The Fertility Decline in Sub-Saharan Africa:
Who's Next After the Elite?

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Introduction

The fertility decline began in the late 1980s in sub-Saharan Africa, much later than in the rest of the world, and has proceeded since then at a slower rate compared to other developing regions (Casterline 2001, Tabutin & Schoumaker 2004). Sub- Saharan Africa's slow progression in the fertility transition between 1950 and 2000 is largely explained by these countries' low development indicators (Bryant 2007). Since 2000, the region as a whole has seen sustained growth in Gross Domestic Product (GDP) (UNCTA 2014), which prompted a number of optimistic discourses about the economic future of the African continent. However, if the share of people living in extreme poverty (with less than 1.25$ PPP a day) has been considerably reduced during the last two decades (World Bank 2013), job growth has not followed (Potts 2013), and the share of people having reached middle class status (more the $4 a day PPP) has not increased much (African Development Bank [ADB] 2011). Poverty reduction seems to have resulted mainly in the growth of a "floating" group (as designated by the ADB 2011), i.e. a group of people who are out of extreme poverty, but who occupy a precarious position and are at risk of falling back into poverty.

Lower fertility is one of the fundamental characteristics of middles classes around the world (Banerjee and Duflo 2008). The sub-Saharan African middle class does not escape this rule: numerous studies have shown that better-off women and couples (whatever the measure of socioeconomic status: educational attainment, household wealth, urban residence, etc.) there, too, have fewer children (Shapiro 2012). On the other hand, little is known to date about the fertility of the "floating" class in sub-Saharan Africa. One segment of this "floating" group has received more attention recently: the proportion of this group living in urban areas. Often broadly defined "urban poor", a term generally used to refer to any segment urban dwellers not among the best off, they have attracted attention because of their high levels of unmet need for family planning (Ezeh et al. 2009, Rossier 2014). These urban "in-betweens" seem characterized by ambivalent fertility intentions: they exhibit the desire to avoid pregnancies in the short –term, due to the high costs of children, but also express long-term desires to have large families (Smith 2004, Agadjanian 2005, Johnson-Hanks 2007, Romaniuk 2011). The reproductive behaviors of the rest of the "floating" group (living in rural areas) remain on the other hand largely uninvestigated to date. Altogether, since the "floating" class will likely constitute the major group on the continent in the decades to come (in urban areas but even more so in rural areas), it seems essential to determine its reproductive specificities and its potential contribution to the future of the fertility decline.

In this paper we will study differences in fertility levels and fertility trends across socioeconomic groups in Sub-Saharan Africa between the early 1990s and 2012, devoting particular attention to the "floating" group, namely its growth, its fertility outcomes, fertility preferences and contraceptive behaviors. Obviously, the definition and measurement of socioeconomic status is central to our study. Conceptually, we start with a definition of the middle class, and delineate two classes below the middle class, one "floating" and one lower class. Note that size of the upper class remains very small on the African continent (ADB 2011), so that we do not study it separately; these few individuals are included in the middle class. Middle class affiliation in the contemporary developing world is commonly identified through a series of interconnected dimensions (Banerjee and Duflo 2008): higher educational attainment, stable, formal and non-manual jobs, higher consumption / income, ownership of a greater number of goods, better quality housing, propensity to save, propensity to invest in the health and schooling of household members, and lower fertility. The lower

fertility of middle class individuals in countries entering economic development / industrialization is explained by their desires to invest in the education of their children, in order to maintain or improve their social status. This phenomenon has been extensively studied by demographic historians who linked the fertility transition in 19th century Europe, which occurred first for the upper classes, to new chances for intergenerational social mobility arising from industrialization (Ariès 1980, Van Bavel 2005). In Sicily, for example, the fertility decline spread slowly from one social class to the next, as each class successively entered the new economic system and needed to invest in the human capital of their children to promote their chances of success (Schneider & Schneider 1984).

In the case of contemporary sub-Saharan Africa, we postulate that the poorest people, especially if they live in rural areas (since much of the economic growth on the continent has been concentrated in cities Potts 2013), are largely cut from the opportunities arising from economic development in their countries, for themselves and for their children; they are expected to have few incentives to limit their family size, even when they have access to contraceptive services. Compared to the very disadvantaged, individuals in the intermediate groups have greater opportunity for social mobility and can hope to benefit from it, especially in urban areas; we could expect them to engage in some amount of fertility limitation, but only at a limited level due to lingering desires for large families. Finally, middle class individuals are expected to have low, post-transitional fertility levels, and to have aligned contraceptive practices. We expect fertility differences across countries and over time to be explained partly by variations in the socioeconomic composition of the population. The degree of wealth inequality, that is, the average income difference between two members of a population, is associated with lower social mobility (Andrew and Leigh 2009), and could explain additional differences in fertility levels and trends across countries; we will especially contrast in this respect Western and Eastern African countries. In sum, we will investigate fertility differentials and trends in sub-Saharan Africa over the last two decades in light of individual's socioeconomic position but also in light of their incentives for social mobility which may vary according to the overall wealth distribution in their context.

A standard approach to operationalize the notion of socioeconomic class in economics has been to use data on income/ consumption (household assets) to identify a number of classes, and to relate this division with other dimensions of class affiliation (educational attainment, fuel use, fertility etc.). Demographic studies, on the other hand, have focused on fertility differentials. Using data from the Demographic and Health Surveys (DHS), they typically discuss the respective effects of each of the indicators of socioeconomic status on the independent variable, usually through the use of logistic regression analysis. They largely conclude that women's education (which has the strongest independent effect) plays the key role in the transition to low fertility (Bongaarts 2003, Shapiro 2012). In this paper, we would like to add to this standard demographic approach, by showing that individuals' (women and their partners) position within the socio-economic hierarchy and their perceptions of social mobility (rather than women's educational attainment per se) play a role in explaining fertility trends in sub-Saharan Africa over the last two decades. To bring our point across, and using DHS data, we will use both women's educational attainment and household wealth to construct an indicator of social status.

Data and Methods

This analysis includes all countries from West and East Africa that have had four DHS carried out from survey rounds II to VI that collected data on both household wealth/assets *and* education. This allows us to analyze fertility trends over approximately 17 years using the same sub-set of countries. Three countries that meet these criteria –Nigeria, Guinea and Benin– were excluded because of concerns over data quality for one or more of their DHS. We examine fertility levels and trends across our defined social strata using data from four loosely defined periods (as in a couple of instances a survey is moved just before or after the cut-off in order to include all four): 1990-1995, 1996-2000, 2001-2005, and 2006 onwards.

TABLE 1: DHS in the analysis

Country	Period 1	Period 2	Period 3	Period 4
Burkina Faso	1993 (II)	1999(III)	2003 (IV)	2010 (VI)
Ghana	1993 (III)	1998 (IV)	2003 (IV)	2008 (V)
Mali	1996 (III)	2001 (IV)	2006 (V)	2012 (VI)
Niger	1992 (II)	1998 (III)	2006 (V)	2012 (VI)
Senegal	1993 (II)	1997(III)	2005 (IV)	2010 (VI)
West Africa: *n*	33,104	39,972	56,442	59,241
Kenya	1993 (II)	1998 (III)	2003 (IV)	2008 (V)
Malawi	1992 (II)	2000 (IV)	2004 (IV)	2010 (VI)
Rwanda	1992 (II)	2000 (IV)	2005 (IV)	2010 (VI)
Tanzania	1992 (II)	1999 (III)	2005 (IV)	2010 (V)
Uganda	1995 (III)	2001 (IV)	2006 (V)	2011 (VI)
Zambia	1992 (II)	1996 (III)	2002 (IV)	2007 (V)
Zimbabwe	1994 (III)	1999 (IV)	2006 (V)	2011 (VI)
East Africa: *n*	48,031	64,271	66,556	80,202
Total *n*	81,135	104,243	122,998	139,443

Note: DHS survey round in parenthesis

Our socio-economic groups are defined with two variables widely used to indicate SES: women's education and estimates of household wealth. Education is a binary variable for well educated (secondary education or higher)/less educated (completed primary school or less, including uneducated). Household wealth is approximated with an index measured by a principal component analysis (PCA) of ownership of consumer goods, household flooring material and adequate sanitation. The PCA here borrows from Rutstein & Staveteig (2014)'s Comparative Wealth Index approach, namely in combining safe water and improved toilets in one variable for "sanitation" and by including only assets that increase monotonically with wealth (unlike ownership of radios or

motorcycles, which may initially increase but subsequently decrease with rising levels of wealth across and within countries).

The three household assets included in our PCA are television, refrigerator and car/truck. Our adequate housing category distinguishes between those houses with only dirt flooring and those with non-dirt flooring. Sanitation is categorized as those who have good sanitation, i.e. access to both adequate toilet facilities and safe drinking water, and those who have access to only one or none. Adequate toilet facilities are either toilets or improved latrines (i.e. uncovered or traditional latrines are considered inadequate). The categorization of access to safe drinking water varies by urban and rural residence: in urban areas, piped water and bottled water are considered adequate sources of drinking water while in rural areas any source of water that is protected (piped water, wells and springs) is considered safe[1].

We created our wealth index to be an objective measure across time periods and countries: the index is computed with a set of household items that are standard across all surveys, and the index is calculated for the entire pooled sample of surveys. We thus pooled respondents from all periods and samples, and then distinguish two groups across the entire pooled sample: those that fall into the upper half of the wealth divide and those who fall below it. We then define the "middle class and up" socio-economic group as the sub-group of individuals having reached secondary education *and* whose household has higher approximated wealth. The "floating" (i.e. intermediate) group of individuals consists of those who either have attained a higher level of schooling (but live in poorer households) *or* who live in a wealthier household (but did not benefit from much schooling). Note that practically all women with secondary and higher education are in the "middle class and up" group, so that our "floating" category almost exclusively captures less educated individuals living in wealthier households (a bit less so in East than in West Africa) (Appendix 1). Our "low" socio-economic group consists of women who have less than a secondary school education and fall into the "poorer" household wealth category. We analyze these three social strata separately for rural and urban areas, in order to account for the fact that formal jobs and good markets and institutions of higher education are concentrated in sub-Saharan African cities. We also performed the analyses on the subset of women in union, and then replaced women's education in the SES indicator by their partner's education. The results were nearly identical to that for all women in the sample and thus are not shown here.

We first provide a descriptive overview of the survey populations' distribution across three socioeconomic strata in rural and urban areas at the regional level (Eastern versus Western African countries) for each period, illustrating changes in the population composition over time. The descriptive overview also includes total fertility rate (TFR) estimates for the different strata per period, to compare fertility across groups, residence, and regions, and determine whether TFR is declining at a standard rate across our three strata /residence /regions. All TFR estimates are calculated using the *tfr2* Stata module (Schoumaker 2013). The TFRs are computed for the last 6 years prior to the survey, so as to avoid "displacement" biases (Schoumaker 2009). We also consider differences in ideal family size, unmet need and contraceptive prevalence (condom, other modern,

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[1] In contrast to the other categories in the PCA, which are constant regardless of place of residence, we vary the definition for drinking water here because: a) access and improvements to water sources are often tied to local infrastructure which in many cases may not be tied to an individual household's level of wealth, and b) some sources for drinking water considered safe in rural areas are not considered potable in urban areas because of factors associated to urban pollution.

traditional) across the three socioeconomic groups, residence, regions and periods. All descriptive overviews here are weighted using country-specific survey weights as well as weights for the size of the country's population.

We then use a basic population decomposition approach to estimate the extent to which the overall decline in the TFR (and for each region and place of residence) is due to declining fertility within each social strata compared to changes in relative size (composition) of these three groups over time. This helps determine whether the fertility decline we observe at the regional level is primarily a factor of the shifting composition of the population that accompanies increases in wealth and education or whether there are discernable declines in fertility within each social strata that would lead to regional-level fertility declines in the absence of any changes in the compositional make-up of the population.

This population decomposition can compare only two populations at a time, so here we compare the earliest and latest periods (periods 1 and 4). We perform this decomposition by breaking down the change (decrease) in overall TFR between periods 1 and 4 into two components, demonstrated by the equation below: 1) a component that is the change in social strata composition (i.e. the percentage distribution - *C*) weighted by each group's TFR for the first period (contribution of social strata composition) and 2) a component that is the difference in TFR over the two periods weighted by the average social strata composition (contribution of differences of fertility - *F*) (Kitagawa 1955, Preston *et al.* 2001). Together, these two components account for all of the difference in TFR between the first and fourth period.

$$\Delta\, TFR = TFR^{p4} - TFR^{p1} = \sum \left(C_i^{p4} - C_i^{p1}\right) \cdot \left[\frac{F_i^{p4}+F_i^{p1}}{2}\right] + \sum \left(F_i^{p4} - F_i^{p1}\right) \cdot \left[\frac{C_i^{p4}+C_i^{p1}}{2}\right]$$
$$= (\Delta C * \bar{F}) + (\Delta F * \bar{C})$$

= difference in social strata composition · [weighted by average fertility (TFR)] +
differences in fertility (TFR) · [weighted by average age composition]

= contribution of social strata compositional differences
+
contribution of rate schedule differences

Results

A growing intermediary class in both regions

We observe, using our socioeconomic indicator, a trend towards disadvantage reduction in the countries in our analysis: 59% of women were classified in the poorest and less educated segment of the population in the early 1990s compared to only 42% in 2010 (Table 2). These results are generally congruent with trends in the proportion of people living with less than $1.25 purchasing power parity (PPP) per day (first line of poverty internationally, target 1.a of the Millennium Development Goals).

According to the World Bank (2013) for the study countries[2], the proportion living under the first poverty line has declined from 62% in 1990 to 50% in 2010 (see Appendix 2). Our socioeconomic indicator, while it differs somewhat from the definition of the first poverty line, indicate a similar starting point regarding extreme disadvantage in the early 1990s; it also features a somewhat greater reduction in the proportion of the worst-off over the period. However, according to both sets of indicators/data, the very poor still remain the most numerous group in 2010.

The East African countries have a greater proportion of women in the poorest class compared to the West African ones, throughout the period (Table 2). Note that the East African countries sampled here are among the poorest countries in Sub-Saharan African. These East African countries have an average Gross National Income per capita of 1700$ PPP, compared to 1880$ for the West African ones (see Appendix 2).

TABLE 2: Population composition (weighted averages)

Population Composition				
All Countries	Period 1 *1990-1994*	Period 2 *1995-1999*	Period 3 *2000-2004*	Period 4 *2005-2012*
Better off	10%	16%	18%	21%
Floating	31%	30%	31%	37%
Lower	59%	54%	51%	42%
	100%	100%	100%	100%
West Africa				
Better off	7%	15%	16%	19%
Floating	40%	33%	39%	42%
Lower	53%	52%	45%	39%
	100%	100%	100%	100%
East Africa				
Better off	12%	16%	19%	24%
Floating	24%	28%	25%	32%
Lower	64%	56%	56%	45%
	100%	100%	100%	100%

The relative size of the "floating" group (i.e. women who have only one advantage, are either better educated or less poor) has increased in both regions over the study period. In 2010, our indicator suggests that there were almost as many women in the "floating" group (37%) than in the most disadvantaged group (42%), while in the early 1990s the former group amounted only to half the size of the poorest group. Again, these results seem to align with that from income data (ADB 2011), which show that the intermediary group (people living on between 1.25$ and 4$ a day[3]) has grown substantially over the last two decades and constitutes today a sizeable share of the population (31%

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[2] Except Zimbabwe, for which there is no recent data in the World Bank databases.
[3] The work by ADB (2011) distinguishes individuals living under the 1st poverty line (1.25$ PPP per person per day), those living between the 1st and the 2nd poverty line (1.25-2), and those living on between 2$ to 4$ a day, calling the last group the "floating group". For comparative purposes here, we extent this concept to all those living between the first poverty line and $4 a day (=the cut off point for middle class status).

in these countries in 2010), the second largest group after those living under the first poverty line (see Appendix 2).

According to our indicator, the better off group (middle class and higher) remains the smallest group overall: even by 2010, only one women out of five fall in this category (13% of the population lives with more than 4$ a day according to ADB 2011, see Appendix 2). While the East African countries included in this study are poorer than the West African ones and their proportion of people living in extreme poverty larger (according to both our indicator and to World Bank data on the first poverty line), their middle and upper class are larger as well. Altogether, these countries are characterized by a more unequal distribution across our socio-economic strata compared to the West African countries: the two extreme groups (the low and middle class + up) are relatively larger in East Africa (Table 2). Gini coefficients and other indicators of wealth inequality confirm this difference (Appendix 2) (World Bank 2013). The five Western African countries studied here have an average Gini index of 38 in 2010 compared to 45 for the East African countries (without Zimbabwe). The Gini index is calculated on a worldwide scale with lower scores indicating greater wealth equality and higher greater disparity, going from 26 (Sweden) to 65 (South Africa). The same source indicates that the Western African countries have seen a decrease in their Gini index since the beginning of the 1990s, while the East African countries saw their wealth inequality grow.

TABLE 3: Population composition by period for West and East Africa (weighted by survey weights and population size at the regional level)

		Period 1 *1990-1994*	Period 2 *1995-1999*	Period 3 *2000-2004*	Period 4 *2005-2012*
		West Africa			
Urban	Better off	6%	10%	12%	13%
	Floating	21%	16%	17%	16%
	Lower	4%	3%	2%	1%
		31%	29%	31%	31%
Rural	Better off	1%	5%	4%	5%
	Floating	19%	16%	22%	26%
	Lower	49%	49%	43%	38%
		69%	71%	69%	69%
Total per period		*100%*	*100%*	*100%*	*100%*
		East Africa			
Urban	Better off	8%	10%	12%	13%
	Floating	10%	11%	10%	10%
	Lower	4%	4%	4%	3%
		22%	25%	26%	25%
Rural	Better off	4%	6%	7%	10%
	Floating	14%	17%	15%	22%
	Lower	60%	52%	52%	42%
		78%	75%	74%	74%
Total per period		*100%*	*100%*	*100%*	*100%*

Before we examine these evolutions by place of residence, we should note that the study countries remain today mainly rural, somewhat more rural in the Eastern region (74% of women are rural around 2010 according to our data) compared to the Western one (69% rural) (Table 3), which is consistent with UN Urbanization Prospect data (Appendix 2). However, the proportions women living in rural areas in these pooled DHS data remain fairly constant over the period: according to UN prospects the proportion population living in rural areas decreased from 72% in 1990 to 64% in these countries in West Africa and from 82% to 76% in these countries in East Africa over the last two decades. These discrepancies could be due either to oversampling of rural areas in some DHS, overestimation of urbanization in UN Urbanization prospects (Bocquier 2005), or issues of reclassification and changing definitions of urban and rural used in different sources.

TABLE 4: Population Composition within Urban/Rural categories (weighted averages)

Population Composition within Urban/Rural categories					
		Period 1	Period 2	Period 3	Period 4
West Africa					
	Better off	20%	35%	37%	43%
Urban	Floating	68%	56%	55%	53%
	Lower	<u>12%</u>	<u>9%</u>	<u>7%</u>	<u>4%</u>
Total		*100%*	*100%*	*100%*	*100%*
	Better off	1%	7%	6%	8%
Rural	Floating	28%	23%	32%	38%
	Lower	<u>71%</u>	<u>70%</u>	<u>62%</u>	<u>55%</u>
Total		*100%*	*100%*	*100%*	*100%*
East Africa					
	Better off	35%	39%	47%	53%
Urban	Floating	46%	44%	39%	37%
	Lower	<u>18%</u>	<u>16%</u>	<u>15%</u>	<u>10%</u>
Total		*100%*	*100%*	*100%*	*100%*
	Better off	6%	8%	10%	13%
Rural	Floating	17%	23%	21%	30%
		<u>77%</u>	<u>69%</u>	<u>70%</u>	<u>57%</u>
Total		*100%*	*100%*	*100%*	*100%*

Looking at the distribution of women across different social groups by place of residence, we see (Table 3) that the great majority of women who have a lower level of education and are poor live ("lower" socioeconomic group) in rural areas; only a small percentage of very disadvantaged women live in urban areas. Using our measurement, most of the people called the "urban poor" (when compared only to other urban dwellers) are in fact likely to fall in the "floating" category when compared to the rest of the country. In other words, when using a national definition of social strata, practically no one (1% of the pooled sample) in urban areas is "poor", even the many "urban poor" often written about. The size of the urban lowest class, when computed relative to the urban

population, remains nevertheless higher in the Eastern African region (10% within cities, Table 4). Women in the "floating" group, while present in both urban and rural areas, are more numerous in rural areas. Moreover, their share is increasing over time in rural areas, especially in Eastern African countries, and is stable (East Africa) or decreasing (West Africa) in urban areas. The "middle class and up" (better off) is a large group in urban areas and increasing there over the period; the better off is a small but growing portion of the population in rural areas. By 2010, the better-off make up about half of the urban population in both regions (43% in West Africa and 53% in East Africa) (Table 4), but given the large size of the rural population, the share of the urban middle class in the entire sample is only slightly higher than the share of the rural middle class in East Africa (Table 3). In West Africa, the middle class remains more decisively urban.

Evolutions in the Total Fertility Rate by socioeconomic group, region and residence

On average, TFR fell by a bit more than half a child (0.6) per woman over the two decades covered according to our data, from 6.3 to 5.7 in all the countries taken together; the decline started from a lower fertility level and was slightly steeper in the East African countries (from 6.1 to 5.4 children) than in the West African ones (from 6.6 to 6.1) (Table 5).

TABLE 5: TFR in three socioeconomic groups defined by women's educational level and an absolute indicator of household wealth, East and West Africa, 1990 to 2010+, DHS

	Period 1	Period 2	Period 3	Period 4
	TFR	TFR	TFR	TFR
All Countries	6.33	5.98	5.83	5.72
Better off	3.89	3.61	3.25	3.22
Floating	5.76	5.43	5.38	5.41
Lower	7.06	6.93	6.93	7.02
West Africa	6.61	6.38	6.08	6.06
Better off	3.30	3.40	3.12	3.02
Floating	6.01	5.87	5.77	5.81
Lower	7.46	7.54	7.29	7.45
East Africa	6.10	5.69	5.63	5.41
Better off	4.14	3.71	3.29	3.33
Floating	5.44	5.07	4.92	4.96
Lower	6.81	6.54	6.68	6.69

Note: Better off= w sec. school *and* hh more wealth, intermediate= w sec school *or* hh more wealth, lowest= none of the two

As expected, the average TFR decreases with higher socioeconomic status: in 2010 (all countries taken together) women in the lower class have 7 children on average, women in the "floating" group close to 5 and a half and better-off women have approximately 3 children. The decline of fertility

rates over time, however, shows some variation across socioeconomic groups. The TFR decreased among better off women during the period for all countries taken together: in the early 1990s, these women had close to 4 children on average, when they had close to 3 in 2010. The TFRs first decreased for the "floating" category from 5.8 to 5.4 children, but stalled in the 2000s. Finally, the TFRs remained stable at 7 children per woman in the lowest class during the entire period for West Africa and showed only a small decline, from 6.81 to 6.69, in East Africa.

In terms of differences across regions, we see that "middle class" (and up) women have relatively similar levels of fertility across the two regions, but that West African women in the "floating class" and in the lowest classes each had almost one child more compared to women in Eastern countries in 2010. Also, the declines in TFRs observed in the highest and in the "floating" categories were sharper in East Africa.

When looking at socioeconomic differentials in fertility by place of residence within regions (Table 6), we first note that living in a rural area is associated with higher fertility, whatever the socioeconomic group, region or period considered. Fertility rates declined among the urban better-off in the early 1990s in both regions but the decline in this group seems to have stalled later just short of three children per women. The fertility of rural "middle class" (and up) women, on the other hand, declined throughout the period in East Africa. Both rural and urban better-off groups for East Africa and West Africa have comparable fertility levels.

TABLE 6: TFR in three socioeconomic groups defined by women's educational level and an absolute indicator of household wealth, East and West Africa, urban and rural areas, DHS

Urban/rural		Period 1	Period 2	Period 3	Period 4
		TFR	TFR	TFR	TFR
West Africa					
Urban	Better off	3.17	2.93	2.76	2.84
	Floating	5.41	5.18	4.96	4.94
	Lower	6.80	6.70	6.55	6.03
Rural	Better off	4.31	4.35	4.29	3.68
	Floating	6.64	6.52	6.44	6.36
	Lower	7.50	7.59	7.34	7.51
East Africa					
Urban	Better off	3.85	3.27	2.85	2.92
	Floating	4.93	4.33	4.15	4.11
	Lower	5.86	5.18	5.61	5.66
Rural	Better off	4.32	4.02	3.92	3.81
	Floating	5.72	5.37	5.37	5.32
	Lower	6.90	6.78	6.78	6.76

Note: Elite= w sec. school *and* hh more assets, intermediate= w sec school *or* hh more assets, lowest= none of the two

The fertility of the "floating" class declined throughout the period when looking separately at urban and rural places of residence, but since the rural floating class is getting larger over the period and

"floating" rural women have more children, the resulting TFR for the entire floating class is not moving down. While this is true for women in both regions, in East Africa women in the floating class have fewer children on average and the decrease in the fertility of the intermediate class observed is steeper there.

Finally, the fertility of the lower class in urban areas (a small group) is also declining in both regions (with lower levels in East African countries), while the poorest class in rural areas (the largest group of all) does not see much change in its fertility rates across the two regions (but the levels are lower in Eastern Africa). This suggests that urban residence has an impact on fertility among even the most disadvantaged, while living in rural areas while being very disadvantaged is not associated with any declines in fertility.

A summary of the evolution of socioeconomic classes and of the TFR and in the two regions

Our descriptive analysis points to two main results. First, we found an urban-rural divide: in urban areas, the share of changes within socio-economic groups seems more pronounced than in rural areas. Second, we observed an East-West divide; changes in the socio-economic composition seem larger in West than in East Africa. To shed additional light on these trends, we used a basic population decomposition approach to see what proportion of the change in TFR over time is attributable to shifts in social strata composition and what proportion is attributable to changes in fertility rates within these strata.

Table 7: TFR for earliest and most recent periods by region and urban/rural subgroups and decomposition of fertility rate vs. compositional changes to explain the difference (declines) in TFR

Region	TFR Period 1	TFR Period 4	% of difference attributable to changes in fertility rates within social strata	% of difference attributable to changes in social strata composition
Overall	6.33	5.72	33.8%	66.2%
West Africa	6.61	6.06	18.5%	81.5%
East Africa	6.10	5.41	43.1%	56.9%
West Africa- Urban	5.15	4.19	43.8%	56.2%
West Africa - Rural	7.23	6.87	26.3%	73.7%
East Africa - Urban	4.67	3.81	71.5%	28.5%
East Africa - Rural	6.47	6.02	38.7%	61.3%

We see (Table 7) that most of the fertility change which happened in rural West Africa (74%) was due to changes in the growth of the size of the "floating" and better-off groups; these two last groups, and especially the latter ones, also experienced some within group fertility decline over the period in that setting. The picture is the same in rural East Africa, except that a lower relative share of the change (61%) was due to the intermediate and better-off groups becoming larger (i.e. compositional shifts), and a larger share to declines in fertility rates within these two groups. This matches earlier

findings, as the fertility decline among the "floating" group in particular was greater in rural East Africa than in rural West Africa. In urban West Africa, less of the change is attributable to compositional changes / extreme disadvantage reduction (56%): close to half of the change was due to fertility declines within groups; as underlined earlier, all three socioeconomic groups saw some fertility decline in West African cities (even among the least advantaged), although the decline eventually stalled in the "floating" and better-off groups. In urban East Africa, the process was even more pronounced; fertility declines have been markedly steeper for the better off and the "floating" (intermediate) class, and disadvantage reduction slower, so that a smaller portion of the change (29%) was due to compositional shifts.

Ideal number of children, contraceptive use, unmet need

Fertility rates were lower to begin with and declined more sharply (albeit if only in some groups) in East African compared to West African countries, particularly in urban areas. We can relate these trends to corresponding differences in fertility preferences, contraceptive use and unmet need (Appendix 3). Countries in the Western African region differ from East African ones throughout the period by a higher ideal number of children, a markedly lower use of modern contraception, and higher levels of unmet need. Urban areas in East Africa look particularly favourable on all these indicators. We also see that differences in modern contraceptive use among socioeconomic groups were much starker 20 years ago in both regions. Progress in uptakes of modern contraception has been faster in East Africa, so that socio-economic differences in contraceptive use are less pronounced today in that region: the only women left behind are the less educated and poor rural women. Programmatic efforts in the area of family planning were indeed stronger in Anglophone Sub-Saharan Africa countries (nearly all of which fall into our East Africa region) in the early 1990s, which could explain the different trends in contraceptive use. However, Francophone countries (all but one, bi-lingual Rwanda, which are found in our West Africa group) have caught up since then. Today, the Eastern and Western African countries studied have nearly identical Family Planning effort indexes (Ross and Smith, 2010, see Appendix 2).

We next examine in more detail differences in fertility preferences and contraceptive behaviours across groups for the most recent of our study periods (2005-2012). The preferences, behaviours and needs of the "floating group" are of special interest since this group is likely to be, in the future, the largest group in Sub-Saharan African. Contrasting socioeconomic groups within the same region by place of residence, we see that the intermediary ("floating") group has an ideal number of children closer to that of the lowest group than to the best off (Table 8). For example, in urban West Africa the better off declare an ideal family size as 4.0 children on average, the "floating" group 4.9 and the poor 5.3. Only in rural East Africa does the intermediate group's ideal family size lie neatly in between that of the two other groups. Altogether, women in the "floating" group still exhibit relatively high life-long fertility ideals (although this is measured by reported ideal family size, not prospective ideal number of children). At the same time, women in the "floating" group use modern method of contraception at almost the same proportion as better-off women. For example, in urban West Africa, 17% of women in the intermediary group used a modern contraceptive method, when these numbers were respectively 18% and 13% in the better-off and lower class in the same setting. We observe the same phenomenon in the different regions and places of residence, except for rural

West Africa, where the "floating" groups is closer to the lower class when it comes to modern contraceptive use. In urban Eastern Africa, the lowest group has a modern contraceptive prevalence rate (MCPR) close to that of the better off class.

Table 8 Fertility preferences, contraceptive use (by methods) and unmet need by socioeconomic groups, residence and regions, 2005-2012, DHS

					Breakdown modern method used		Breakdown all method used*	
		Ideal # of children	Modern contraceptive use	Unmet need	Other modern methods	Condom	All modern	Traditional
West Africa								
Urban	**Better off**	4	18%	14%	66%	34%	84%	16%
	Floating	4.93	17%	24%	90%	10%	93%	7%
	Lower	5.34	13%	23%	98%	2%	100%	0%
Rural	**Better off**	4.18	16%	20%	76%	23%	80%	20%
	Floating	5.27	10%	27%	94%	6%	92%	8%
	Lower	5.56	7%	25%	98%	2%	98%	2%
East Africa								
Urban	**Better off**	3.27	32%	9%	79%	21%	89%	10%
	Floating	3.91	30%	14%	84%	16%	90%	10%
	Lower	4.17	29%	17%	90%	10%	92%	8%
Rural	**Better off**	3.46	32%	9%	87%	13%	93%	7%
	Floating	3.95	29%	14%	90%	10%	91%	9%
	Lower	4.56	22%	19%	91%	9%	89%	11%

* Except folkloric methods

Altogether, the "floating" group (and lowest class in urban East Africa) has fairly impressive contraceptive use, with an MCPR close to that of the better off. Nevertheless, other indicators seem to point to greater contraceptive challenges in the intermediary groups compared to better-off women. First, the unmet need for contraception in these groups remains closer to that of the lowest group: for example, in urban West Africa, 24% of women in the intermediate group have an unmet need, 23% of women in the lowest group living and only 14% of better-off women. Also, the ranges of method types used by better-off women seems larger, with larger proportions of these women using condoms and traditional methods than the floating or lower groups; this trend is especially pronounced in West Africa, but true only for the condom in East Africa.

Discussion

This paper examined in depth the differences in fertility trends by socio-economic strata across East and West Africa, and sketched potential explanations for the seemingly more dynamic fertility decline in Eastern Africa. The usual suspects when explaining the East-West fertility divide (Cleland et al. 2006) are the following: first, fertility preferences are higher in West Africa, and our analysis

confirms this difference. Second, women's educational attainment is greater and the number of years of schooling is systematically higher in the East African countries (Appendix 2). Third, family planning programs were stronger in East Africa at the beginning of the 1990s, and probably translated into higher use of modern contraception there. These differences are evident in our data *and for every socioeconomic group*. However, fertility levels for the better off are *comparable* across the two regions at the late 2000s, for both rural and urban areas (and were higher in this class in the Eastern African countries in the early 1990s). If women's education /family planning program and policy approaches / pro-natalist values explained East/West differences, fertility rates would also be higher among the West African better-off – but they are not. This suggests that there may be other factors at play that influence (or do not influence) the better off in East and West Africa equally.

Among the different explanations we examined, the degree of wealth inequality and associated attitudes towards social mobility emerges as a potential alternative explanation that has not been explored to date. Our analysis reminds us that East African countries are characterized by starker wealth inequalities (although our measure includes education, so it is not strictly a wealth measurement), and especially East African cities, which have larger relative proportions of the better off and the lower class, relative to West Africa. Individuals in the lower and floating classes in East Africa, and especially in cities, seem to put more effort into fertility limitation in order to increase the chances of social mobility of their children, in a context where social mobility is at the same time more desirable and more difficult. More research is needed to explore this rarely examined idea: rather than working as a hindrance to fertility decline, in high fertility settings socioeconomic inequalities may in fact work to encourage fertility decline across larger swaths of the population.

Finally, this analysis suggests some specific considerations for family planning policies and approaches. First, it is notable that fertility has not declined over the last two decades among the rural, less educated poor -they still report higher ideal family sizes and may be less motivated to practice voluntary family planning in the near future. On the contrary, the "floating" group may in fact be another "low hanging fruit" for family planning programs: they are women with lower fertility desires who may wish to use contraception at higher rates than they currently do. Much attention has been given in recent literature on the "urban poor" (an often loosely defined group), while this large and growing "floating" group may have the greatest potential for changing high fertility ideals and greater uptake of modern contraceptives. This group, particularly in urban areas, may have aspirations for upward socio-economic mobility, and may see lower fertility as part of this. This group may in fact highly motivated to use contraception at higher rates.

Second, the overview of contraceptive methods reveals an interesting picture, particularly for the breakdown of condom use compared to all other methods and for modern compared to traditional method use. We had initially hypothesized that the lowest groups would have the highest proportion of condom use (compared to other modern methods) and of traditional method use, due to difficulties of access and hesitancy to use for many modern methods. We find, however, that the best off that have the highest proportion of condom use and that, with the exception of rural East Africa, traditional method use (abstinence, withdraw and "other" methods, not including folkloric) is also highest among the wealthiest. This could be interpreted in a number of ways. First, simply that the wealthiest and best educated prefer condoms to all other methods (hormonal and non-hormonal), but we find this unlikely. Second, that the better off may be more apt at navigating between methods to match their needs: condoms for temporary FP needs (particularly among the

young or for less frequent intercourse) and traditional for situations where modern methods present problems for use (i.e. fears of secondary effects). Third, when modern methods are not available the better off women may transition to traditional methods, while their counterparts in the floating and lower groups may simply use nothing. If women in the better of socio-economic groups are better able to adapt to challenging situations regarding contraceptive use (i.e. difficulties accessing or using many modern methods) to meet their lower fertility desires, this suggests that with lowered desired fertility and increased knowledge of traditional methods and willingness to use condoms, the floating group may likewise be able to transition to these alternative methods if required.

As a result, we use our findings to argue for a focus for family planning program approaches on the "floating" group of women (many of whom live in rural areas) who make up a growing proportion of the population in sub-Saharan Africa and who may offer an overlooked opportunity for fertility decline in the immediate future. We do not, however, propose that the wealthiest (who may have gaps in accessing modern methods but are temporarily adapting) or the poorest (who also have unmet needs for family planning) be overlooked or that the floating group be the primary priority in all contexts. Those decisions are best left to policy makers and program designers at the national level. Rather, we suggest renewed consideration be given to the "floating" women who are often neglected in research and discussions about family planning that focus on the "lowest hanging fruit" (women with low fertility desires and low FP access) or the hardest-to-reach (rural women with high fertility). Our results instead indicate that this large and diverse group of "floating" women may present a unique opportunity for achieving broader fertility decline in tandem with continued positive upward shifts in wealth and education across the region.

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Appendix 1: Diving the "floating" group into women with higher level of education in poorer households and women with lower level of education and wealthier households, DHS

Population Composition								
All Countries	Period 1 *1990-1994*		Period 2 *1995-1999*		Period 3 *2000-2004*		Period 4 *2005-2012*	
Better-off	10%		16%		18%		21%	
Floating	31%		30%		31%		37%	
High ed/poor		*3.02%*		*3.45%*		*3.75%*		*4.1%*
Low ed/richer		*27.8%*		*24.4%*		*27.6%*		*32.5%*
Lower	59%		54%		51%		42%	
	100%		100%		100%		100%	
West Africa								
Better-off	7%		15%		16%		19%	
Floating	40%		33%		39%		42%	
High ed/poor		*0.42%*		*1.08%*		*1.33%*		*1.59%*
Low ed/richer		*39.6%*		*31.7%*		*37.9%*		*40.9%*
Lower	53%		52%		45%		39%	
	100%		100%		100%		100%	
East Africa								
Better-off	12%		16%		19%		24%	
Floating	24%		28%		25%		32%	
High ed/poor		*4.92%*		*5.07%*		*5.6%*		*6.3%*
Low ed/richer		*19.0%*		*19.4%*		*19.7%*		*25.4%*
Lower	64%		56%		56%		45%	
	100%		100%		100%		100%	

Appendix 2: Development indicators of study countries

	Population size (millions) (1)		Gini index (2)		% population living with less than 1.25 $ a day (PPP) (3)		GNI per capita, PPP current international $ (4)	Percentage of urban population (%) (5)		Expected years of schooling (female) (6)	Family planning effort index (7)
	1990	2010	1990-94	2005-2009	1990-94	2005-2009	2010	1990	2010	2002-2012	2009
West Africa											
Burkina Faso	5.0	15.5	50.7	39.8	71.2	44.5	1440	13.8	25.7	7.0	45.6
Ghana	14.6	24.3	38.1	42.8	51.1	28.6	2950	36.4	50.7	10.9	46.4
Mali	8.0	14.0	50.5	39.0	85.9	51.4	1560	23.3	36.0	7.6	61.4
Niger	7.8	15.9	41.5	34.6	78.2	42.1	820	15.4	17.6	4.8	55.0
Senegal	7.5	13.0	41.4	39.2	53.5	33.5	2120	38.9	42.2	7.8	47.5
Total or average	**42.9**	**82.7**	**43.7**	**39.5**	**65.7**	**38.8**	**1878**	**27.9**	**35.8**	**7.9**	**50.8**
East Africa											
Kenya	23.4	40.9	42.1	47.7	28.5	43.4	2440	16.7	23.6	10.7	48.7
Malawi	9.4	21.1	46.2 [1988]	46.2 [2010]	83.2 [1995]	72.2 [2010]	710	11.6	15.5	10.8	47.8
Rwanda	7.2	10.8	28.9 [1985]	53.1	63.3 [1985]	72.0	1230	5.4	24.0	10.3	-
Uganda	17.5	34.0	42.6	44.3	71.9	37.9	1240	11.1	14.5	10.6	50.4
Tanzania	25.5	45.0	33.8	37.6	72	67.9	1490	18.9	28.1	9.0	47.0
Zambia	7.8	13.2	52.6	54.6	65.3	68.5	3150	39.4	38.7	13.0	44.6
Zimbabwe	10.5	13.1	-	-	-	-	1420	29.0	33.2	9.1	59.9
Total or average	**101.3**	**178.1**	**40.30**	**44.9**	**60.5**	**55.9**	**1701**	**18.0**	23.9	10.3	**49.0**

Note: averages are weighted by population size.

Data sources
(1) and (5). UNPD (2014), World Urbanization Prospects (esa.un.org/unpd/wup/CD-ROM/)
(2), (3) and (4). World Bank (2013) (data.worldbank.org/indicator/NY.GNP.PCAP.PP.CD)
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Appendix 3: Ideal number of children, modern contraceptive use, unmet need across socioeconomic categories, place of residence in West and East Africa, 1990-2010+, DHS

Ideal Number of Children				
	Period 1	Period 2	Period 3	Period 4
West Africa				
Better-off	3.89	3.91	3.96	4.05
Floating	4.83	5.11	5.11	5.14
Lower	5.65	5.73	5.63	5.55
East Africa				
Better-off	3.53	3.41	3.28	3.35
Floating	4.35	4.16	4.03	3.94
Lower	4.90	4.77	4.65	4.54
By urban/rural residence				
West Africa				
Urban				
Better-off	3.85	3.86	3.90	4.00
Floating	4.64	4.94	4.94	4.93
Lower	5.45	5.54	5.61	5.34
Rural				
Better-off	4.10	4.01	4.12	4.18
Floating	5.04	5.29	5.26	5.27
Lower	5.67	5.74	5.63	5.56
East Africa				
Urban				
Better-off	3.56	3.33	3.18	3.27
Floating	4.46	4.11	3.87	3.91
Lower	4.88	4.55	4.36	4.17
Rural				
Better-off	3.49	3.57	3.46	3.46
Floating	4.26	4.21	4.12	3.95
Lower	4.90	4.78	4.67	4.56

Current Use of Contraception (modern) - v313				
	Period 1	Period 2	Period 3	Period 4
West Africa				
Better-off	0.20	0.16	0.19	0.17
Floating	0.08	0.09	0.10	0.13
Lower	0.01	0.03	0.04	0.07
East Africa				
Better-off	0.28	0.32	0.33	0.32
Floating	0.18	0.24	0.25	0.30
Lower	0.08	0.12	0.14	0.23
By urban/rural residence				
West Africa				
Urban				
Better-off	0.20	0.19	0.19	0.18
Floating	0.10	0.13	0.14	0.17
Lower	0.05	0.07	0.08	0.13
Rural				
Better-off	0.18	0.12	0.17	0.16
Floating	0.05	0.06	0.08	0.10
Lower	0.01	0.03	0.03	0.07
East Africa				
Urban				
Better-off	0.28	0.33	0.33	0.32
Floating	0.17	0.25	0.27	0.30
Lower	0.09	0.18	0.20	0.29
Rural				
Better-off	0.28	0.31	0.32	0.32
Floating	0.20	0.23	0.24	0.29
Lower	0.07	0.11	0.13	0.22

	Unmet Need			
	Period 1	Period 2	Period 3	Period 4
West Africa				
Better-off	0.12	0.18	0.16	0.16
Floating	0.25	0.26	0.25	0.26
Lower	0.22	0.24	0.23	0.25
East Africa				
Better-off	0.09	0.09	0.07	0.09
Floating	0.15	0.14	0.14	0.14
Lower	0.18	0.18	0.17	0.18
West Africa				
Urban				
Better-off	0.12	0.14	0.14	0.14
Floating	0.23	0.23	0.22	0.24
Lower	0.24	0.26	0.21	0.23
Rural				
Better-off	0.12	0.24	0.23	0.20
Floating	0.28	0.29	0.27	0.27
Lower	0.22	0.24	0.23	0.25
East Africa				
Urban				
Better-off	0.09	0.09	0.07	0.09
Floating	0.16	0.14	0.13	0.14
Lower	0.18	0.17	0.16	0.17
Rural				
Better-off	0.09	0.09	0.08	0.09
Floating	0.15	0.15	0.15	0.14
Lower	0.18	0.18	0.18	0.19