# Ideal Family Size Dynamics in Kigoma, Tanzania

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## Abstract

Ideal family size (IFS) and pregnancy intentions are consistently measured in social surveys, including the Demographic and Health Surveys (DHS) and Reproductive Health Surveys (RHS). Discrepancies between measured IFS and fertility behavior are not well understood; it is unclear whether discrepancy between ideal and realized fertility are associated with differential pregnancy behaviors and investments in children. Demographers propose that a decline in IFS (and demand for children) is a prerequisite to fertility decline. If reported IFS is inconsistent with contraceptive use, this may reflect ambivalence toward additional births; conversely, if preferences reflect underlying constraints we may observe differential patterns of investment among women who have exceeded their IFS. This paper considers predictors of IFS, exceeding IFS, and healthcare utilization among mothers who move from parities less than their IFS to those exceeding their IFS. We examine predictors of IFS and exceeding IFS in a rural, high-fertility population in Kigoma, Tanzania and across a nationally representative sample. We assess whether women approaching their stated ideals are using family planning services, and whether children of birth orders greater than IFS fare worse in terms of pre- and postnatal care, birth outcomes, and survival. Among women surveyed in both 2014 and 2016 RHS, 14.7% of women have more children than their stated ideals, and mean IFS is 6.6 children. By age 45-49, 20% of women have exceeded their stated ideals. Rural residence and older maternal age are significantly associated with higher IFS, while higher education and wealth are associated with significantly lower IFS. Further analyses will examine whether pre- and post-natal maternal behavior differ toward children with birth orders greater than stated ideals, and whether women approaching their fertility preferences are engaging in family planning programs.

**Introduction**

Decline in ideal family size and desired number of children are viewed as necessary preconditions for fertility decline (J. A. Behrman, 2015; Costa, Trumble, Kaplan, & Gurven, 2018; Pritchett, 1994). Demand for fewer children is thought to increase contraceptive use when family planning services are available. Supply of contraceptives and family planning programs in absence of significant demand for lower fertility are unlikely to drive fertility decline (Pritchett, 1994). Given the theoretical relationship between demand for fewer children and changes in family size, it is critical to understand the relationship between ideal and realized fertility in population surveys. Across low and middle-income countries, mean ideal family size (IFS) tends to exceed total fertility rates (TFR), where TFR exceeds IFS by 0.89 children on average among a series of 64 country-years of Demographic and Health Surveys (Pritchett, 1994). An updated assessment of mean IFS and total fertility rate using Demographic and Health Surveys from year 2000 onward suggests this relationship has not changed significantly over the last two decades (Figure 1, $\beta = 0.84$). Few studies examine whether TFR continues to exceed IFS in sub-Saharan African countries, which sociodemographic characteristics predict exceeding IFS at the individual level, and whether there is any difference in health and wellbeing among children born in excess of mothers' stated ideal family size. Understanding socio-economic factors predicting IFS, whether IFS (as an indicator of demand) is declining over time, and whether children born outside of IFS experience different investment is critical for understanding long-term fertility change in sub-Saharan Africa.

Fertility decline in sub-Saharan Africa has not occurred as rapidly as in countries with comparable gross domestic product and fertility levels in Asia and Latin America (Gerland, Biddlecom, & Kantorová, 2017). In Tanzania, total fertility rates remain relatively high; the 2015 Demographic and Health Survey suggests women can expect to have 5.2 children between ages 15 and 49 yet mean ideal family size was 4.8 children per woman (Figure 2). Within the more rural Western region where Kigoma is located, TFR was higher than the national average, with an expected 6.7 births per woman between the ages of 15 and 49 and IFS of 6.1 children (95% CI 5.7 – 6.4 children per woman) (MoHCDGEC, 2016). Among women who have had a birth within the previous 5 years, this IFS is even higher at 6.6 children (Table 1). On average, women had more than their desired number of children at both the national and subnational level (Western region) in 2015. Modern contraception use in the Western region is low relative to the

national average; 18% of women aged 15-49 in the Western region were using a modern method of contraception, while 31% of women use a modern method of contraception nationally (MoHCDGEC, 2016). A mismatch between realized fertility, modern contraception usage, and ideal family size presents a key point of understanding for reproductive health and family planning researchers; why to behaviors and ideals appear to contradict one another?

To better understand this relationship, we leverage multiple rounds of cross-sectional data from the Tanzania Reproductive Health Survey in Kigoma, Tanzania (2014, 2016) and the Demographic and Health Survey (2015) to identify sociodemographic predictors of ideal family size and maternal characteristics that predict exceeding ideal family size. We assess whether predictors of IFS differ between national and subnational levels for the Kigoma region, the geographical focus of the 2014 and 2016 Reproductive Health Survey. Understanding predictors of ideal family size and whether women are exceeding their stated IFS in rural contexts where both ideal family size and total fertility rates remain high better allows practitioners to focus family planning efforts and availability to women who are most likely to exceed their stated ideals. Lastly, we examine whether children born in excess of maternal IFS experience worse outcomes in terms of infant mortality, onset or number of antenatal care visits, or birth outcomes. Having more than the expected or 'ideal' number of births may affect maternal investment in children, where resources are allocated differentially toward children of earlier, 'wanted' birth orders. Alternately, if high fertility remains advantageous in a rural context children may provide labor, childcare for siblings, and support over the life course, including old-age insurance (Caldwell, 2005). Given the importance of material wealth for parental investment in later stages of the fertility transition, socioeconomic status is expected to play a significant role in the ability to cope with additional 'unwanted' children, even in this rural context.

We propose that increased education, wealth, and urban context are associated with lower IFS and lower odds of exceeding IFS (Figure 3). Holding wealth constant, women in urban contexts will have higher access to family planning resources and ultimately have lower odds of exceeding IFS. Due to increased costs associated with raising children in urban contexts, women are more likely to have a demand for fewer children (lower IFS) and an increased demand for family planning (decreased odds of exceeding IFS).

We present preliminary results indicating a negative association between education, wealth, and less stable living arrangements and ideal family size for both national Tanzanian and

subnational Kigoma datasets (Tables 2 and 3). We expect to find that children born in excess of maternal ideals will have similar mortality experiences to their peers, however, engagement in maternal care-seeking behavior will differ by 'wantedness.' Potential spillover effects to other, more 'ideal' birth orders will also be assessed.

**Data and Methods**

*Data*

Birth histories from the 2015-2016 Tanzanian Demographic and Health Surveys (DHS) were linked to individual and household data to assess fertility, desired family sizes, and characteristics predicting whether women have more children than their stated IFS. The Demographic and Health Survey includes interviews from women aged 15 to 49 years of age on the topics of maternal and newborn mortality and health, family planning, health services, and utilization. Key predictive characteristics of IFS and exceeding IFS include maternal education, age at survey, household wealth, marriage status, rural and urban residence, ever use of contraceptives, and length of recall (time between first birth and survey date). Corresponding measures collected in the 2014 and 2016 CDC Reproductive Health Surveys for Kigoma, Tanzania were added to generate a woman-centered dataset to consider predictors of IFS and exceeding IFS. The Reproductive Health Surveys were collected in Kigoma, Tanzania in 2014 and 2016. This survey, which focuses on the rural district of Kigoma, contains many of the same instruments as the DHS. DHS and RHS are used in this analysis to better understand how characteristics of women exceeding IFS differ between subnational and national contexts.

*Outcomes*

Ideal family size (IFS) was measured using two questions within the DHS and RHS; both surveys ask women with surviving children and women with no living children slightly different questions (Supplement, Figure 1). Surveys asked women with living children "If you could go back to the time you did not have any children and could choose exactly the number of children to have in your whole life, how many would that be?" The IFS item was identical across all three survey years (RHS 2014, 2016 and DHS 2015). If a woman had no living children, she was asked "If you could choose exactly the number of children to have in your whole life, how many would that be?" In the case of all three surveys, interviewers were prompted to probe for a numeric response. Further analyses will include utilization of healthcare services including

prenatal tetanus shots and number and onset of antenatal care visits as measures of investment in children.

*Predictors*

Schooling categories were classified using a continuous measure of the number of grades completed, resulting in the categories of no education, primary not completed, primary completed, and secondary or more. All measures generated within the RHS are consistent with DHS measures. Wealth indices were calculated using asset inventories similar to those employed across DHS, which measure relative wealth using assets rather than absolute income or expenditures (Rutstein & Johnson, 2004).

*Methods*

To avoid long-term recall issues, IFS and odds of exceeding IFS were predicted using a data from subset of women who gave birth in the five years preceding the survey. A continuous variable indicating the length of time between first birth and survey (in years) was included to control for recall period (Table 1). IFS was predicted as a continuous variable using survey structure for DHS 2015 and pooled RHS 2014 and 2016. Combining RHS permits improved statistical power; women included in 2014 were not re-interviewed in 2016, all 2016 participants were selected from adjacent enumeration areas, and the relationship between contextual factors and IFS are not expected to have changed over this short inter-survey period. Survey year was included as a control in all analyses. Maternal IFS, odds of exceeding IFS, and maternal care-seeking behavior will be modeled using survey design.

**Preliminary Results, Discussion, and Future Directions**

Across both the DHS and RHS, women in Kigoma and Tanzania as a whole are having more children than their stated ideal family size. Nationally, younger women have lower IFS (Table 2). Within Kigoma, increased age is associated with higher IFS, where women aged 45+ average an IFS 1.3 children higher than women aged 15-19 (Table 3). Across both samples, increased education is significantly associated with lower IFS, consistent with previous findings from Sub-Saharan Africa (J. Behrman, 2015). Rural residence is associated with increased IFS, however, future analyses will examine relative impact of rural residence on IFS between Kigoma and nationally representative samples. Consistent with extant literature, women in less stable unions relative to marriage exhibit lower IFS.

In both nationally representative and Kigoma-level samples, increased education is associated with decreased odds of exceeding IFS (Tables 2 and 3); not only is increased education associated with lower ideals, but women with higher education have lower odds of exceeding IFS. Finally, rural residence is not associated with exceeding IFS at a national level, but women in Kigoma are 2.94 times as likely to exceed their stated IFS if they live in a rural area. This is after holding wealth, education, marriage status, recall, and survey year constant. Future analyses will probe this relationship in more detail, where interactions will be tested between ever-use of family planning, exceeding IFS, and rural residence.

Future analyses will incorporate data on use of family planning services and use of prenatal services to explore whether birth orders in excess of IFS are prioritized differently in terms of tetanus injections, onset and number of antenatal care visits, and care-seeking behavior when children are ill. These analyses will include an interaction between birth order and IFS status on child investment, as exceeding one's IFS by one child may not have the same impact at the household level as exceeding one's IFS by several children. We expect small but significant associations between wantedness and investment, however, we expect these relationships to differ between a more nationally-representative sample and the rural region of Kigoma. This study will provide additional nuance and understanding of fertility intentions and behaviors in a high fertility population with increased use of family planning services over time.

## Tables and Figures

**Table 1:** Sample Characteristics, DHS 2015 and RHS 2014, 2016 (pooled); women with most recent birth 5 years prior to survey

| | DHS | RHS 2014, 2016 |
|---|---|---|
| N | 7,457 | 4,145 |
| IFS | 5.03 | 6.64 |
| % Exceeded IFS | 7.67% | 14.72% |
| Maternal age at Survey | | |
| 15-19 | 8.13% | 7.82% |
| 20-24 | 23.01% | 23.35% |
| 25-29 | 23.34% | 21.24% |
| 30-34 | 18.52% | 18.55% |
| 35-39 | 15.15% | 15.20% |
| 40-44 | 8.80% | 10.28% |
| 45+ | 3.04% | 3.56% |
| Education | | |
| None | 18.94% | 28.91% |
| Primary incomplete | 12.46% | 15.16% |
| Primary completed | 67.77% | 49.09% |
| Secondary + | 0.84% | 6.84% |
| Wealth Tercile | | |
| 1 | 34.89% | 35.24% |
| 2 | 33.07% | 32.79% |
| 3 | 32.04% | 31.97% |
| Rural Residence | 70.08% | 82.11% |
| Marriage Status | | |
| Married | 57.27% | 55.31% |
| In Union | 22.74% | 25.22% |
| Widowed | 2.18% | 2.48% |
| Divorced | 4.62% | 1.51% |
| Separated | 5.99% | 8.57% |
| Never In Union | 7.20% | 6.92% |
| Recall (distance between survey and first birth in years) | 9.65 | 10.46 |

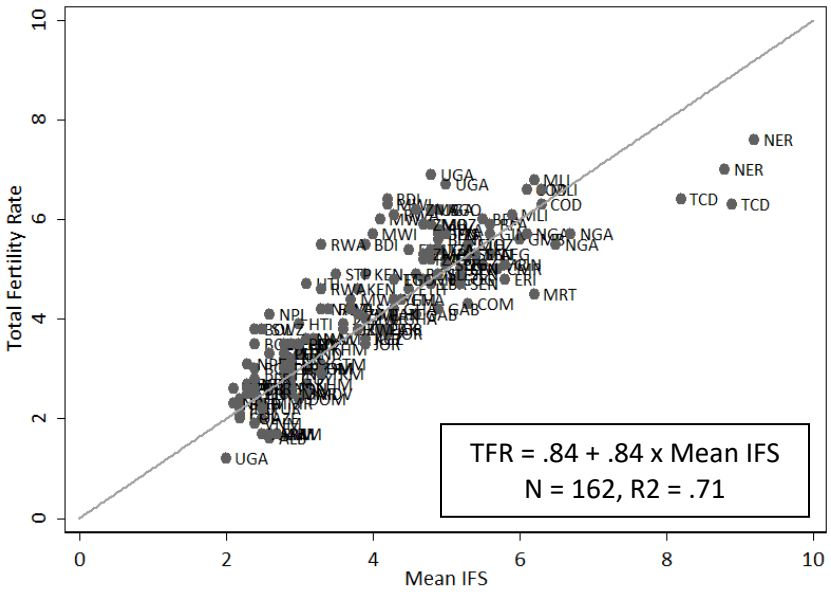
**Table 2.** Maternal Characteristics predicting Ideal Family Size, and Odds of Exceeding Ideal Family Size, DHS 2016

| | Ideal Family Size | | Odds of Exceeding IFS | |
|---|---|---|---|---|
| | β | p | OR | p |
| Maternal age at Survey (baseline 15-19) | | | | |
| 20-24 | **-0.216** | **0.025** | 1.167 | 0.833 |
| 25-29 | **-0.316** | **0.002** | 1.479 | 0.590 |
| 30-34 | **-0.371** | **0.006** | 2.337 | 0.230 |
| 35-39 | **-0.453** | **0.006** | 2.889 | 0.155 |
| 40-44 | -0.339 | 0.120 | 2.644 | 0.214 |
| 45+ | -0.313 | 0.310 | 2.771 | 0.231 |
| Education (baseline none) | | | | |
| Primary incomplete | **-0.461** | **<0.001** | **1.618** | **0.012** |
| Primary completed | **-0.932** | **<0.001** | **0.774** | **0.076** |
| Secondary + | **-1.558** | **<0.001** | **0.292** | **0.042** |
| Wealth Tercile (baseline 1) | | | | |
| 2 | **-0.316** | **<0.001** | **0.735** | **0.036** |
| 3 | **-0.854** | **<0.001** | **0.255** | **<0.001** |
| Rural Residence | **0.475** | **<0.001** | 1.289 | 0.270 |
| Marriage Status | | | | |
| In Union | **-0.331** | **<0.001** | 0.937 | 0.716 |
| Widowed | **-0.459** | **0.006** | 0.624 | 0.167 |
| Divorced | **-0.655** | **<0.001** | 0.754 | 0.316 |
| Separated | **-0.520** | **<0.001** | 1.106 | 0.643 |
| Never In Union | **-0.854** | **<0.001** | **0.364** | **0.022** |
| Recall | **0.082** | **<0.001** | **1.389** | **<0.001** |
| IFS | | | **0.364** | **<0.001** |
| Number of Women | 7,104 | | 7,104 | |

**Table 3.** Maternal Characteristics predicting Ideal Family Size, and Odds of Exceeding Ideal Family Size, RHS 2014 and 2016

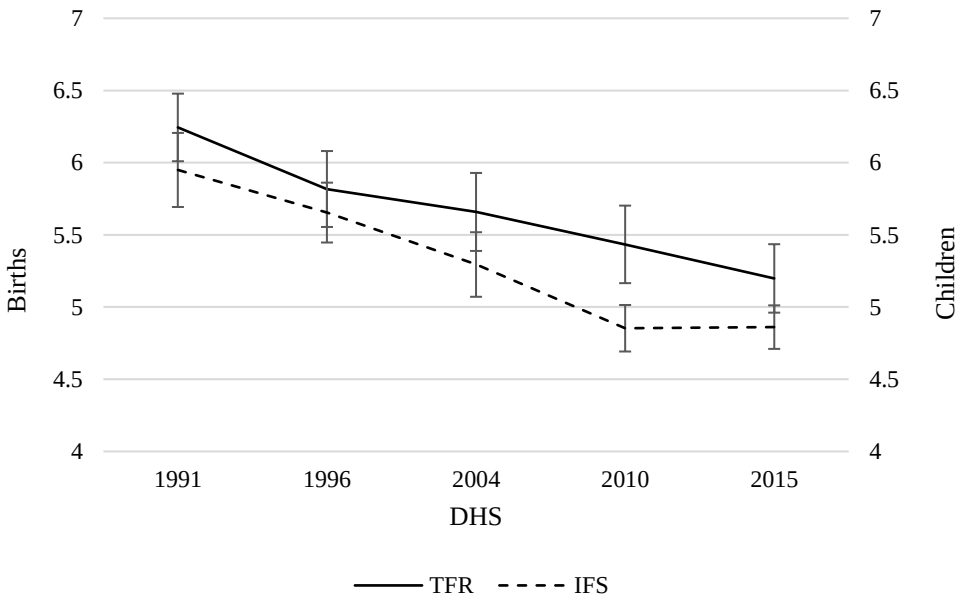
| | Ideal Family Size | | Odds of Exceeding IFS | |
|---|---|---|---|---|
| | β | p | OR | p |
| Maternal age at Survey (baseline 15-19) | | | | |
| 20-24 | 0.118 | 0.439 | 0.852 | 0.796 |
| 25-29 | 0.180 | 0.325 | 0.880 | 0.843 |
| 30-34 | 0.404 | 0.064 | 0.652 | 0.464 |
| 35-39 | **0.647** | **0.010** | 0.942 | 0.915 |
| 40-44 | **0.735** | **0.015** | 0.724 | 0.588 |
| 45+ | **1.294** | **0.005** | **0.219** | **0.025** |
| Education (baseline none) | | | | |
| Primary incomplete | 0.194 | 0.183 | 0.723 | 0.277 |
| Primary completed | **-0.487** | **<0.001** | **0.539** | **0.004** |
| Secondary + | **-1.279** | **<0.001** | 0.458 | 0.072 |
| Wealth Tercile (baseline 1) | | | | |
| 2 | -0.050 | 0.663 | 1.243 | 0.313 |
| 3 | **-0.371** | **0.002** | 0.833 | 0.465 |
| Rural Residence | **0.714** | **<0.001** | **2.941** | **<0.001** |
| Marriage Status | | | | |
| In Union | -0.165 | 0.139 | 0.832 | 0.393 |
| Widowed | -0.354 | 0.295 | 0.467 | 0.123 |
| Divorced | **-1.127** | **<0.001** | **0.047** | **<0.001** |
| Separated | **-0.635** | **<0.001** | **0.443** | **0.011** |
| Never In Union | **-1.010** | **<0.001** | 0.369 | 0.051 |
| Survey Year 2016 | -0.193 | 0.064 | 0.757 | 0.120 |
| Recall | **0.050** | **<0.001** | **1.566** | **<0.001** |
| IFS | | | **0.345** | **<0.001** |
| N (women) | 3,666 | | 3,666 | |

**Figure 1.** Total Fertility Rate (TFR) and Ideal Family Size (IFS) over 162 country-years of Demographic and Health Surveys after year 2000




**SOURCE:** Costa, in preparation
**NOTE:** Includes survey years after 2000 only, surveys are labeled by country code.

**Figure 2.** Trends in Total Fertility Rate (TFR) and Ideal Family Size (IFS) by Tanzania Demographic and Health Survey (DHS) year




**SOURCE:** Kelly et al. 2018, working paper
**NOTE:** TFR: births per woman aged 15-49 years in the 3 years preceding the survey; primary vertical axis. IFS: ideal number of children per woman aged 15-35 years; secondary vertical axis.

**Figure 3.** Hypothesized associations between maternal characteristics and ideal family size (IFS).

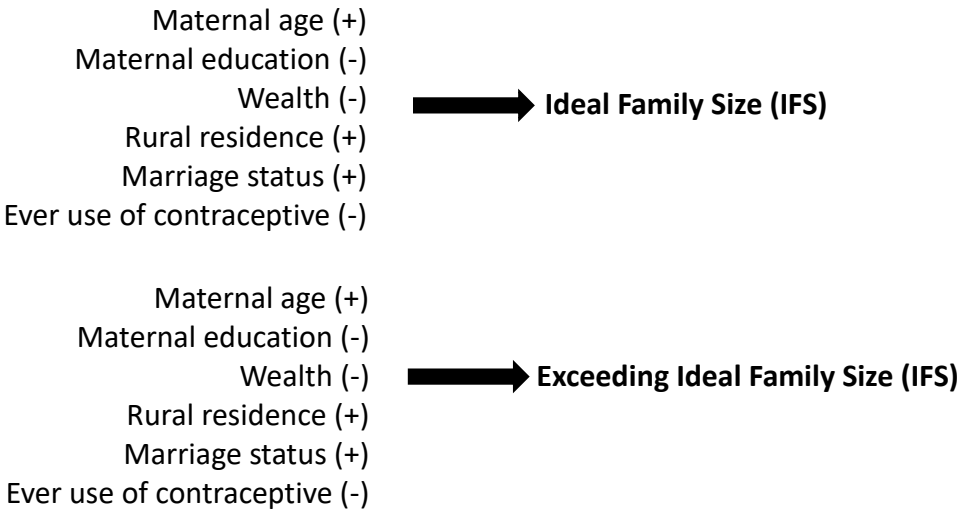
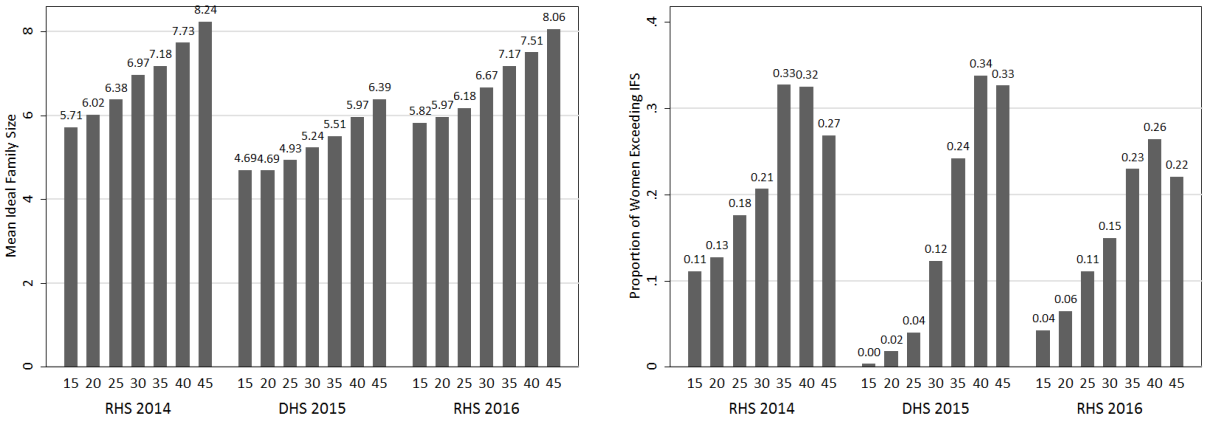



**Figure 4.** Ideal family size (IFS) by age at survey and proportion of women exceeding IFS by age



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Supplement

Figure 1. Formatting of Reproductive and Demographic and Health Surveys Questions of Ideal Family Size