Ideal Number of Children in Sub-Saharan Africa: Trends, Determinants, and Consequences

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Abstract

This paper examines survey data from sub-Saharan Africa on the ideal number of children, an important indicator of the demand for children that is highly correlated with fertility. We use Demographic and Health Survey data from 31 countries in the region, each of which has had at least two surveys, and examine trends and determinants in the ideal number of children, before discussing the consequences of the ongoing changes in this important variable. The paper begins with a review of trends in the ideal number of children, which in most countries entails reductions. Our analysis of trends utilizes a new procedure for estimating fertility preferences of women with nonnumeric responses to questions about ideal number, and in so doing demonstrates that failure to take account of the preferences of these women understates the magnitude of the downward trend in preferences for number of children. After reviewing the aggregate situation in the countries, we examine differences by educational attainment, and how the ideal number of children has changed over time for different education groups in different countries. We then look at determinants of the ideal number of children, using both macro and micro data for analyses. Here, education and place of residence are key variables, and other variables are also included. Based on the micro analyses, we carry out decompositions for each country that estimate the importance of increased education and changes in residence in contributing to observed changes in the ideal number of children. Finally, we explore the consequences of levels and changes in the ideal number of children. We show the strong correlations between this variable and fertility, and we explore the implications of increasing women's education, increasing urbanization, and changes in contraceptive and marital status for ideal number of children and fertility.

I. Introduction

This paper examines survey data from sub-Saharan Africa on the ideal number of children, an important indicator of the demand for children that is highly correlated with fertility (Bongaarts, year; Shapiro, 2018b). We use Demographic and Health Survey (DHS) data from 31 countries in the region, representing more than 85 percent of the region's population. Each of the countries has had at least two surveys (most have had more), and we first examine trends in the mean ideal number of children, comparing data from the first and last survey for each country. A factor complicating this comparison is the presence of nonnumeric responses to the question on ideal number of children, especially since, as we shall see, for the most part the frequency of such responses has tended to decline between the first and last survey. We introduce a procedure for adjusting the data so as to include data for women with nonnumeric responses, and thereby enhance comparability of the first and last surveys (Shapiro, 2018a).

Following our analysis of trends, we turn to examination of the determinants of the ideal number of children. Women's educational attainment (in seven detailed categories) and place of residence (capital, other urban, and rural) are key variables here. We carry out analyses using both aggregated (country-level) data and individual data. In the aggregated-data analyses, in addition to the key variables, we also take account of recent economic growth, population density, and sub-region within sub-Saharan Africa, as well as the percentage of the female population that is Muslim. In the analyses using individual data, we run separate regressions for each country, and thus lose the density and sub-region variables, but introduce variables representing the principal ethnic groups within each country as well as several other relevant variables.

Finally, we first show the strong relationship between mean ideal number of children and fertility, examining correlations between these two variables in all DHSs, and examining these correlations in different subperiods to see if there has been any pattern of change over time. We then discuss the prospective changes in women's educational attainment and in place of residence, and the likely consequences for mean ideal number of children and ultimately, for fertility.

II. Trends in the Ideal Number of Children

In each DHS, women are asked one of two questions, depending on whether they have had children. If they have not had children, they are asked "If you could choose exactly the number of children to have in your lifetime, how many would that be?" Respondents who had at least one living child were asked, "If you could go back to the time you did not have children and could choose exactly the number of children to have in your lifetime, how many would that be?" While typically most women provide a numeric response, some women reply with nonnumeric answers, like "Up to God," "As many as possible," or "Don't know." Table 1 shows, for each country, the mean numeric response from the first and last survey, and the percentage of responses that were nonnumeric.

There is clearly substantial variation across countries in the mean ideal number of children. As of the first survey, these means ranged from a high of 8.3 for Chad to a low of 3.0 for Lesotho, and overall the unweighted average was just under 5.7. Cameroon, Chad, the Democratic Republic of the Congo (DRC), Mali, Niger, Senegal, Tanzania, and Uganda all had a mean ideal number of children as of the first survey in excess of 6.0. Conversely, Gabon, Kenya, Lesotho, Rwanda, Sierra Leone, and Zimbabwe all had means as of the first survey that were less than five. Between the first and last survey, the mean ideal number of children declined in 27 of

the 31 countries – only in Comoros, Guinea, Niger, and Nigeria did the mean increase. Hence, as of the last survey the overall mean ideal number of children had fallen to just beneath 5.0.

Table 1. Mean Ideal Number of Children and Percentage of Nonnumeric Responses, First and Last Demographic and Health Surveys

	First survey			Last survey			Change in:	
Country	Year	Mean ideal no.[a]	Pct. non-numeric	Year	Mean ideal no.[a]	Pct. non-numeric	Mean	Pct.
Benin	1996	5.54	6	2011.5[b]	4.57	0	-0.97	-6
Burkina Faso	1993	5.74	25	2010	5.54	4	-0.20	-21
Burundi	1987	5.34	10	2010	3.86	5	-1.49	-5
Cameroon	1991	6.82	10	2011	5.53	7	-1.29	-3
Chad	1996.5	8.30	22	2014.5	8.17	23	-0.13	+1
Comoros	1996	5.31	7	2012	5.32	11	0.01	+4
Congo Republic	2005	5.09	12	2011.5	4.98	4	-0.11	-8
Cote d'Ivoire	1994	5.52	2	2011.5	5.25	7	-0.27	+5
D.R. Congo	2007	6.34	8	2013.5	6.10	7	-0.24	-1
Ethiopia	2000	5.26	18	2016	4.45	11	-0.81	-7
Gabon	2000	4.87	10	2012	4.59	5	-0.28	-5
Ghana	1988	5.26	13	2014	4.34	2	-0.93	-11
Guinea	1999	5.67	4	2012	5.76	11	0.09	+7
Kenya	1989	4.43	4	2014	3.61	2	-0.83	-2
Lesotho	2004	3.01	0	2014	2.64	0	-0.38	0
Liberia	1986	5.98	25	2013	4.83	4	-1.14	-21
Madagascar	1992	5.52	7	2008.5	4.66	6	-0.86	-1
Malawi	1992	5.06	13	2015.5	3.66	1	-1.40	-12
Mali	1987	6.92	25	2012.5	5.86	3	-1.06	-22
Mozambique	1997	5.87	17	2011	4.85	1	-1.02	-16
Namibia	1992	5.01	8	2013	3.22	1	-1.79	-7
Niger	1992	8.23	14	2012	9.21	7	0.98	-7
Nigeria	1990	5.82	61	2013	6.53	7	0.71	-54
Rwanda	1992	4.24	2	2014.5	3.36	1	-0.87	-1
Senegal	1986	6.83	11	2016	5.21	19	-1.62	+8
Sierra Leone	2008	4.97	5	2013	4.90	5	-0.07	0
Tanzania	1991.5	6.05	14	2015.5	4.74	4	-1.31	-10
Togo	1988	5.27	1	2013.5	4.32	3	-0.94	+2
Uganda	1988.5	6.49	8	2011	4.79	3	-1.70	-5
Zambia	1992	5.79	6	2013.5	4.66	3	-1.12	-0
Zimbabwe	1988	4.89	7	2015	3.95	0	-0.94	-7
Averages	1993.8	5.66	12.1	2012.8	4.95	5.4	-0.71	-6.6

[a] For women with numeric responses.

[b] In cases where a survey was carried out in two calendar years, this is indicated by adding 0.5 to the first year. Hence, for example, 2011.5 indicates that the survey was carried out in 2011 and 2012.
*** The averages are unweighted. They should be done weighted. ***

These means are calculated based on a subset of responses to the question on ideal number of children: as shown in the table, with the exception of Benin in 2011-12, Lesotho in 2004 and 2014 and Zimbabwe in 2015, every country has at least one percent of responses that are nonnumeric, and hence, those respondents are not included in the calculated means. These nonnumeric responses constitute an average of 12 percent of respondents in the first survey, and this mean percentage declines to just over five percent as of the last survey. Burkina Faso, Chad, Liberia, Mali, and Nigeria all have more than 20 percent of respondents to the first survey providing a nonnumeric response, with Nigeria having an astounding 61 percent of respondents without a numerical ideal number of children.

Later in the paper, we will see that among countries, mean ideal number of children is highly correlated with fertility. Further, later in this section we present evidence showing that the ideal number of children declines as women's years of schooling increase. It turns out that the women who provide nonnumerical responses concerning the ideal number of children are not a representative sample of all women surveyed; in particular, for each of the 62 first and last surveys, the women without numerical responses were disproportionately likely to have no schooling. Sometimes the difference between this group and the full sample was modest, and other times it was substantial. In any case, since the educational group with no schooling has the highest mean ideal number of children in every country and survey, the failure to account for the preferences of women with nonnumerical responses means that the estimated mean ideal number of children will be downwardly biased. The magnitude of the bias will depend on the proportion of all respondents with nonnumerical responses, the extent to which the no-schooling group is

overrepresented among these respondents, and the extent to which women with no schooling have mean ideal number of children greater than that of women with schooling. Further, since in general the proportion of nonnumeric responses has declined over time as mean ideal number of children has declined, this implies that the change in fertility preferences over time will also be biased downward by the omission of women with nonnumerical responses.

To address these issues of bias, we will produce adjusted measures of mean ideal number of children that consider the preferences of women without quantitative responses to the question on ideal number of children. Our procedure is based on that described in Shapiro (2018a), and essentially imputes to women with nonnumeric responses a predicted ideal number of children based on their schooling, place of residence, and numerous other characteristics associated with ideal number of children among women with numeric responses.[1]

While declines in the mean ideal number of children are widespread, in order to compare countries with respect to the pace of decline in ideal number of children, we must adjust the overall changes reported in Table 1 for the duration between the first and last survey, since these durations, averaging 19 years, ranged from as little as five years to as much as 30 years. Table 2 reports the annual pace of decline in the mean ideal number of children for each country, thereby facilitating comparisons. Over all, the (unadjusted for nonnumeric responses) mean ideal number of children declined on average by 0.035 per year, or a little more than a third of a child

[1] This procedure corresponds to the approach used in labor economics to impute wages for women not in the labor market, prior to James Heckman's pioneering work on sample selection bias (Heckman, 1979). Hence, it entails some sample selection bias, but much less than what occurs when these nonnumeric responses are simply excluded from calculation of mean ideal number of children. [So far, we have not been successful at implementing Heckman's procedure on these data, but we will be working on this paper in Luxembourg for several weeks this fall and hope to produce estimates that take selection bias into consideration.]

per decade. Among the 27 countries which experienced declines, the mean annual decline was 0.041.

The declines were relatively rapid (0.05 per year or greater) in 12 of the 27 countries: Benin, Burundi, Cameroon, Ethiopia, Madagascar, Malawi, Mozambique, Namibia, Senegal, Tanzania, Uganda, and Zambia. We note that while all four subregions of sub-Saharan Africa are included in this group, with eight countries Eastern Africa is especially well-represented. Among the 15 countries where declines did not reach 0.05 per year, six had slow declines of from 0.007 per year up to 0.023 per year, while the other nine had declines ranging from 0.033 to 0.042 per year. The four countries with increases in the mean ideal number of children between the first and last survey were Comoros (a trivial increase), Guinea (a very small increase), Niger (a substantial increase of 0.049 per year), and Nigeria (an increase of 0.031 per year). [N.B. Once we adjust for nonnumeric responses, these numbers will all change. For Nigeria, in particular, the substantial increase disappears once the nonnumeric responses are included.]

Table 2. Pace of Change in Mean Ideal Number of Children between First and Last Demographic and Health Survey

Country	Change	Years[a]	Change /year
Benin	-0.97	15.5	-0.063
Burkina Faso	-0.20	17	-0.012
Burundi	-1.49	23	-0.065
Cameroon	-1.29	20	-0.065
Chad	-0.13	18	-0.007
Comoros	0.01	16	0.001
Congo Republic	-0.11	6.5	-0.017
Cote d'Ivoire	-0.27	17.5	-0.015
D.R. Congo	-0.24	6.5	-0.037
Ethiopia	-0.81	16	-0.051
Gabon	-0.28	12	-0.023
Ghana	-0.93	26	-0.036
Guinea	0.09	13	0.007
Kenya	-0.83	25	-0.033

Lesotho	-0.38	10	-0.038
Liberia	-1.14	27	-0.042
Madagascar	-0.86	16.5	-0.052
Malawi	-1.40	23.5	-0.060
Mali	-1.06	25.5	-0.042
Mozambique	-1.02	14	-0.073
Namibia	-1.79	21	-0.085
Niger	0.98	20	0.049
Nigeria	0.71	23	0.031
Rwanda	-0.87	22.5	-0.039
Senegal	-1.62	30	-0.054
Sierra Leone	-0.07	5	-0.014
Tanzania	-1.31	24	-0.055
Togo	-0.94	25.5	-0.037
Uganda	-1.70	22.5	-0.076
Zambia	-1.12	21.5	-0.052
Zimbabwe	-0.94	27	-0.035
Averages	-0.71	19.0	-0.035

[a] Years show the duration from the first to the last survey.
*** The averages are unweighted. They should be done weighted. ***

In addition to the overall changes in the mean ideal number of children, we calculated these means for educational subgroups. Table 3 shows the overall unweighted means by years of schooling for both the first and last surveys of the 31 countries. A few points are noteworthy. First, it is apparent that both as of the first survey and the last survey, there is a clear tendency for mean ideal number of children to decline as years of schooling increase, for every schooling group. However, on average the declines diminish in size as years of schooling increase. And finally, note that the overall average mean decline of 0.71 substantially exceeds the declines of any schooling group. This last point is simply a consequence of the fact that women's schooling has been increasing (Barro and Lee, 2013), so other things equal, this compositional shift should result in reductions of mean ideal number of children between the first and last surveys.

Table 3. Mean Ideal Number of Children by Years of Schooling, 31 Countries

	Years of schooling							
	0	1-5	6	7-8	9-10	11-12	13+	All
First survey	6.46	5.45	4.94	4.53	4.27	3.95	3.71	5.66
Last survey	5.98	5.12	4.70	4.38	4.11	3.85	3.67	4.95
Change	-0.48	-0.33	-0.23	-0.15	-0.16	-0.10	-0.04	-0.71

To put the point a bit differently, we note that at any point in time, mean ideal number of children in a country will be a weighted average of schooling-specific means, with the proportions in each schooling group constituting the weights. Since over time schooling has increased, the educational attainment will be higher in the last survey than in the first survey, and since higher schooling is associated with lower ideal numbers of children, this by itself will result in a lower mean ideal number of children.

In the four countries in which mean ideal number of children increased, this downward pressure on the mean was more than offset by changes in preferences reflected in increases in the mean ideal number of children of the different schooling groups. Consider the two countries with substantial increases in mean ideal number of children between the first and last survey: Niger and Nigeria. In Niger, the mean in 2012 was higher than it had been 20 years earlier for every schooling group, by just under one child among the small group with the highest schooling, and more than one child (and in two groups, more than two children) in the other groups. In Nigeria, the school-specific means increased for every schooling group as well between 1990 and 2013, but the increases were small to moderate beyond six years of schooling, while being more than 1.6 for those with no schooling and just over 0.6 for those with 1-6 years of schooling.[2]

[2] In Comoros and Guinea, there were also increases in means for each schooling group, but they were more modest than in Niger and Nigeria. In Comoros, the effect of these increases was just barely in

It is useful to consider why preferences for numbers of children as reflected in the ideal number might change over time. In this regard, declines are easy to explain: as economic growth and development proceed, typically returns to education emerge, and parents, whose preferences for the schooling of their children typically are that their children exceed their own schooling (cf., Shapiro and Tambashe, 2003, Table 8.1, p. 161), have increased motivation to invest in the schooling of their children. Given the quality-quantity tradeoff that exists with respect to fertility (Becker and Lewis, 1973), parents opt for fewer children.

Examination of the changes in mean ideal number of children among the 27 countries where that mean declined between the first and last survey showed that in 17 cases, there were reductions for either all seven or at least six of the schooling groups. Conversely, there were six countries in which at least six of the school-specific means increased from the first to the last survey (the four for which the overall means increased, plus Chad and Cote d'Ivoire). For the remaining eight countries, there were more mixed changes, with decreases for some schooling groups and increases for others.

For the majority of countries, then, there is clearly a tendency for the ideal number of children to decline over time, as one would anticipate simply as a reflection of the secular trend toward increased schooling, as well as from ongoing economic development. At the same time, in six countries ideal numbers by schooling group have tended to increase over time, and there is not an obvious explanation for this behavior. The two prominent cases in this group are Niger and Nigeria. Are women from Niger, confronting a daunting economic situation, thinking about children as equivalent to lottery tickets? Are women from Nigeria stimulated by the religious

excess of the effect of increased schooling, and in Guinea it was sufficient to produce a modest increase in the overall mean.

difference between the Christian south and the Muslim north to prefer higher numbers of children to reinforce their religious group?

III. Determinants of the Ideal Number of Children

It is clear from the preceding section that one important determinant of a woman's ideal number of children is her level of educational attainment. Although there are some minor exceptions here and there, it is typically the case in each country that mean ideal number of children declines monotonically as years of schooling increase. Further, recent economic growth is expected to be inversely related to the ideal number of children. In addition, previous work analyzing data on ideal number of children has shown that a woman's place of residence (capital, other urban places, and rural places), her age, and whether she is Muslim all will be significantly related to her ideal number of children, other things equal, and that at the aggregate level, high population density is conducive to lower fertility and lower ideal number of children, and that ideal number of children tends to be low in Southern Africa and high in Central Africa (Shapiro, 2018b). Finally, since the preferences embodied in the ideal number of children are likely to reflect cultural influences, it is likely that other things equal, there will be differences by ethnic group in the ideal number of children.

Our analysis of the determinants of the ideal number of children will include both macro and micro data. We begin with macro data, with countries as the units of observation. We will estimate regressions for the first and last survey in each country, with the mean ideal number of children as the dependent variable, and explanatory variables consisting of measures of schooling of women of reproductive age (mean years in one specification, and dummy variables for different schooling groups in a second), indicators of recent economic growth, measures of

the proportion of the population in the capital and other urban places, the percentage of women who are Muslim, population density, and subregion.

Our analyses of micro data will entail estimation of separate equations for individuals from each country, for the first and last survey. A woman's ideal number of children is the dependent variable, and independent variables include her years of schooling, dummies for place of residence, a dummy indicating if she is Muslim, her age, dummies for the country's major ethnic groups, and additional variables correlated with ideal number of children. These estimates, in turn, will be used to do a decomposition analysis, similar to that in Shapiro and Tenikue (2017), but with ideal number of children rather than fertility as the dependent variable. These decompositions will quantify the contributions of changes in schooling and in place of residence to the observed changes in mean ideal number of children. We will also do expanded decompositions that will include variables for contraceptive and marital status that are predictors of ideal number of children.

[N.B. This is what has been completed to date. The Consequences section will show the strong correlations between ideal number of children and fertility, both at a moment in time and over time.

As noted in footnote 1, Shapiro will be going to Europe for several weeks this fall to work on this paper. We anticipate that the end product will be very informative and interesting. Hope you agree!]

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