# Childlessness and Human Development in sub-Saharan Africa between 1986 and 2016

*Florianne C. J. Verkroost, Nuffield College, Department of Sociology, University of Oxford*
*Christiaan W. S. Monden, Nuffield College, Department of Sociology, University of Oxford*

In the 1980s, various authors hypothesised that childlessness (i.e. the share of individuals who do not have own children) is associated with human development (i.e. the richness, freedom, opportunities and well-being experienced in human life) (Poston et al., 1985; Poston and El-Badry, 1987; Poston and Trent, 1982). At the early stages of development, technological and medical advancements improve health and nutrition and reduce the prevalence of (sexually transmitted) diseases, which in turn leads to decreasing infertility-related involuntary childlessness (Baudin and De La Croix, 2017). These same advancements allow for contraception, on the other hand, giving especially women more control over their childbearing outcomes (Casterline and Han, 2017). At the later stages of human development, medical advancements may still reduce infertility further, but other forces push up childlessness. Increasing educational attainment and female labour market participation as well as urbanisation (Lesthaeghe, 2007) offer particularly women more varied opportunities and social roles besides motherhood, thereby increasing childlessness as a deliberate choice and through postponement of marriage/cohabitation and childbirth (Poston et al., 1983). At high levels of development, as relatively more women become higher educated and work in higher status occupations, an increasing number of lower socio-economic status (SES) men may be left behind on the mating market and remain childless by circumstance (Kreyenfeld and Konietzka, 2017). Overall, we may expect to observe a U-shaped pattern in the relationship between childlessness and human development as medical advancements precede socio-economic advancements in the stages of development (Poston and Trent, 1982).

Previous studies on Egypt (Poston and El-Badry, 1987), Mexico (Poston et al., 1985) and a range of different countries throughout the world (Poston and Trent, 1982) have found some support for the hypothesis that development is negatively related with involuntary childlessness and positively related with voluntary childlessness (Poston et al., 1985; Poston and El-Badry, 1987; Poston and Trent, 1982). However, up to date very little is known about the association between childlessness and human development in sub-Saharan Africa, a region that has seen substantial improvements in human development over the last decades. Research on sub-Saharan Africa has focused on infertility prevalence (Casterline and Han, 2017; Inhorn and Patrizio, 2015; Larsen, 2003; Rutstein and Shah, 2004) and trends (Mascarenhas et al., 2012), but has not addressed the trends in childlessness more broadly or in relation to human development. By exploiting the large sample sizes of the Demographic Health Surveys (DHS), we can produce the first estimates of overall childlessness in sub-Saharan Africa and distinguish between involuntary, voluntary, and circumstantial childlessness; and their relationship with human development.

Most studies on childlessness so far have focused on women (Dyer et al., 2004). Especially for sub-Saharan Africa, little is known about male childlessness. We aim to fill this empirical void. Moreover, relationships between (types of) childlessness and human development may be different for men and women. We expect that the association between voluntary childlessness and human development is particularly strong among women due to increased educational and occupational attainment and autonomy (Becker, 1960), whereas the association between circumstantial childlessness and human development might be particularly strong among men if relatively more low-SES men remain single.

Finally, we add to the field by examining the relationship between childlessness and human development using indicators of human development on the sub-national level. Most studies focus either on the individual level within countries or the macro level and then use countries as the unit of analysis (Baudin and De La Croix, 2017; Poston and Trent, 1982). Levels of human development

vary significantly within countries and this variation is lost in most macro studies. We use recently developed indicators for human development at the regional level (Smits and Permanyer, 2018) to study the relationship between childlessness and human development across a wider range of human development and hereby take into account intra-country variation.

To sum, we use DHS to examine the relationship between childlessness and human development in sub-Saharan Africa. More specifically, we aim to answer the following questions. First, is there a U-shaped association between childlessness and human development on the national and regional level in sub-Saharan Africa? Second, how does this association differ across types of childlessness (i.e. involuntary, voluntary and circumstantial childlessness)? Third, to what extent are there gender differences with respect to the first two questions? We define childlessness as "never having born any biological children". We want our sample of involuntarily childless individuals to include all infertile individuals, even those who have coped with infertility through adoption or stepchildren.

## Data

We analyse data from 249 individual-level standard DHS surveys between 1986 and 2016 throughout 33 sub-Saharan African countries.[1] Our sample is limited to those aged 40 and older. While some men and women will have their first child after age 40, this group is very small. Setting a higher cut-off age (i.e. 45) would limit the sample size too much. Sensitivity analysis suggest our results are robust to this cut-off. We aggregate all data to regional-level averages or percentages. Our sample includes 1,268 unique region-year combinations for women and 853 for men. Although some region-year combinations include only a small number of individuals, we do not impose any sample size restrictions because our results prove robust against these small sample sizes. Childlessness is still relatively uncommon: 2.8% among women and 3.4% among men across our region-year observations. Childlessness is aggregated to the regional level based on an individual-level dichotomous variable for ever having given a live birth. We do not include adopted and stepchildren because we would underestimate infertility, which is still the main reason for childlessness in sub-Saharan Africa. Over-reporting of fertility by women and under-reporting of fertility by men are minimised by examining coherency among responses to an extensive set of related fertility questions. The types of childlessness represent the percentages of individuals in every region-year who are involuntarily, voluntarily or circumstantially childless. This classification is based on responses to a number of questions about marital status and fertility preferences and ideals. Generally, involuntary childlessness usually relates to infertility; voluntary childlessness is defined as the choice not to want any children; and circumstantial childlessness results from not having been able to find a mating partner. We further add indicators for human development on the regional and national levels as obtained from the Subnational Human Development Index (Smits and Permanyer, 2018) and the Human Development Index (UNDP, 2015), respectively, which are comprised of indicators for life expectancy, education and gross national income per capita (UNDP, 2016). Currently, the HDI and SHDI go back until 1990 and 1995, respectively, but once we have obtained historical HDI that goes further back, we include these year-specific indicators not at the year of the survey but at the year where the average age of all individuals in a particular region-year combination was 20, because fertility behaviour and decision-making is more relevant around this age than at ages over 40. Our preliminary sensitivity analyses show that lagging the (S)HDI does not affect our main conclusions. Further, we add control variables at the region-year level for averages of age, age at first cohabitation or marriage, age at first sex and age at first childbirth as well as percentages of individuals living in an urban area, being married, being separated/divorced, being widowed, being in a polygamous union, and having had a doctor or nurse present at childbirth delivery.

---

[1]The countries considered are: Angola, Benin, Burkina Faso, Burundi, Congo Democratic Republic, Congo, Cote d'Ivoire, Cameroon, Ethiopia, Gabon, Ghana, Gambia, Guinea, Kenya, Comoros, Liberia, Lesotho, Madagascar, Mali, Malawi, Mozambique, Nigeria, Niger, Namibia, Rwanda, Sierra Leone, Senegal, Chad, Togo, Tanzania, Uganda, Zambia and Zimbabwe.

Additionally, we add indicators for HIV prevalence on the regional level and marriage market sex ratios on the national level at the time when the average age of the respondents in a particular region-year or country-year would have been 20. Finally, we use multiple imputation ($M = 50$) to recover missing data and pool the hierarchical regression results obtained from these imputed datasets.

## Results

At the national level (Figure 1), we find positive relationships between childlessness and HDI, particularly for men. If the influence of medical advancements, nutrition and health care rather than socio-economic advancements is assumed to be stronger in sub-Saharan African countries in the early stages of development, this would have resulted in an inverse rather than positive relationship. At the regional level, we have many more observations and this allows us to examine different shapes of the relationship between childlessness and HDI. The correlations between childlessness and HDI are stronger at the regional level ($\rho_W = 0.06, \rho_M = 0.33$) than at the national level ($\rho_W = 0.19, \rho_M = 0.31$). A model with a quadratic specification fits significantly better than a linear function, particularly for women. Figure 2 shows that this quadratic function describes a U-shaped association. One interpretation of this result is that medical advancements have taken place, reducing childlessness particularly among women, followed by socio-economic advancements that have largely induced male childlessness.
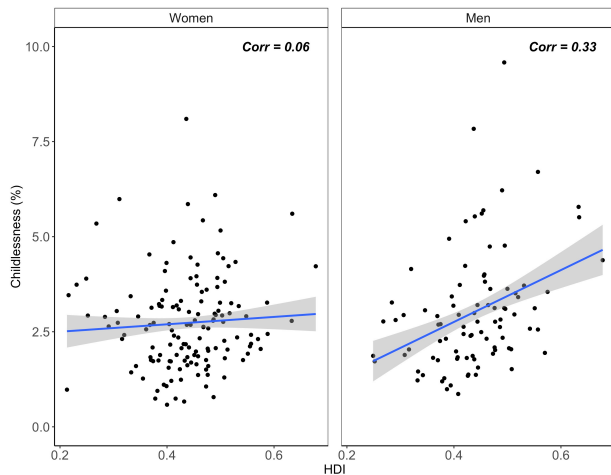


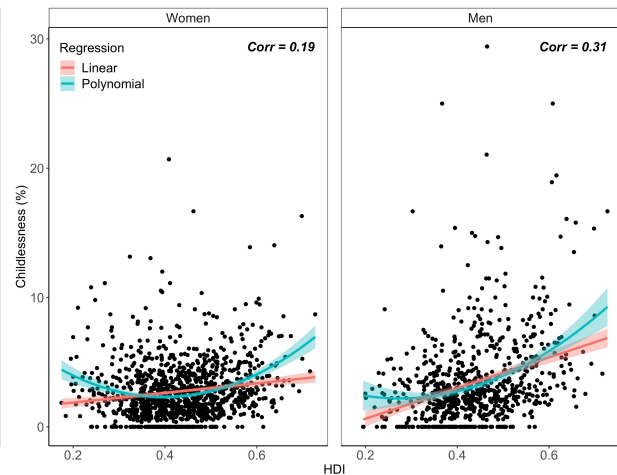Figure 1: Childlessness and HDI: National



Figure 2: Childlessness and HDI: Regional

To understand what drives this positive relationship between childlessness and human development, we develop a baseline hierarchical model to which we add different variables per model and compare these. The baseline model includes only HDI and HDI$^2$. The remainder of the models include time variables (also quadratic and cubed) as well as either HDI and HDI$^2$; average age; % living in an urban residence; marital status (% never married, % divorced/separated, % widowed); % in polygamous relationship; nuptiality (average ages at first cohabitation/marriage, first sex and first birth); presence at childbirth delivery (% doctor present, % nurse present); and indicators for HIV and the marriage market sex ratios. The total model includes all of the variables from the previous models. The fitted values of the models are shown in Figure 3. Throughout all female models, the effects of HDI remain significant, indicating that HDI explains childlessness. For the male models, the effects of HDI are significant in all models except for the model with marital status variables, the model with childbirth delivery information variables and the final model with all variables. The results show that the percentage of never-married and widowed men as well as healthcare proxied by doctor presence at childbirth delivery play a large role in explaining male childlessness. For both men and women, higher prevalence of never married and widowed individuals increase childlessness, likely because these individuals have not had the chance to have children

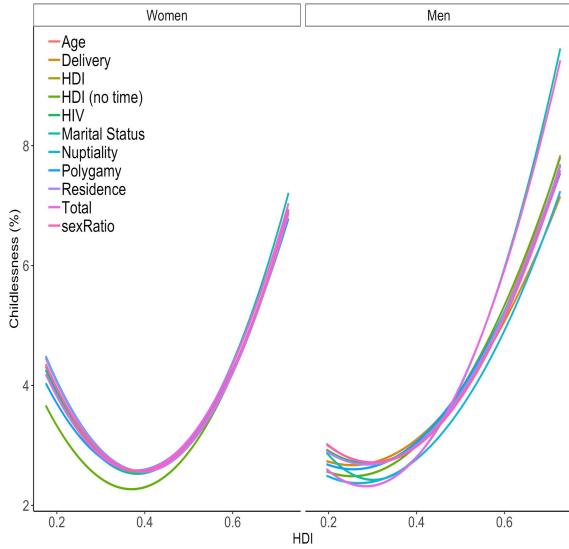due to the lack of having a mating partner.



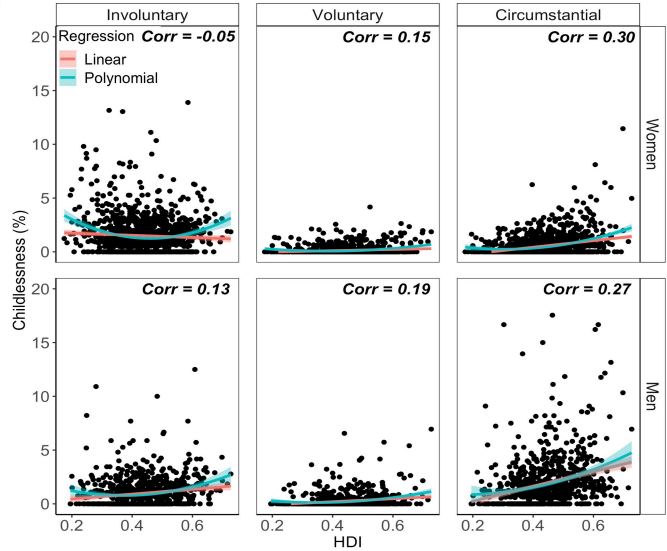Figure 3: Fitted hierarchical Models



Figure 4: Types of Childlessness and HDI: Regional

To understand what drives the shapes of the relationships between childlessness and HDI for women and men, we distinguish between different types of childlessness at the regional level (Figure 4). We observe that involuntary childlessness is slightly inversely related with human development among women and that this relationship has the opposite direction for men. The inverse relationship for women agrees with our hypothesis, because we expected that human development brings improved healthcare and assisted reproductive technology, in turn reducing infertility. The positive relationship for men is surprising and may be the result of a decline in polygamy prevalence as human development occurs, thereby offering subfecund men less chances to have children than if they had multiple wives. Further, although voluntary childlessness is still very uncommon, likely because childlessness is non-universal and stigmatised in sub-Saharan Africa, we observe positive associations with human development. These results agree with our expectations, because human development brings socio-economic advancements that offer individuals opportunities besides childbearing, thereby increasing the share of individuals choosing to not have children. This association seems to be stronger among men than among women, which is surprising given that these socio-economic advancements were expected to be particularly influential among women. A possible explanation that voluntary childlessness is still less common among women than men may be that in sub-Saharan Africa, childlessness is stigmatised and it is usually women rather than men who face severe consequences. Finally, circumstantial childlessness is indeed positively related to human development among women and men. This result agrees with our expectations for men particularly because we hypothesized that a larger share of low-SES men will be left behind on the partnering market as women catch up with men in terms of education and occupation. The positive relationship for women may be explained by decreasing polygamy prevalence, reducing the chances of women to find an exclusive mating partner.

Finally we summarize the preliminary answers to our research questions. First, is there a U-shaped association between childlessness and indicators of human development in sub-Saharan Africa? We find evidence for a U-shape in the this relationship, which is particularly apparent for women. Second, how does this association differ across types of childlessness (i.e. involuntary, voluntary and circumstantial childlessness)? We find that involuntary childlessness is inversely related with human development among women and positively among men. Finally, we conclude that voluntary and circumstantial childlessness are positively related with human development for women and even more strongly for men.