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Fertility of the Elite in Sub-Saharan Africa:
Is Low Fertility Among the Better-off a Phenomenon Throughout the Region?

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Low fertility has been well documented among wealthier and more educated women in sub-Saharan African countries; supposed mechanisms of action (greater empowerment, better contraceptive access, more distance to norms) mean that the strength of these relationships should vary across contexts. However, women's education and wealth are also central markers of couples' position in the new social hierarchies, which emerge with the advent of market economies. Economic theory and historic works predict that upper class individuals want small families to invest in children's schooling in industrializing societies, whatever the normative or contraceptive context. Here we ask: what is the share in each country of couples which are at the top of the emerging socioeconomic stratification (women who are well educated *and* wealthy), which we call here the "elite"? Do "elite" women in SSA really have similarly low fertility outcomes, regardless of the national fertility and family planning contexts? Or is low fertility found only among elite women in wealthier countries with lower overall fertility? Using DHS data from 27 countries since 2010, we find that 22 out of 27 have elite TFR <3.5; while there is some variation (1.7 in Sierra Leone to 3.9 in Nigeria) it substantially lower than non-elite TFR. Multilevel analysis shows national contextual characteristics (GDP, ideal number of children, MCPR, proportion elite, TFR) are only weakly related to fertility for elite women, in contrast to non-elite women. These findings indicate that the profile of elite women across SSA results in similarly low fertility, regardless of national contexts.

Background/Introduction

The historical demography literature has long established that at the onset of industrialization in Western countries, upper class couples were the first ones to choose to have smaller families (Dalla Zuanna 2007). As societies started to develop economically, more endowed families consolidated their upper-class status by investing in the formal education of their children; their boys went to secure the new high-income managerial or technical white-collar urban occupations, and their educated daughters married into similarly positioned families (Ariès 1980, Schneider and Schneider 1984, Schoumaker 2010). People belonging to this privileged category were eager to have educated wives and small families, to be able to invest in the human capital of each of their children and consolidate their position. The emphasis placed on schooling and low fertility aspirations eventually spread to the rest of the population as schooling systems extended, economies became more fully industrialized, the demand for qualified jobs and opportunities for social mobility increased.

The economic demography "quantity-quality trade-off" theory (Becker and Tomes 1976) (also called resources dilution theory) is as an alternative way to tackle the shift in fertility behaviours due to intergenerational mobility aspirations occurring first among upper social categories during fertility transitions. While this trade-off seems indeed to have played an important role in bringing about historic transitions (Van Bavel et al. 2011), the negative association between family size and investments in children's schooling has also been documented for Asian and Latin American countries, (Knodel, Havanon, and Sittitrai 1990; Psacharopoulos and Arriagada 1989). Current research has highlighted that this relationship varies according to the exact period, institutional set up and social group (Maralani 2008), with this effect unfolds at given stages of economic development and successively in different groups.

In sub-Saharan Africa (SSA) today, schooling has made important progress for boys and girls, subsistence agriculture is occupying a smaller share of the population, economic activities increasingly take place in the frame of global economic exchanges and urban areas, and labour is becoming more specialized. In this context, economically-based social stratification schemes have gained grounds in the region and people increasingly secure status and power over other –and associate with or differentiate themselves from other– along educational, occupational and monetary lines. However, economic modernization has been sluggish in SSA, and large segments of economic production remain in the informal sector today. Because the process of integration in the global capitalist economy is partial, the new social categories, new sources of status and new social groups brought about by the growth of market economies largely cohabit with pre-existing social hierarchies organized along customary lines, such as gender, age, lineage, etc. (Marie *et al.*, 2008), for example when individuals and families with low levels of human capital still acquire wealth and status outside of the formal economy. Also, some families have a foot in both worlds, typically when some members (usually boys and men) acquire higher education and formal jobs while the education of wives and female children is not considered as a priority.

We are interested here, in the case of SSA countries, at the group situated at the top of this emerging form of social stratification; i.e. we are interest in couples who have a high social status (for both husbands and wives) according to their position in the formal economic market. Upper class affiliation in fully modernized economies is tied to professional occupation, educational level and living standards being tightly linked to it. We hypothesize that this group exist in every country of

SSA, but that its size is arguably still low, hence how use of the term “elite” to characterize them. We hypothesize that this elite group has small families (of three children or less) in SSA today, following theories from the historical/economic literature (predominately these individuals’ motivation to invest in the education of their children, which helped themselves achieve or consolidate their social status). Recent work in some SSA settings suggest that such mechanisms are at work in that context, at least in urban areas (Bougma et al. 2015).

The strong relationship between women’s educational attainment (which we frame here as a proxy for social hierarchy status) and lower fertility is well documented generally and in SSA (Bongaarts 2003, Shapiro 2012). Many theories have been proposed to explain this relationship, including increased women’s empowerment among more educated women, their increased ability to break social norms promoting high fertility and to access and use contraception. The association between wealth (an index measure of household goods) and fertility is also well established, although the relationship is generally weaker. These supposed mechanisms of action of education and wealth on fertility mean that the relationship between these variables and fertility outcomes will vary according to the context: stronger fertility norms, stronger gender inequalities and weaker family planning programs will influence the strength of the relation. If we view instead the educational level and living standards of couples as markers of professional class occupations and of their educational aspirations, and of their positions in the social hierarchy, then we expect these couples to desire smaller families, regardless of the normative and family planning context of that country.

In this paper, to identify the “elite” in the social hierarchy across SSA countries, we combine two dimensions of social status, education and wealth. We operationalize “elite” status as having high educational achievement (having completed secondary school or higher) *and* being in the wealthiest quintile. Several theoretical and practical reasons guide our choice. Theoretically, educational level and relative wealth are routinely used as proxies for social class as both constructs tap into somewhat different dimensions of socio-economic status; here we combine them to define the elite category as strictly as possible. More practically, accurate and reliable data on income at the individual level is not widely or reliably available for most SSA all countries, as data on income is not routinely collected in household surveys such as the DHS, but relative wealth is captured by the DHS wealth quintiles. These reasons make the combination of women’s higher educational attainment with wealthiest quintile the best indicator of elite status available in the DHS, compared to each variable taken separately or urban residence or occupation (whose coding varies across countries).

We note, however, that completed secondary education tends to more discriminating than wealth, as most women with a secondary education are in the wealthiest quintile, when the reverse is not true. Given this and the stronger relationship of higher education than wealth with lower fertility, we also seek throughout this paper to determine whether our combined wealth and higher education category has a clear value-add over higher educational status alone for identifying elite women and differences in their fertility outcomes in the SSA context, or whether completion of secondary education adequately captures elite status exclusive of combining it with wealth.

An investigation of the relative influence of contextual factors compared to individual characteristics on lower fertility among elite women throughout SSA will give us a better understanding of the role of improvements in overall socio-economic conditions at the individual level compared to country-level fertility-related indicators may have on the fertility transition in the region.

Research question

Do elite women across SSA have similarly low fertility (TFR <3), regardless of differences in overall levels of economic development, fertility, and contraceptive use among countries in the region? Or is low fertility among the elite in SSA generally limited to elite women in wealthier countries that have relatively lower overall fertility and strong FP programs?

Data and methods

We use the most recent DHS data from countries in West, East, and Central Africa (using the United Nations designations of sub-regions) that had a Standard DHS or Continuous survey (for Senegal) carried out since 2010. This provides us with a sample of surveys from 27 countries (Table 1). Notably, in this analysis, we use only the sub-sample of women aged 20-49, because we use completed secondary education to define our elite category and including 15-19 will categorize many young women who will go on to get a secondary education as "less educated". All analysis accounts for survey-specific weights at the individual level, while the pooled sample is also weighted by country population. The descriptive and regression analysis performed account for the DHS's stratified, clustered sample design by using the *svy* commands in Stata.

Table 1: Surveys in the analysis, 2010-2017 DHS

Country	DHS Year	N (15-49)	n (20-49)
Benin	2012	16,599	13,677
Burkina Faso	2010	17,087	13,738
Burundi	2016-17	17,269	13,301
Cameroon	2011	15,426	11,836
Côte d'Ivoire	2012	10,060	8,063
DR Congo	2014	18,827	14,846
Ethiopia	2017	15,683	12,185
Gabon	2012	8,422	6,588
Gambia	2013	10,233	7,770
Ghana	2014	9,396	7,640
Guinea	2012	9,142	7,148
Kenya	2014	31,079	25,001
Liberia	2013	9,239	7,324
Malawi	2015-16	24,562	19,289
Mali	2012-13	10,424	8,506
Mozambique	2011	13,745	10,680
Niger	2012	11,160	9,259
Nigeria	2013	38,948	31,043
Rep of Congo	2012	10,819	8,656
Rwanda	2014-15	13,497	10,718
Senegal (continuous DHS)	2017	16,787	12,867
Sierra Leone	2013	16,658	12,607
Tanzania	2015-16	13,266	10,334
Togo	2014	9,480	7,747
Uganda	2016	18,506	14,230
Zambia	2013-14	16,411	12,725
Zimbabwe	2015	9,955	7,799
Total Sample		412,680	325,577

For our analysis, we create two categories of women: 1) those with completed secondary education or higher who are also in the wealthiest quintile ("elites") and 2) all other women ("non-elites"). Women having completed secondary education or higher are identified using the DHS variable *v149*, which specifies whether a respondent has attended or completed different schooling levels (e.g., primary, secondary). Wealth quintile is designated using *v190.* Future analysis will look at a) different variables for measuring completed secondary schooling given discrepancies we have found across countries comparing *v149* with mean years of schooling (*v133*) and b) different sub-groups of women within the non-elite category (as our group of interest is the most elite women, here we compare only elites to all other women combined).

Descriptive analysis

We first describe the characteristics of the elite and non-elite, in terms of population composition urban/rural distribution, partner's education level (among the subset of women in union), and the proportion of non-elite that falls in the richest country-specific wealth quintile (100% of the elite falls into that quintile by construction). Next, we calculate TFR for the elite and non-elite for each country. We then show the relationships between elite TFR at the country level and their overall TFR.

In order to assess whether our combined category of wealthiest and most educated captures an elite group that is not simply the most educated or the wealthiest, we also run descriptive statistics and calculate TFR separately for the two components of our elite definition, women in the wealthiest quintile and those who have completed secondary school.

Multilevel analysis

Next, we perform a series of multilevel multivariate regression analyses with an outcome variable of number of children ever born. Independent variables include 1) individual-level variables for elite status, urban/rural residence, age groups and marital status and 2) country-level variables for GDP per capita, ideal number of children, proportion currently using modern method, proportion elite, and country-level TFR. We aim here to capture both individual and contextual influences on fertility to assess whether and to what extent elite fertility outcomes depend on country-level characteristics.

We analyze the impact of elite status on the dependent variable, the number of children ever born, at two levels: the individual-(woman) level and the country-level. Our dependent variable is children ever born (*v201).* Our independent variables at individual-level include are: elite status (yes/no), marital status (single, married, separated/divorced), residence (urban/rural) and age (5-year age groups). Independent variables at individual country level are the following: % of a country's population of women 20-49 (i.e. DHS respondents) that fall into the elite category (divided into terciles: <3.78%, 3.78-8%, and >8%), modern contraceptive prevalence rate (MCPR) (divided into terciles: <11%, 11% – 22%, > 22%), GDP per capita (two categories using the World Bank classification[1] of 1) low-income countries with GDP per capita <= $995 and 2) lower middle income with GDP per capita from $996 – $3895)[2], ideal number of children (three categories: <5, 5-6, >6) and TFR (three categories: <5, 5-6, >6). The country level variables are in a first series of model: the

[1] https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups

[2] Although the GDP of Gabon was higher than 3895, that country was classified in the second group as it was the only country to fall into this group.

national GDP per capita, ideal number of children, MCPR and proportion elite, and in a second series of model, the national TFR.

The multilevel methodology allows us to account for the relationship between individual-level variables while also accounting for country-level contextual variables. We analyze the dependent variable as a function of the elite variable (being elite or non-elite) by taking into account the other independent individual- and country-level variables. All multilevel analysis were run in R. The use of a binary "elite" variable allows us to fit a generalized linear regression between the dependent variables and that independent variable. As the dependent variable is a count of children ever born, we use the Poisson link for the generalized linear modeling. We present tables with the intercept and the fixed effects. (The variability of the intercepts and slopes in the countries will be included in an Annex to the full paper).

To compare the variance explained by the country-level variables separately for the elite and non-elite, we performed four regressions separately for each of these two groups. Model 1 is empty (with no predictor), Model 2 includes only country-level variables, Model 3 includes the individual-level variables only, and Model 4 includes all the predictors. In these models, we focus on the percentage reduction of the variance that is explained after controlling for independent variables and we use the AIC to determine if a given model is contributing to reduce the prediction error. The tables show the fixed effects only and are read as a logarithm of the number of children.

Finally, we graph the difference in variation in the number of children ever born between elite and non-elite by country controlling for several independent variables and using country-level random effects. For this graph we used a simpler regression model with varying intercept and varying slopes by place of residence and country-level TFR. The lines present the variation between elite and non-elite. Each line represents a place of residence by country and is represented for different TFR levels.

Results

Descriptive Statistics

Our first look at the elite category by population composition and other elite characteristics suggests our measure of secondary education and top wealth quintile is a good proxy of elite status. While the proportion of elite women within each country varies from 1.0% in Niger to 17.3% in Nigeria the survey and population weighted proportion of elite women across all surveys is 8.7%. And while, by definition, 100% of elite women fall into the top wealth quintile relative to each country, only 7.4%-22.1% of non-elite women do. Among the subset of women who are currently married/in union, educational attainment of secondary schooling or higher education is very common among their partners (82.8%), implying that elite women are part of elite couples. Additionally, elite women are found predominately (88%) but not exclusively in urban areas.

Table 2: Population composition and characteristics for elite and non-elite women aged 20-49, by country, 2010-2017, DHS

Country	% elite	% in wealthiest quintile		Partner secondary + education (%)		% living in urban areas	
		elite	*non-elite*	*elite*	*non-elite*	*elite*	*non-elite*
Pooled sample	**8.7**	**100.00**	**16.0**	**82.8**	**13.8**	**88.0**	**31.1**
Burkina Faso	1.7	100.0	22.1	68.5	1.4	99.3	24.2
Benin	3.7	100.0	21.2	84.4	6.8	95.9	43.9
Burundi	2.3	100.0	18.7	69.4	1.8	80.7	11.0
DR Congo	9.9	100.0	15.0	91.4	29.1	99.3	30.3
Rep of Congo	6.4	100.0	15.6	81.0	22.4	98.2	66.1
Cote d'Ivoire	4.9	100.0	19.7	85.2	8.3	99.3	46.4
Cameroon	6.8	100.0	18.9	77.9	11.8	95.8	50.5
Ethiopia	7.0	100.0	20.2	77.5	5.5	95.6	16.1
Gabon	8.9	100.0	14.8	84.5	24.3	98.6	87.4
Ghana	10.8	100.0	15.1	72.4	18.4	96.3	49.7
Gambia	10.1	100.0	16.9	71.5	18.7	100.0	51.5
Guinea	4.3	100.0	19.1	71.7	8.2	98.6	31.8
Kenya	16.9	100.0	13.4	89.6	28.9	87.5	33.8
Liberia	8.9	100.0	14.2	88.3	29.5	98.1	55.3
Mali	2.1	100.0	19.8	64.7	3.4	90.8	21.8
Malawi	8.6	100.0	16.5	89.9	15.2	74.7	13.2
Mozambique	3.8	100.0	19.8	77.3	4.4	93.6	31.6
Nigeria	17.3	100.0	7.4	87.5	27.4	86.7	32.8
Niger	1.0	100.0	21.3	72.4	1.8	88.5	17.3
Rwanda	6.8	100.0	16.2	67.8	3.5	74.7	15.2
Sierra Leone	6.7	100.0	17.3	77.3	9.9	97.7	29.3
Senegal	5.2	100.0	21.2	61.8	6.8	95.0	47.7
Togo	4.1	100.0	21.9	83.7	10.0	99.4	43.0
Tanzania	10.5	100.0	17.7	53.0	7.5	86.5	30.0
Uganda	8.6	100.0	19.2	82.5	11.4	72.4	23.2
Zambia	10.8	100.0	15.1	91.1	17.0	93.0	40.0
Zimbabwe	8.2	100.0	19.2	82.1	10.3	90.1	35.6

We also produced the same descriptive statistics separately for each or our "elite" components: women in the wealthiest quintile and those with secondary or higher education (Annex A & Annex B).

Analysis of TFR for elite women, compared to non-elite women and to all women combined (Table 3), shows that elites have low TFR. On average, elite TFR (3.2) is 2.5 children per woman less than non-elite TFR (5.7) but there is noticeable variation in the overall elite TFR levels across countries. While two-thirds (17 out of 27) of the analysis countries have elite TFR at 3.0 or less, ten countries have elite TFR above 3; at less than 4, however, this is still low for the SSA region. Even in these higher elite TFR countries, elite TFR is consistently 2 children per woman less than the country-level TFR. Altogether, 21 out of 27 countries have an elite TFR below 3.5 (exceptions: Tanzania 3.5, Burundi 3.6, Uganda 3.6, DRC 3.7 and Mali 3.8, Nigeria 3.9).

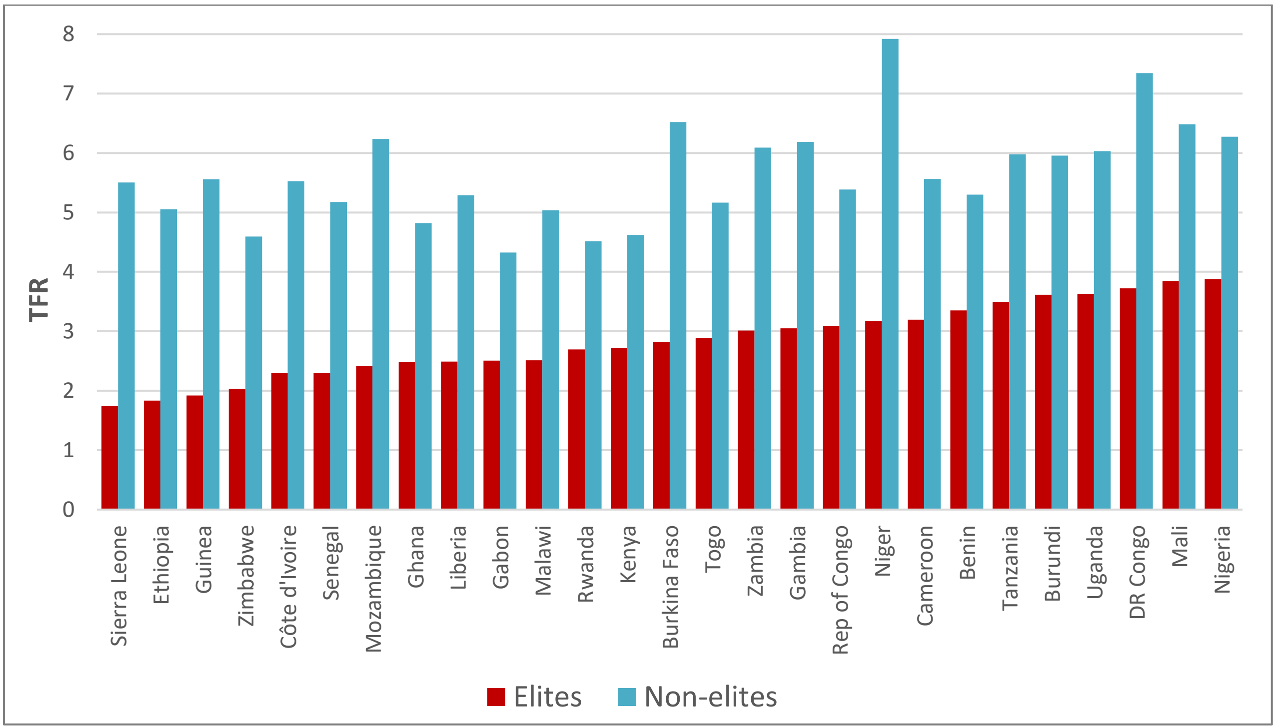
Table 3: TFR by country and for elites and non-elites, in ascending order of elite TFR, all women of reproductive age (15-49) and women 20-49, 2010-2017 DHS

Country	TFR	TFR	Elites TFR	Non-elites TFR
	15-49	*20-49*	*20-49*	*20-49*
Pooled sample	**5.1**	**5.6**	**3.2**	**5.8**
Sierra Leone	4.9	5.2	1.7	5.5
Ethiopia	4.6	4.9	1.8	5.1
Guinea	5.1	5.4	1.9	5.6
Zimbabwe	4.0	4.4	2.0	4.6
Côte d'Ivoire	4.9	5.2	2.3	5.5
Senegal	4.6	4.9	2.3	5.2
Mozambique	5.9	6.2	2.4	6.2
Ghana	4.2	4.4	2.5	4.8
Liberia	4.7	5.1	2.5	5.3
Gabon	4.1	4.3	2.5	4.3
Malawi	4.4	4.8	2.5	5.0
Rwanda	4.2	4.4	2.7	4.5
Kenya	3.9	4.2	2.7	4.6
Burkina Faso	6.0	6.4	2.8	6.5
Togo	4.8	5.0	2.9	5.2
Zambia	5.3	5.6	3.0	6.1
Gambia	5.6	5.9	3.0	6.2
Rep of Congo	5.1	5.3	3.1	5.4
Niger	7.6	8.0	3.2	7.9
Cameroon	5.1	5.4	3.2	5.6
Benin	4.9	5.2	3.4	5.3
Tanzania	5.2	5.6	3.5	6.0
Burundi	5.5	5.9	3.6	6.0
Uganda	5.4	5.8	3.6	6.0
DR Congo	6.6	6.9	3.7	7.3
Mali	6.1	6.4	3.8	6.5
Nigeria	5.5	5.9	3.9	6.3

We do find some evidence of correlation between higher country-level TFR and higher TFR among the elites, or (which is the same thing) between the TFR of the elite and the TFR of the non-elite (Figure 1). This suggests that country fertility levels are associated with fertility levels among the elite. This is important because it suggests that fertility of the elite may in fact be influenced by a country's fertility context. However, the correlation between elite TFR and overall TFR is only moderately strong (0.46), and at any rate not as strong as between non-elite TFR and overall national TFR (.99), which are almost the same thing.

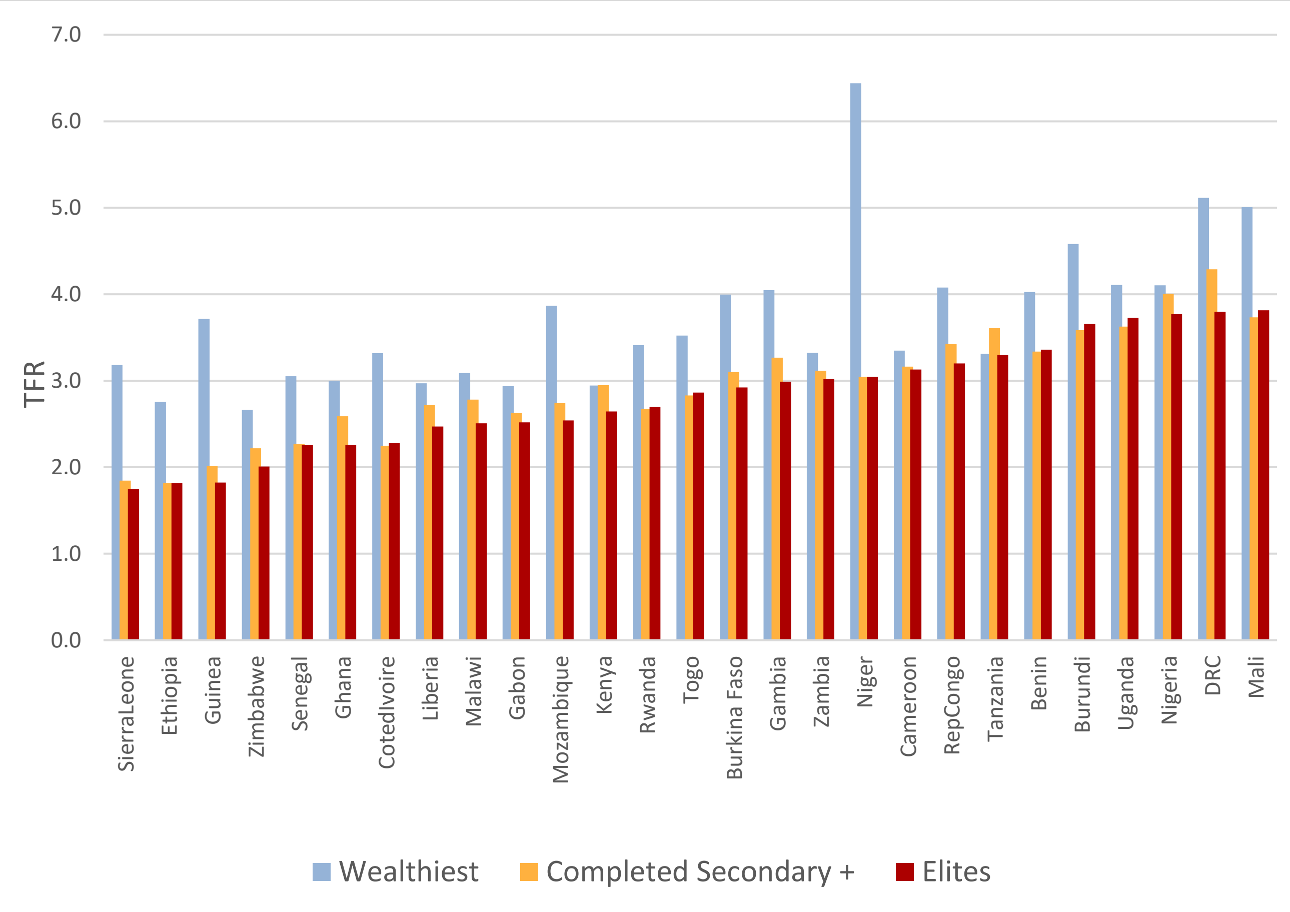
When examining the association between overall TFR and elite TFR (Figure 1), we see that countries with the lowest overall TFR (less than 5) do not have particularly low elite TFR: Gabon, Kenya, Zimbabwe, Rwanda, Ghana' s elites have TFRs hovering between 2.3-2.6, except for Ethiopia (1.8 elite TFR). If we focus on the 22 countries with an overall TFR lower than 6, we observe only a moderate correlation (0.58) between their overall TFR and their elite TFR. In other words, in countries that have not progressed much in their fertility transition so far (TFR above 6) the elite fertility is lower than that of the overall population, but still aligned with the fertility of the overall population (except in Niger). However, in countries more advanced in the transition (TFR less than 6), the elite TFR seem to converge towards a family size between 2 and 3 children, whatever the overall fertility level.

Figure 1: TFR for elites and non-elites (women 20-49), by country, 2010-2017, DHS



Results (Figure 2) suggest that there is something similar about the profile of our elite category of women distinct from the profile of women in the wealthiest quintile, who have higher TFR than our elite category in every country. The difference is less pronounced when comparing our category of elite women with those with who have completed secondary education. When we compare the fertility of our elite category women with the fertility of the most educated women we see that it is lower for elite women in most countries, but only slightly. This suggests that our elite category may be a better measure of elite status than is using simply education, if only slightly, and we proceed with the elite category for our subsequent analysis to incorporate the most distinguishing elite measure of the three we explored.

Figure 2: TFR for women in the richest wealth quintile, completed secondary + education, and elite category (women 20-49), by country, 2010-2017, DHS



To test our hypothesis that similarities in the profile of elite women in SSA exclusive of their country context results in similar fertility outcomes we then implemented a series of multilevel models on women's number of children ever born in the two groups of interest: elite and non-elite, contrasting the impact of individual-level variables (age, residence, and marital status) to that of country-level variables. For the latter, we tested three sets of contextual variables: only national-level TFR (Tables 4 & 5), then the different factors thought to be closely linked to national-level TFR: ideal number of children, country GDP and country modern contraceptive prevalence (Tables 6 & 7); we also tested possible diffusion effects by adding the proportion of the elite group in the analyses (Tables 8 & 9).

Multilevel Analysis

Table 4: Multilevel generalized linear regression models for children ever born, non-elite women with country-level TFR

	(1)	(2)	(3)	(4)
TFR (5-6)		0.126*** (0.043)		0.095*** (0.033)
TFR 6+		0.239*** (0.054)		0.174*** (0.041)
Age 25-29			0.566*** (0.004)	0.566*** (0.004)
Age 30-34			0.916*** (0.004)	0.916*** (0.004)
Age 35-39			1.144*** (0.004)	1.144*** (0.004)
Age 40-44			1.276*** (0.004)	1.276*** (0.004)
Age 45-49			1.369*** (0.004)	1.369*** (0.004)
Married			1.387*** (0.008)	1.387*** (0.008)
Separated/divorced			1.172*** (0.008)	1.172*** (0.008)
Rural residence			0.204*** (0.002)	0.204*** (0.002)
Constant	1.291*** (0.026)	1.200*** (0.029)	-1.009*** (0.021)	-1.077*** (0.024)
Variance	0.01842	0.0102	0.01033	0.005905
% réduction de la var		44,6	43,9	67,9
Observations	285,795	285,795	285,795	285,795
Log Likelihood	-696,657.000	-696,649.100	-539,936.800	-539,929.300
Akaike Inf. Crit.	1,393,318.000	1,393,306.000	1,079,894.000	1,079,883.000
Bayesian Inf. Crit.	1,393,339.000	1,393,349.000	1,079,999.000	1,080,009.000

Note: *p<0.1; **p<0.05; ***p<0.01

Looking first at the non-elite women (table 4) and a set of models including only the TFR as the country-level variable, we see that the variance in the total number of children of women is reduced by 44.6% when controlling for the country-level TFR, and by 43.9% controlling only for individual-level variables. In other words, country-level variables (here the TFR) explains as much of the variance as do individual-level ones. The ANOVA test shows that adding individual-level variables improves the fit of the model, as does adding contextual level variables and considering both sets of variables - all the models are significantly improvements over the model without covariates.

Table 5: Multilevel generalized linear regression models for children ever born, elite women with country-level TFR

	(1)	(2)	(3)	(4)
TFR (5-6)		0.219** (0.099)		0.141** (0.063)
TFR 6+		0.262** (0.124)		0.202** (0.081)
Age 25-29			0.520*** (0.024)	0.520*** (0.024)
Age 30-34			0.941*** (0.024)	0.942*** (0.024)
Age 35-39			1.196*** (0.024)	1.196*** (0.024)
Age 40-45			1.377*** (0.025)	1.378*** (0.025)
Age 45-49			1.501*** (0.025)	1.501*** (0.025)
Married			1.999*** (0.026)	1.998*** (0.026)
Separated/divorced			1.757*** (0.031)	1.756*** (0.031)
Rural residence			0.075*** (0.015)	0.075*** (0.015)
Constant	0.248*** (0.050)	0.120* (0.067)	-2.190*** (0.043)	-2.277*** (0.051)
Variance	.06415	0.05042	0.02668	0.01939
% reduction in variance		21,4	58,4	69,77
Observations	20,779	20,779	20,779	20,779
Log Likelihood	-46,438.890	-46,435.810	-31,976.140	-31,972.610
Akaike Inf. Crit.	92,881.770	92,879.630	63,972.280	63,969.220
Bayesian Inf. Crit.	92,897.650	92,911.390	64,051.690	64,064.520

Note: *p<0.1; **p<0.05; ***p<0.01

The elite women present a different picture (Table 5): the country TFR reduces the variance in women's average number of children by only 21%, while individual characteristics reduce this variance by 58%. The ANOVA comparison of models shows that the only model which very significantly improves the fit of the model to the data is the model containing only individual-level variables.

Table 6: Multilevel generalized linear regression models for children ever born, non-elite women with country-level GDP, MCPR and ideal number of children

	(1)	(2)	(3)	(4)
GDP per capita ($996-$3895)		-0.092** (0.046)		-0.023 (0.038)
MCPR 11%-22%		0.056 (0.054)		0.029 (0.045)
MCPR >22%		-0.010 (0.062)		-0.005 (0.052)
Mean ideal # of children 5-6		0.061 (0.051)		0.042 (0.042)
Mean ideal # of children >6		0.228*** (0.074)		0.168*** (0.060)
Age 25-29			0.566*** (0.004)	0.566*** (0.004)
Age 30-34			0.916*** (0.004)	0.916*** (0.004)
Age 35-39			1.144*** (0.004)	1.144*** (0.004)
Age 40-44			1.276*** (0.004)	1.276*** (0.004)
Age 45-49			1.369*** (0.004)	1.369*** (0.004)
Married			1.387*** (0.008)	1.387*** (0.008)
Separated/divorced			1.172*** (0.008)	1.172*** (0.008)
Rural residence			0.204*** (0.002)	0.204*** (0.002)
Constant	1.291*** (0.026)	1.261*** (0.051)	-1.009*** (0.021)	-1.042*** (0.043)
Variance	0.01842	0.01081	0.01033	0.007286
% reduction in variance		41,31	43,92	60,45
Observations	285,795	285,795	285,795	285,795
Log Likelihood	-696,657.000	-696,649.900	-539,936.800	-539,932.100
Akaike Inf. Crit.	1,393,318.000	1,393,314.000	1,079,894.000	1,079,894.000
Bayesian Inf. Crit.	1,393,339.000	1,393,388.000	1,079,999.000	1,080,053.000

Note: *p<0.1; **p<0.05; ***p<0.01

Table 7: Multilevel generalized linear regression models for children ever born, elite women with country-level GDP, MCPR and ideal number of children

	(1)	(2)	(3)	(4)
GDP per capita ($996-$3895)		-0.037 (0.093)		-0.015 (0.067)
MCPR 11%-22%		0.104 (0.114)		0.015 (0.083)
MCPR >22%		0.255* (0.131)		0.048 (0.096)
Mean ideal # of children 5-6		-0.040 (0.106)		-0.047 (0.077)
Mean ideal # of children >6		0.424*** (0.150)		0.218** (0.108)
Age 25-29			0.520*** (0.024)	0.519*** (0.024)
Age 30-34			0.941*** (0.024)	0.941*** (0.024)
Age 35-39			1.196*** (0.024)	1.196*** (0.024)
Age 40-44			1.377*** (0.025)	1.377*** (0.025)
Age 45-49			1.501*** (0.025)	1.501*** (0.025)
Married			1.999*** (0.026)	1.999*** (0.026)
Separated/divorced			1.757*** (0.031)	1.757*** (0.031)
Rural residence			0.075*** (0.015)	0.074*** (0.015)
Constant	0.248*** (0.050)	0.100 (0.108)	-2.190*** (0.043)	-2.217*** (0.084)
Variance	0.06415	0.04211	0.02668	0.02074
% reduction in variance		34,36	58,41	67,67
Observations	20,779	20,779	20,779	20,779
Log Likelihood	-46,438.890	-46,433.560	-31,976.140	-31,973.200
Akaike Inf. Crit.	92,881.770	92,881.110	63,972.280	63,976.390
Bayesian Inf. Crit.	92,897.650	92,936.700	64,051.690	64,095.520

Note: *p<0.1; **p<0.05; ***p<0.01

Replacing the country-level TFR by GDP, country MCPR and country mean number of desired children (Tables 6 & 7), we see the same picture emerge, with 34% and 58% reduction in variance after introducing only these country-level variables or only individual-level variable for the elite, versus 41% and 44% for the non-elite. Only the individual variables model is significant at 5% for the elite, while both the models with individual and contextual variables are significant for the non-elite.

Table 8: Multilevel generalized linear regression models for children ever born, non-elite women and all country-level variables

	(1)	(2)	(3)	(4)
GDP per capita ($996-$3895)		-0.097** (0.049)		-0.041 (0.039)
MCPR 11%-22%		0.058 (0.062)		0.012 (0.051)
MCPR >22%		-0.014 (0.065)		-0.024 (0.053)
Mean ideal # of children 5-6		0.062 (0.053)		0.055 (0.043)
Mean ideal # of children >6		0.219*** (0.077)		0.154** (0.063)
Proportion elite 3.78-8%		0.002 (0.060)		0.043 (0.049)
Proportion elite >8%		0.019 (0.063)		0.062 (0.051)
Age 25-29			0.566*** (0.004)	0.566*** (0.004)
Age 30-34			0.916*** (0.004)	0.916*** (0.004)
Age 35-39			1.144*** (0.004)	1.144*** (0.004)
Age 40-44			1.276*** (0.004)	1.276*** (0.004)
Age 45-49			1.369*** (0.004)	1.369*** (0.004)
Married			1.387*** (0.008)	1.387*** (0.008)
Separated/divorced			1.172*** (0.008)	1.172*** (0.008)
Rural residence			0.204*** (0.002)	0.204*** (0.002)
Constant	1.291*** (0.026)	1.258*** (0.053)	-1.009*** (0.021)	-1.058*** (0.044)
Variance	0.01842	0.01077	0.01033	0.006864
% reduction in variance		41,53	43,92	62,74
Observations	285,795	285,795	285,795	285,795
Log Likelihood	-696,657.000	-696,649.800	-539,936.800	-539,931.300
Akaike Inf. Crit.	1,393,318.000	1,393,318.000	1,079,894.000	1,079,897.000
Bayesian Inf. Crit.	1,393,339.000	1,393,413.000	1,079,999.000	1,080,076.000

Note: *p<0.1; **p<0.05; ***p<0.01

Adding a variable for the proportion of the population of women at the country-level who fall into the elite category (Tables 8 & 9) changes the outcome slightly only for the elite, by increasing their number of children; contextual factors then become somewhat more important to explain variations in their fertility. Note that the proportion elite reflects not only the true size of this group, but also the proportion women who have a secondary education in a country, which, depending on the quality of the schooling system, may or may not actually translate into middle class status.

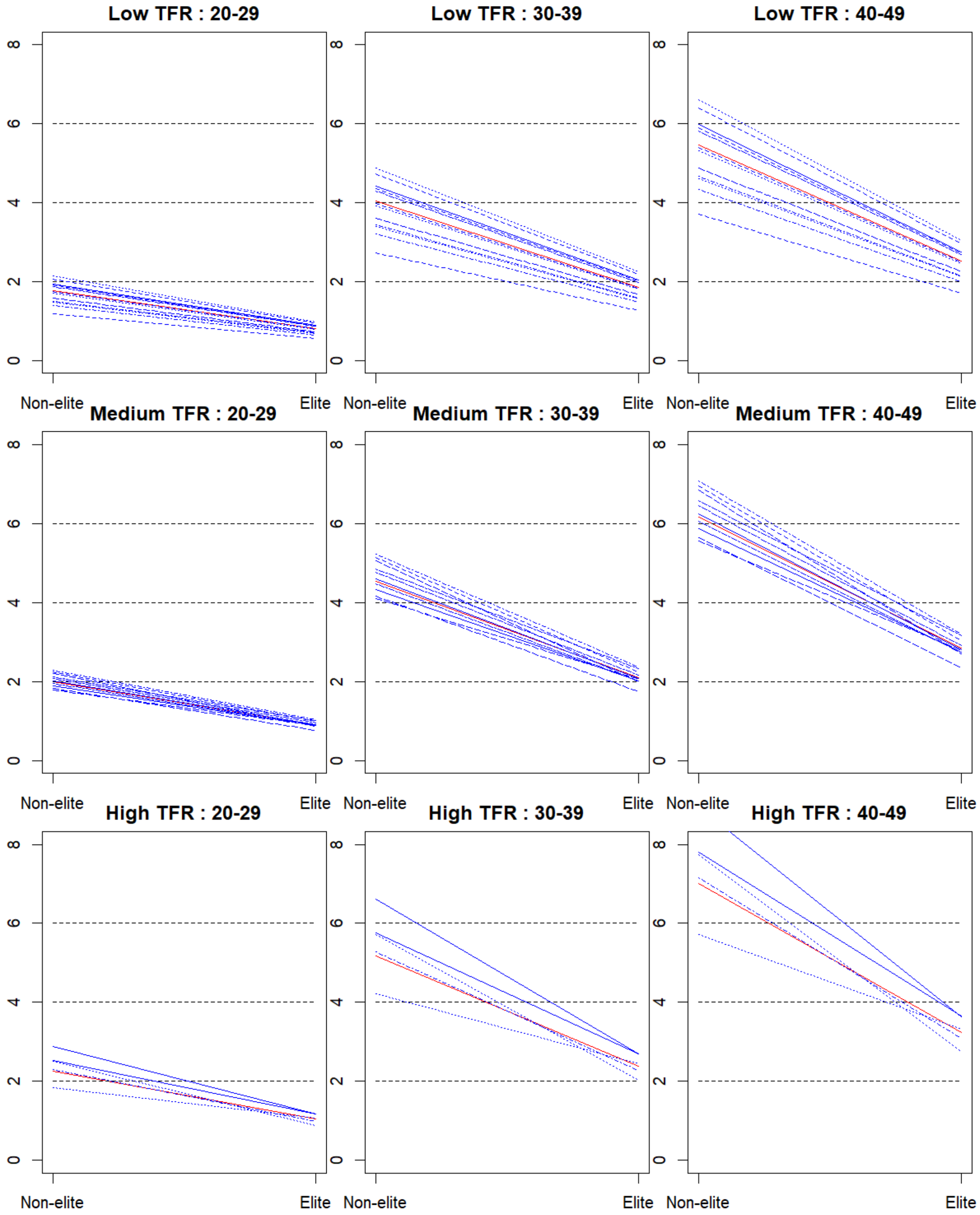
Table 9: Multilevel generalized linear regression models for children ever born, elite women and all country-level variables

	(1)	(2)	(3)	(4)
GDP per capita ($996-$3895)		-0.081 (0.094)		-0.054 (0.065)
MCPR 11%-22%		-0.002 (0.124)		-0.094 (0.087)
MCPR >22%		0.195 (0.129)		-0.008 (0.090)
Mean ideal # of children 5-6		0.016 (0.104)		0.010 (0.072)
Mean ideal # of children >6		0.441*** (0.154)		0.246** (0.106)
Proportion elite 3.78-8%		0.221* (0.117)		0.223*** (0.081)
Proportion elite >8%		0.146 (0.123)		0.131 (0.086)
Age 25-29			0.520*** (0.024)	0.520*** (0.024)
Age 30-34			0.941*** (0.024)	0.942*** (0.024)
Age 35-39			1.196*** (0.024)	1.196*** (0.024)
Age 40-44			1.377*** (0.025)	1.377*** (0.025)
Age 45-49			1.501*** (0.025)	1.501*** (0.025)
Married			1.999*** (0.026)	1.999*** (0.026)
Separated/divorced			1.757*** (0.031)	1.756*** (0.031)
Rural residence			0.075*** (0.015)	0.075*** (0.015)
Constant	0.248*** (0.050)	0.034 (0.108)	-2.190*** (0.043)	-2.284*** (0.081)
Variance	0.06415	0.037	0.02668	0.01616
% reduction in variance		42,32	58,41	74,81
Observations	20,779	20,779	20,779	20,779
Log Likelihood	-46,438.890	-46,431.820	-31,976.140	-31,969.750
Akaike Inf. Crit.	92,881.770	92,881.640	63,972.280	63,973.500
Bayesian Inf. Crit.	92,897.650	92,953.110	64,051.690	64,108.510

Note: *p<0.1; **p<0.05; ***p<0.01

Last, we conduct a simplified version of this modelling exercise (Figure 3) with only age (20-29, 30-39 and 40-49) at the individual-level and country-level TFR to visually display the impact of contextual factors for the elite and non-elite groups. Models are run separately for countries at different stages of the fertility transition by distinguishing between countries with high (>6), medium, (5-6) and low (<5) national-level TFR for all women (elites and non-elites combined). Figure 3 shows that variations in elite fertility across countries shows less variability in contrast to the fertility in the non-elite groups, and this is true whatever the stage of the country in the fertility transition and across age groups.

Figure 3: Elite and non-elite fertility



Discussion and next steps

We find that, as expected, across SSA countries, elite women have lower fertility than non-elite women in every country, often substantially lower. Wealthiest women and the best educated also have lower TFR than their less wealthy and less educated counterparts, with TFR levels of more educated women taken alone very close to those of women in our elite category. Further investigation of our better educated category will help us better determine whether or how our combined wealth and education elite category, compared to using only education, better captures elite status across SSA.

Results from our multi-level modelling indicate that for elite women country-level variables explain less of the difference in fertility levels than do individual variables. For non-elite women, individual-level variables explain as much of differences in fertility as do contextual variables. In other words, our models suggest that the relatively large variation in non-elite fertility across countries is explained in large part by contextual factors such as national GDP, national MCPR, and national mean ideal number of children, while such factors do not explain as much for the lower levels of elite fertility. Our findings suggest that regardless of country context, there is something distinct about elite women across SSA that results in lower fertility outcomes, while the majority of non-elite women's fertility is more influenced by country context factors. There does in fact appear to be something specific to "elite" women, regardless of where they find themselves, that results in lower and more similar fertility levels across the region. This in turn suggests that increases in the proportion of elite women within a country will result in a larger proportion of the population choosing to have smaller families, which could in turn impact overall fertility at the national level. On the other hand, changes in country contextual factors are likely to influence fertility of the overwhelming majority of non-elite women, though these changes may arguably take longer to have an impact at the population level and may need to be of a more complex and multi-faceted nature.

Though elite status is highly correlated with education level, the absence of contextual effects on elite fertility seems to indicate that it is the translation of women's education into higher class status – including greater wealth and better educated partners (as a proxy for better paying jobs) – that moves women and couples to have smaller families. Our findings also imply that education alone, while highly correlated with elite status, may not have the same influence on lower fertility desires and outcomes. This may be related to question of quality of education (i.e., learning rather than years of school) and can be investigation of countries with high levels of secondary education without commensurate expected changes in fertility (e.g., Nigeria). Nonetheless, from a programmatic perspective our findings suggest while education certainly plays a role in the SSA fertility decline, the creation of well-paying human capital jobs that facilitate movement into a higher socio-economic status is also important.

As a last step in our analysis, we will run the multilevel regression analysis separately for the wealthiest (richest quintile) and most educated (completion of secondary education or higher) women to determine whether results from our elite category are in fact sufficiently distinct from results for each component of elite run separately, specifically completed education, or whether completed education in SSA by and large captures elite socio-economic status. Part of this analysis will involve re-examining educational attainment categories within each country. We hope that findings from this second round of analysis will also help enrich discussions around the best marker of social class in the contemporary SSA setting.

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Annexes

Annex A: GDP per capita for most recent DHS survey year

Country	Survey year	TFR (20-49)	Elite TFR	GDP
Burkina	2012	6.4	2.9	575.45
Benin	2010	5.2	3.4	825.94
Burundi	2016-17	5.9	3.7	285.73
DRC	2011	6.9	3.8	458.13
Rep of Congo	2012	5.3	3.2	3,196.65
Cote d'Ivoire	2014	5.2	2.3	1,214.70
Cameroon	2017	5.4	3.1	1,429.65
Ethiopia	2012	4.9	1.8	706.76
Gabon	2013	4.3	2.5	9,774.18
Ghana	2014	4.4	2.3	1,432.23
Gambia	2012	5.9	3.0	483.49
Guinea	2014	5.4	1.8	654.80
Kenya	2013	4.2	2.6	1,335.06
Liberia	2015-16	5.1	2.5	454.12
Mali	2012-13	6.4	3.8	777.35
Malawi	2011	4.8	2.5	362.66
Mozambique	2012	6.2	2.5	526.53
Nigeria	2013	5.9	3.8	2,996.96
Niger	2012	8.0	3.0	391.52
Rwanda	2014-15	4.4	2.7	710.35
Sierra Leone	2017	5.2	1.7	710.82
Senegal	2013	4.9	2.3	1,329.30
Togo	2015-16	5.0	2.9	579.43
Tanzania	2014	5.5	3.3	872.30
Uganda	2016	5.8	3.7	580.38
Zambia	2013-14	5.6	3.0	1,850.79
Zimbabwe	2015	4.4	2.0	1,033.42

Source: World Bank Development Indicators,
http://databank.worldbank.org/data/reports.aspx?source=2&series=NY.GDP.PCAP.CD&country

Annex B: Descriptives for women with secondary education or higher

Country	% secondary education + (most educated)	% in wealthiest quintile		Partner secondary + (among subset of women in union)		Urban	
		2ndary+	other	2ndary+	other	2ndary+	other
Full sample	**13.9**	**62.5**	**17.0**	**78.1**	**11.6**	**71.3**	**30.3**
Burkina	1.8	98.2	22.1	67.7	1.4	97.9	24.2
Benin	4.3	86.8	21.3	81.8	6.7	93.2	43.7
Burundi	2.5	88.7	18.7	69.7	1.8	72.1	11.0
DR Congo	14.3	69.6	15.8	86.9	26.8	82.2	29.7
Rep of Congo	12.1	53.0	16.6	72.6	20.6	94.7	64.5
Cote d'Ivoire	6.5	75.9	20.0	82.1	8.0	92.0	46.0
Cameroon	9.2	74.2	19.4	73.3	11.1	92.4	49.7
Ethiopia	7.9	88.4	20.4	77.5	5.1	85.4	16.2
Gabon	15.8	56.5	16.0	71.9	22.2	97.7	86.7
Ghana	19.7	55.1	16.7	70.6	16.0	78.5	48.9
Gambia	16.3	61.8	18.1	69.8	16.5	87.9	50.2
Guinea	5.5	79.5	19.3	70.5	7.7	92.5	31.4
Kenya	30.5	55.5	16.0	79.5	23.0	64.6	33.4
Liberia	13.0	68.3	14.8	85.4	27.6	93.5	54.0
Mali	2.4	89.5	19.9	63.7	3.3	85.1	21.8
Malawi	11.1	77.3	17.0	83.3	14.2	60.1	13.3
Mozambique	4.1	92.0	19.9	76.6	4.2	89.2	31.5
Nigeria	30.3	57.1	8.8	82.9	21.1	70.7	29.7
Niger	1.0	100.0	21.3	72.4	1.8	88.5	17.3
Rwanda	9.2	74.5	16.6	66.3	2.8	56.9	15.4
Sierra Leone	8.3	80.5	17.6	74.0	9.6	89.8	28.9
Senegal	6.8	76.1	21.5	56.6	6.4	88.4	47.3
Togo	5.3	76.7	22.2	83.2	9.7	92.8	42.6
Tanzania	15.1	69.6	18.7	46.9	6.7	68.8	30.1
Uganda	11.4	75.7	19.8	77.5	10.2	60.0	23.3
Zambia	15.0	71.5	15.8	83.9	15.4	82.2	39.3
Zimbabwe	11.0	74.2	19.8	73.7	9.3	78.4	35.3

Annex C: Descriptives for women in the wealthiest quintile

Country	% Wealthiest	% in wealthiest quintile		Partner secondary + (among subset of women in union)		Urban	
		elite	non-elite	elite	non-elite	elite	non-elite
Full sample	**23.4**	**100.0**	**0.0**	**46.0**	**11.3**	**85.2**	**21.0**
Burkina Faso	23.5	100.0	0.0	10.6	0.0	82.9	7.9
Benin	24.1	100.0	0.0	32.7	2.5	92.8	30.9
Burundi	20.5	100.0	0.0	14.8	0.3	53.6	2.0
DRC	23.5	100.0	0.0	69.0	25.2	98.3	18.4
Rep of Congo	21.0	100.0	0.0	52.7	18.4	96.2	60.7
Cote d'Ivoire	23.6	100.0	0.0	33.1	4.7	98.1	33.8
Cameroon	24.4	100.0	0.0	45.0	7.0	94.4	40.5
Ethiopia	25.8	100.0	0.0	33.4	2.4	77.1	2.5
Gabon	22.4	100.0	0.0	61.6	20.0	97.5	85.8
Ghana	24.3	100.0	0.0	50.4	14.5	97.6	41.0
Gambia	25.2	100.0	0.0	48.4	15.7	99.3	41.9
Guinea	22.6	100.0	0.0	30.7	5.1	98.7	16.0
Kenya	28.1	100.0	0.0	70.1	26.6	87.6	25.4
Liberia	21.8	100.0	0.0	68.7	25.4	96.8	48.6
Mali	21.5	100.0	0.0	18.6	0.8	80.0	7.7
Malawi	23.7	100.0	0.0	55.5	10.4	61.9	5.1
Mozambique	22.9	100.0	0.0	26.4	1.6	87.2	18.1
Nigeria	23.4	100.0	0.0	77.8	25.0	86.6	28.5
Niger	22.1	100.0	0.0	10.6	0.2	70.3	3.2
Rwanda	21.9	100.0	0.0	27.5	1.8	69.3	5.2
Sierra Leone	22.8	100.0	0.0	39.3	6.5	95.6	15.7
Senegal	25.3	100.0	0.0	26.1	4.1	89.7	36.8
Togo	25.1	100.0	0.0	32.6	6.0	98.2	27.6
Tanzania	26.4	100.0	0.0	31.2	5.3	86.9	17.7
Uganda	26.2	100.0	0.0	45.0	8.4	69.9	12.4
Zambia	24.2	100.0	0.0	62.4	12.2	94.0	30.3
Zimbabwe	25.8	100.0	0.0	41.8	7.1	92.4	21.8