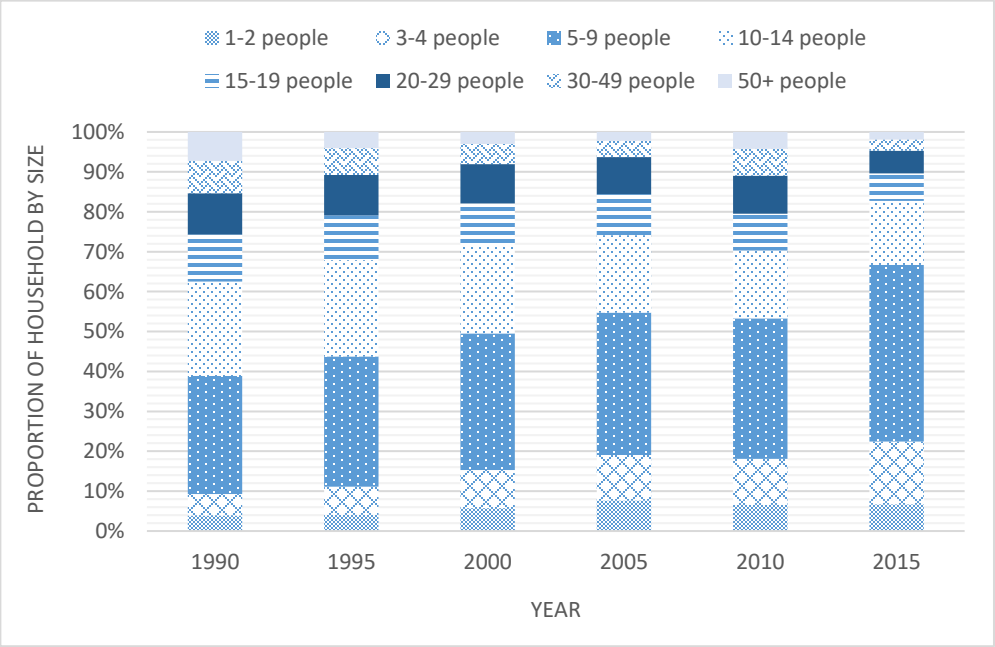
As part of the household composition we also examine maternal indicators of presence in the household (which shifts as she migrates or dies). The available data do not include identifiers of the father, but it is possible to deduce who the father is based on his age range. Since age of mother at birth of child is known, and age at fatherhood is higher by around 10 years in SSA (Schoumaker 2019), we can identify potential fathers. An algorithm to identify fathers based on this assumption can be tested on data from a couple of HDSS for which we have identified fathers. We can then also test the presence of the father in the household.

Our analysis is conducted using Cox proportional hazard models controlling for site and period effects, to examine a number of household compositional and structural effects on under-five mortality in sub-Saharan Africa.

Preliminary Findings

Based on a sample of the pooled data, of 1000 households across the 27 sites in sub-Saharan Africa, we firstly examine the shift of household size over time (Figure 1). Although all sites do not cover the whole period, the impression from the figure is that of increasingly smaller households. In 1990 10% of households had up to four members, while in 2015 22% of households have up to four members. Larger households follow inverse trends, with households of over 15 members forming 37% of household sizes across the HDSS in 1990 and declining by 20% in 2015.

Figure 1: Proportion of (Households) Residential Units



Using a simple model with 29,000 children under age five (5%-sample of our full dataset), we find that the risk of child mortality declines with an increase in household size. Furthermore, when the sex ratio of the household is higher (with more males), we find an increase in the risk of child mortality. However, the confidence intervals for both household size and sex ratio are large, suggesting insignificant effects on child mortality. These very preliminary results confirm our hypotheses but we clearly need to expand our analysis to the full dataset to confirm these results. We will also include more covariates in the models, indicating presence of grandmothers or whether the father has migrated out of site alone, as well as the usual factors found to affect child mortality such as maternal age at birth and presence of siblings.

References

Bongaarts, J. (2001). Household size and composition in the developing world in the 1990s. *Population Studies*, *55*(3), 263–279. doi:10.1080/00324720127697

Burch, T. K. . (1979). Household and Family Demography : A Bibliographic Essay. *Population Index*, *45*(2), 173–195.

Desai, S. (1992). Children at Risk : The Role of Family Structure in Latin America and West Africa. *Population and Development Review*, *18*(4), 689–717.

Gaydosh, L. (2015). Childhood Risk of Parental Absence in Tanzania. *Demography*, *52*(4), 1121–1146.

Houle, B., Stein, A., Kahn, K., Madhavan, S., Collinson, M., Tollman, S. M., & Clark, S. J. (2013). Household context and child mortality in rural South Africa: The effects of birth spacing, shared mortality, household composition and socio-economic status. *International Journal of Epidemiology*, *42*(5), 1444–1454. doi:10.1093/ije/dyt149

INDEPTH. (2017). INDEPTH i-Share Data Repository. http://www.indepth-ishare.org/index.php/home

Lloyd, C. B. ., & Desai, S. (1992). Children's living arrangements in developing countries. *Population Research and Policy Review*, *11*, 193–216.

Madhavan, S., Myroniuk, T., Kuhn, R., & Collinson, M. (2017). Household structure vs. composition: Understanding gendered effects on educational progress in rural South Africa. *Demographic Research*, *37*(December), 1891–1916. doi:10.4054/DemRes.2017.37.59

Madhavan, S., Schatz, E., Clark, S. J., & Collinson, M. (2012). Child mobility, maternal status, and household composition in rural South Africa. *Demography*, *49*(2), 699–718. doi:10.1007/s13524-011-0087-3

Raley, R. K., Weiss, I., Reynolds, R., & Cavanagh, S. E. (2019). Estimating Children's Household Instability Between Birth and Age 18 Using Longitudinal Household Roster Data. *Demography*, 1957–1973. doi:10.1007/s13524-019-00806-1

Russell, M. (1993). Are Households Universal ? On Misunderstanding Domestic Groups in Swaziland.

Development and Change, *24*, 755–785.

Sankoh, O., & Byass, P. (2012). The INDEPTH network: Filling vital gaps in global epidemiology. *International Journal of Epidemiology*, *41*(3), 579–588. doi:10.1093/ije/dys081

Sastry, N. (1996). Community Characteristics , Individual and Household Attributes , and Child Survival in Brazil. *Demography*, *33*(2), 211–229.

Schoumaker, B. (2019). Male Fertility Around the World and Over Time: How Different is it from Female Fertility? *Population and Development Review*, *0*, 1–2. doi:10.1111/padr.12273

Sear, R., Steele, F., McGregor, I. A., & Mace, R. (2002). The effects of kin on child mortality in rural Gambia. *Demography*, *39*(1), 43–63. doi:10.1353/dem.2002.0010

Townsend, N., Madhavan, S., Tollman, S., Garenne, M., & Kahn, K. (2002). Children's residence patterns and educational attainment in rural South Africa, 1997. *Population Studies*, *56*(2), 215–225.

UN IGME. (2018). *Levels and Trends in Child Mortality, Report 2018*. New York.

United Nations. (2017). Household Size and Composition Around the World 2017. http://www.un.org/en/development/desa/population/publications/pdf/ageing/household_size_and_composition_around_the_world_2017_data_booklet.pdf

Weinreb, A., Gerland, P., & Fleming, P. (2008). Hotspots and Coldspots: Household and village-level variation in orphanhood prevalence in rural Malawi. *Demographic Research*, *19*(32), 1217.

Winters, P., Stecklov, G., & Todd, J. (2009). Household structure and Short-Run economic change in nicaragua. *Journal of Marriage and Family*, *71*(3), 708–726.

You, D., Hug, L., Ejdemyr, S., Idele, P., Hogan, D., Mathers, C., et al. (2015). Global, regional, and national levels and trends in under-5 mortality between 1990 and 2015, with scenario-based projections to 2030: A systematic analysis by the un Inter-Agency Group for Child Mortality Estimation. *The Lancet*, *386*(10010), 2275–2286.

Zimmer, Z., & Dayton, J. (2005). Older adults in sub-Saharan Africa living with children and grandchildren. *Population studies*, *59*(3), 295–312.