Is Fertility Behavior in Africa Different?*

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Abstract

Half a century ago, the total fertility rate was around seven children in most regions but is now around the replacement level of 2.1. The outlier is Sub-Saharan Africa. Fertility decline has progressed at a much slower pace in Sub-Saharan Africa than in other regions, and even appears to have stalled in some countries. Why does fertility behavior in Sub-Saharan Africa appear to differ from other areas? This project uses DHS from countries in East Asia, South Asia, Latin America, and Sub-Saharan Africa to examine whether the determinants of urban fertility differ across regions. I focus on urban fertility for two reasons. First, urban areas tend to be less different across countries, which allows us to understand better whether Sub-Saharan Africa is inherently different. Specifically, the likelihood of unobserved or hard to measures factors, such as land access, affecting fertility is smaller in urban than in the rural area. Second, despite significant projected increases in urbanization, we know much less about the determinants of fertility in the urban than in the rural areas of developing countries.
JEL: Keywords:

1 Introduction

Most developing countries have seen astonishing declines in their total fertility rate (TFR) over the last half-century, moving from close to 7 children to below or only slightly above replacement (Pörtner, 2018). The exception is Sub-Saharan Africa. TFR is about twice as large in Sub-Saharan Africa as the other regions, and the decline in fertility may even have stalled in some countries (Ainsworth, 1996; Bongaarts and Casterline, 2013; Singh, Bankole and Darroch, 2017). Most of the future increase in the world's population is therefore projected to come from Sub-Saharan Africa (Gerland, Raftery, Ševčíková, Li, Gu, Spoorenberg, Alkema, Fosdick, Chunn, Lalic, Bay, Buettner, Heilig and Wilmoth, 2014).

An important question—both from a policy and an academic standpoint—is why the fertility decline in Sub-Saharan Africa appears to have moved at a slower pace than other regions. One possible explanation behind the slow decline in fertility is "African exceptionalism" (Caldwell and Caldwell, 1987, 1988; Caldwell, Orubuloye and Caldwell, 1992; Bledsoe, Banja and Hill, 1998; Bongaarts and Casterline, 2013). The argument is that strong pronatalistic cultural norms in Sub-Saharan Africa lead to higher reported ideal family sizes—and therefore higher actual fertility—than we expect given Sub-Saharan Africa's level of development and mortality risk. For example, mortality in Sub-Saharan Africa is currently at the same level as mortality was in South Asia around the turn of the century, but fertility is about 1.5 children higher in Sub-Saharan Africa now than fertility was in South Asia at the turn of the century.

The purpose of this project is to examine to what extent the determinants of fertility differ across regions, and whether cultural norms might explain any differences. I use women-level data on fertility from Demographic and Health Surveys (DHS) collected in countries in East Asia, South Asia, Latin America, and Sub-Saharan Africa.

The main challenge in understanding to what extent cultural norms affect fertility is that we cannot (easily) measure norms. To overcome this challenge the standard approach is to control as fully as possible for what are considered important factors in determining fertility. Any "unexplained" differences, often captured by region dummies, is then taken to be the "cultural components."

The main problem with this approach is that anything we do not capture also end up in the unexplained difference.[1] Variation that we do not capture could, for example, come from noisy or incomplete measures of important factors or from factors that we do not realize are important. This problem is the reason we cannot use self-reported ideal family size as a proxy for cultural norms. To the extent that ideal family size affects realized fertility, the ideal family size will be driven by both norms and all the other factors that drive fertility, some of which may be unobservable or poorly measured.

When comparing Sub-Saharan Africa and the other regions two factors stand out as potentially important for fertility but hard to measure well: land access and contraceptive access.

First, there is, on average, more land per capita in Sub-Saharan Africa than in the other regions and substantial differences in farming practices across regions. At Sub-Saharan Africa's median projected population growth its population density will only be roughly equal to China's current density (Gerland et al., 2014, p 235). The low density leads to a higher return to children in rural Sub-Saharan Africa than in the other regions and little pressure to lower rural fertility for fear of running out of land (Caldwell et al., 1992). Surveys contain, however, only limited information on current land access and none on potential future land access.

Second, Sub-Saharan Africa exhibit a substantial "unmet need" for contraception compared to other regions (Bongaarts and Casterline, 2013; Casterline and Agyei-Mensah, 2017; Singh et al., 2017). Contraceptive use is, indeed, lower in Sub-Saharan Africa, but historical data show that fertility reduction is possible even in the absence of modern contraceptives, and it is unclear whether the low use rate is an independent factor or simply a reflection of higher desired fertility (Schultz, 1985; Galloway, 1987; Bailey and Chambers,

[1] Another issue is that the approach ignores the potentially substantial differences across countries within regions.

1998; Bengtsson and Dribe, 2006).

I focus here on urban fertility rather than either rural or overall fertility as in prior studies, based on the idea is that urban areas tend to be less different across countries. In other words, focusing on urban areas allows me to better understand whether there are something inherently different in Sub-Saharan Africa fertility behavior by abstracting from factors that are potentially important for fertility but hard to measure well. Specifically, the return to children is likely more homogeneous across built-up areas, and focusing on urban areas therefore ameliorate the land access concern when examining determinants of fertility. Furthermore, urban areas have substantially better access to contraceptives (Jones, 2015), effectively eliminating contraceptive access as an explanation across regions. An additional motivation for examining urban fertility is that, despite projected significant increases in the degree of urbanization, we know much less about urban fertility determinants than we do about rural fertility for developing countries.

[TK results.]

2 Conceptual Discussion of Estimation Strategy

The major obstacle in designing an estimation strategy for the question, "is fertility behavior in Sub-Saharan Africa different," is that there are many potential ways in which fertility behavior could differ across regions and each require a different approach to identify. Based on the idea of "African exceptionalism", one approach is to say that there is an unobserved component, "culture", that induces higher fertility in Sub-Saharan Africa than in other regions. Generically, this can be captured by

$$F_{ir} = g(X_{ir}, C_r) + \epsilon, \tag{1}$$

where F_{ir} is fertility for woman i in region r, X_{ir} is a set of observed individual and country characteristics (education, income, access to family planning, cost of children, etc.), and

C_r is "culture." This formulation is flexible in that it allows culture to have both a direct impact or work though the effects of the observed explanatory variables.

Assume that we can observe completed fertility and that all regions beside Sub-Saharan Africa have identical fertility culture (C in effect becomes a dummy for Sub-Saharan Africa). In that case, the simplest possible model would be

$$F_{ir} = \mathbf{X}_{ir}\boldsymbol{\beta} + \gamma C_r + \epsilon. \tag{2}$$

This assumes that there is a level effect of culture, but no slope effects. In other words, women in Sub-Saharan Africa, independently of other characteristics, such as education, would, on average, have γ children more. [examples of this approach in the literature?]

Alternatively, culture might also affect the individual slope parameters

$$F_{ir} = \mathbf{X}_{ir}\boldsymbol{\beta} + \gamma C_r + C_r\mathbf{X}_{ir}\boldsymbol{\alpha} + \epsilon. \tag{3}$$

In that situation, we would say that there are no difference across regions if we cannot reject the null hypothesis

$$\gamma = \boldsymbol{\alpha} = 0. \tag{4}$$

Even with completed fertility and interactions between culture and explanatory variables there is still the concern that culture might have a non-linear effect across different levels of the explanatory variables. It is, for example, possible that culture plays a substantially stronger role in fertility for lower levels of education than for higher levels. The implemented specification should examine this possibility.

Simply testing whether the coefficients are jointly equal to zero does not tell us anything about how fertility might vary across regions. There are two possible way to address this issue. First, we could compare the gradients for a set of explanatory variables. If each possible education level is captured by a dummy (with, for example, no education the excluded variable) we can compare the gradient in fertility for education. That is, how much lower is fertility for, say, a woman with eight years of education compared to somebody with no education, holding all other characteristics constant. While this is interesting, it ignores differences in levels across regions. For example, the education gradient for fertility may be higher in Sub-Saharan Africa than other regions, but this may hide a fertility that is still higher than in other regions. Furthermore, the common support problem discussed below makes it difficult to compare gradients for mortality. An alternative solution is to compare the predicted average fertility across regions for specific values.

2.1 Incomplete Fertility

One of the issues with using completed fertility is that the analysis ignores most of the potential changes that have happened more recently. Specifically, when we focus on completed fertility, most of the fertility decisions occurred 10 to 20 years before the collection of the survey.

To overcome this issue requires use of information on fertility behavior for women who have not yet completed their fertility. One simple measure is children ever born. The problem is with this measure is that it also requires information on how fertility is distributed across age. Say that in one region women begin childbearing at age 20 and have two children before age 25 after which they stop childbearing. In another region women begin childbearing at age 25, have two children by age 30, after which they stop childbearing. The only way that fertility behavior differs across these two regions is in when childbearing begins. The problem is that if we regress children ever born on a set of explanatory variables that includes age, it would appear that fertility is higher in the first region than the second region among the younger age group (it is identical from age 30 across regions).

This suggests that there are (at least) three different fertility behaviors that might vary across regions: age at first birth, birth spacing, and number of children (both during childbearing and at completed fertility). For ease of analysis, I focus on age at first birth and number of children ever born for given ages (keeping in mind the issue above).

3 Variables

What should the regression model control for? This discussion does not include potential interactions between variables, just the individual groups of potential variables. We can divide the potential variables into four not completely separate groups: education, income, cost of children, and mortality risk. The problem is that some of these are hand to measure well, and we, therefore, need a set of proxies.

Holding cost of children, etc., constant, we would expect that higher household income is associated with higher fertility. One option here is the wealth index, although I am not sure if it is possible to compare this across surveys. Furthermore, wealth accumulation likely reflects choices made with respect to fertility (for example, higher desired fertility is associated with lower female labor participation and, therefore, lower wealth accumulation). The second option is GDP per capita. There are two problems with this measure. First, at what time point should this be measured at? Second, there is likely no information available on urban GDP, which is really what we need. The final option is the husband's education level, but the problem is that many women have no husband/partner information.

Cost of children encompasses opportunity of time, mostly driven by the woman's education level. Another option is to use the degree of female labor force participation. This would have to be measured at population level rather than individual level since the individual level decision reflects the individual desired fertility. The presence and access to family member may also affect the opportunity cost of children. A woman with parents or in-laws in the area have lower opportunity cost of children because childcare can be farmed out to family members. Again, this may reflect a choice of the individual household/woman so might be difficult to include. Furthermore, this may exactly be part of the "culture" component, which means that I need to think more about under what circumstance it makes sense to include this as a variable.

The density of the urban areas and the size of the city also affect the cost of children. More dense cities likely have higher cost of children, partly because there is lower probability of having agriculture within city limits. Furthermore, independent of city density, a larger city would make access to surrounding agriculture more difficult. This also relates to the likelihood of child labor. Finally there is the cost/access to schooling, and the quality of the schooling. If access and/or the quality of schooling is low the quantity/quality trade-off suggests that fertility should be higher.

4 Estimation Strategy

For completed fertility, I run the follow regression for each region:

$$Y_i = \alpha + \mathbf{D}_i^{age}\beta + \mathbf{D}_i^{educ}\gamma + \mathbf{D}_i^{cohort} + \mathbf{D}_i^{educ} \times \mathbf{D}_i^{cohort}\delta + \mathbf{D}_i^{mortality}\omega + \epsilon \qquad (5)$$

D represents dummies for the associated characteristics. For example, D^{age} is a vector of dummies with the lowest age as the excluded category.

If we are just comparing a coefficient across regions it is straightforward to test for whether the difference in the coefficients are statistically significantly different from each other by

$$z = \frac{\hat{\beta}_{SSA} - \hat{\beta}_{MEN}}{\sqrt{s^2_{\hat{\beta}_{SSA}} + s^2_{\hat{\beta}_{MEN}}}} \qquad (6)$$

This follows a standard unit normal under the null hypothesis of equality of the two coefficients. The standard error of the difference is the square root of the sum of the two squared standard errors, assuming that the samples are independent. The advantage of this approach is that it does not require that the error variances are the same across groups.

[See Gujarati 1988 - Basic Econometrics]

It becomes a little more complicated when we are comparing some combination of two coefficients across regions. Say we want to compare the sum of β_2 and β_3 across the regions. We now need a standard error for this sum, which is

$$s_{\hat{\beta}_2+\hat{\beta}_3} = \sqrt{s^2_{\hat{\beta}_2} + s^2_{\hat{\beta}_3} + 2\,\mathrm{Cov}(\hat{\beta}_2, \hat{\beta}_3)} \tag{7}$$

Because the sum of the coefficients are still independent across regions we can then use this calculated standard error in the comparison equation above.

[For now I simply present predicted average fertility at specific values]

5 Data

The data comes from 233 Demographic and Health Surveys (DHS) from countries in East Asia, South Asia, Latin America, and Sub-Saharan Africa, collected between 1986 and 2018. The sample consists of all surveyed women aged 15 to 49 with complete information on number of children ever born, number of children who have died, and education. There are 1,498,311 urban women in the sample. Table 1 shows the complete listing of the countries and years of the surveys.

Education is recoded, so the maximum number of years of schooling is 17. Furthermore, I group education into three groups for calculation of measures such as mortality by cohort to ensure sufficient cell sizes. The groups are 0–7, 8–11, and 12+. The grouping is different from the one in DHS recode, which lumps all primary together. Furthermore, since some countries have different education systems the recode grouping may fit less well.

Mortality risk of children is one of the major factors in determining fertility, either through replacement or hoarding effects. I define a number of mortality measures.

The simplest measure is the percent children who have died by country for women living in urban areas. This measure is simply the number of children who have died divided by the number of births across all urban women in a given country.

Mortality may, however, vary across time and education levels. I, therefore, also define a mortality measure by years of education within a country, by five-year cohorts of the respondents, and by five-year cohorts split by the three education groups. In all cases, the measure is the number of children who have died divided by the number of births across all urban women in a given country with the specific years of education, cohort, or combination of cohort and education group.

For all measures some groups have few observations by cell and some cells show no births by the time of the survey. For mortality by years of education I set mortality to zero if there are no births.[2] For mortality by cohort and mortality by cohort and education group combined, I use the observed mortality rate of the closest older cohort if available, or if no older cohort is observed the one five years younger. The reason for the different treatment is that zero mortality rate by cohort is driven mostly by very young women or very small cell sizes because of survey dates relative to cohort groupings.[3]

For more than a quarter of all observations there is no information available on prior residence. This is a combination of some surveys not collecting any information about prior residence (childhood place of living, how long lived in current area, and prior type of residence) and "regular" missing information. Specifically, in DHS VI the question was not part of the core questionnaire. This means that it is not possible to calculate separate mortality measures for women who have lived their entire reproductive lives in cities. Hence, a concern about the mortality measures is that they are biased by recent immigrants who had some or most of their children in their prior area of residence and based their fertility decisions on that areas' mortality risk.

[2]There are 42 country/year of education combinations where there are no deaths and the mortality rate is, therefore, zero. I keep these as zeros.

[3]The exception is Sao Tome and Principe, where there are so few women with 12+ years of education that they are assigned the mortality for the older cohort with 8 to 11 years of education.

6 Descriptive Statistics on Children Ever Born

Figure 1 shows plots of average children ever born by year survey was collected (grouped in five-year intervals), years of education completed, birth cohort of the women in the sample (grouped in five-year intervals), and age of the mother in years at the time of the survey for urban and rural areas.

Panel (1) shows only relatively small differences in the urban areas' average number of children ever born across the regions, with the exception of the Middle East and North Africa. East Asia and Pacific and Sub-Saharan Africa show an almost identical decline in fertility until the last decade. Furthermore, even though Latin America and the Caribbean is consistently below Sub-Saharan Africa the difference has narrowed to about half a child. Sub-Saharan Africa appears more of an outlier when we look at rural fertility in Panel (1a), with a smaller decline in fertility and, therefore, a widening difference to the other regions over time. For example, the difference in children ever born between the rural areas of East Asia and Pacific and Sub-Saharan Africa has widen from less than half a child to about one child.

There is remarkable little difference across regions in terms of children ever born in urban areas by education level as panel (1b) shows, with the exception again the Middle East and North Africa. What is especially of interest is that for very low levels of education—between no and five years of schooling—urban fertility is lowest in Sub-Saharan Africa and South Asia. In rural areas, however, even though fertility may not be the highest in Sub-Saharan Africa, the region is consistently among the higher region and there is more of a divergence as education increases. For the most educated women children ever born is about half a child higher in Sub-Saharan Africa than in the Latin America and the Caribbean and the East Asia and Pacific and more than a child higher than in South Asia.

Panels (1d) and (1e) show children ever born by birth cohort of the respondents, grouped into five-year intervals. In both urban and rural areas fertility is generally higher in Sub-Saharan Africa than other regions for cohorts born before the 1970s. From then onward

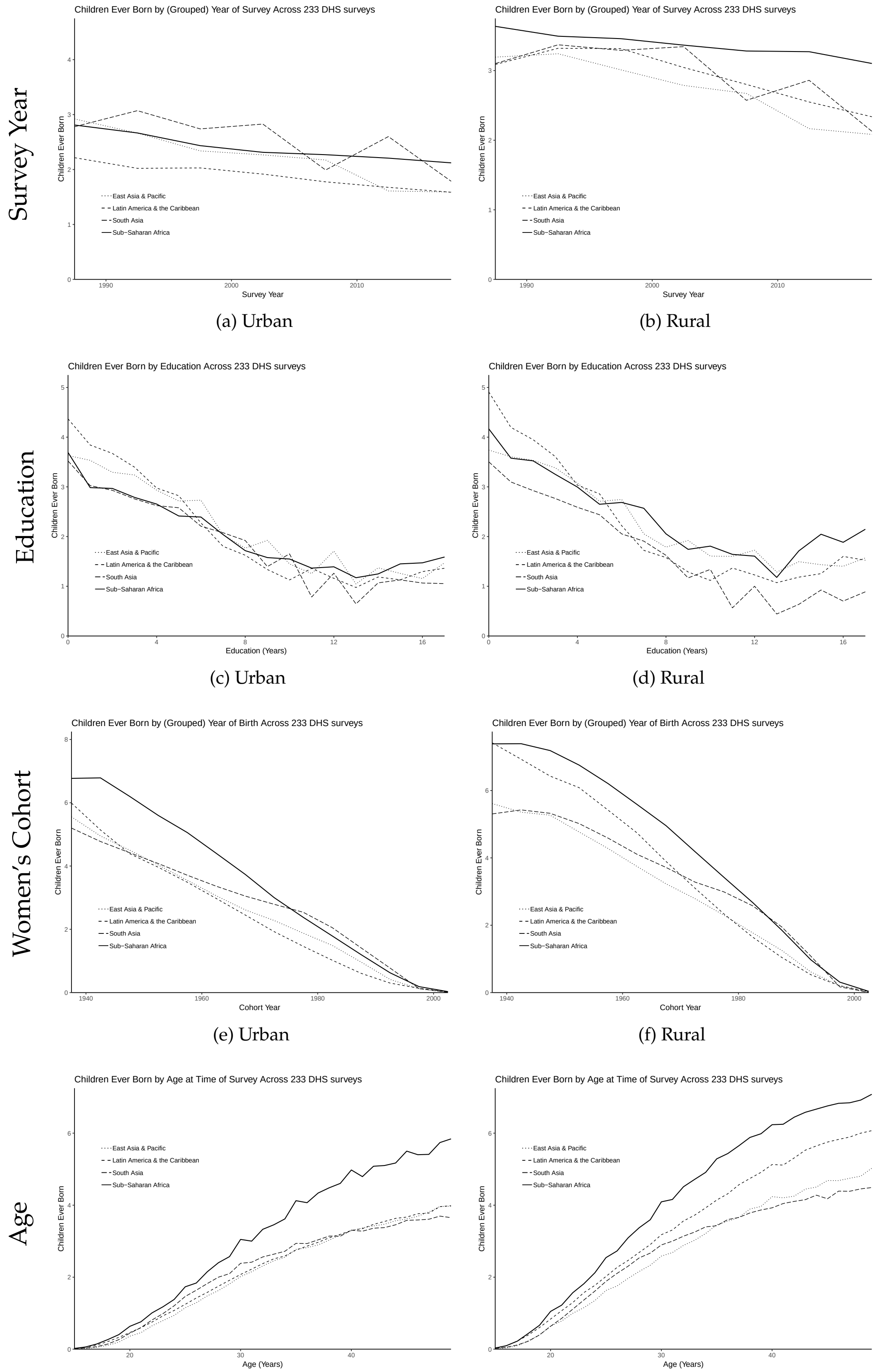


Figure 1: Children Ever Born by Survey Year, Education, and Age

observed fertility in urban areas is approximately similar in Sub-Saharan Africa and South Asia and both are lower than in the Middle East and North Africa. For rural areas, Sub-Saharan Africa remains the region with the highest number of children ever born until the 1990s, although South Asia show a similar level.

The one place where Sub-Saharan Africa appears substantially different from other regions is for children ever born by age at the time of the survey as shown in panels (1f) and (1g). The number of children ever born in urban areas is consistently higher in both Sub-Saharan Africa and the Middle East and North Africa, and at age 40 the difference is close to 1.75 child. The pattern is even more pronounced in rural areas where Sub-Saharan Africa alone has the highest number of children ever born for most ages, and where the difference at age 40 is more than one child to Latin America and the Caribbean and more than two children to East Asia and Pacific and South Asia.

Although informative, the descriptive statistics comparisons cannot provide a full picture of the differences across regions. It is, for example, possible that part of the reason for the relatively small difference in the urban number of children ever born across regions is drive by compositional differences, such as age. If Sub-Saharan Africa consistently has a younger urban population than other regions this will, everything else equal, drive down the observed fertility by survey year and education. The idea is that for a given level of education, say, 12 years the average age in urban areas in Sub-Saharan Africa is lower than in other areas and the average children ever born is, therefore, also lower. I, therefore, turn to regression analysis.

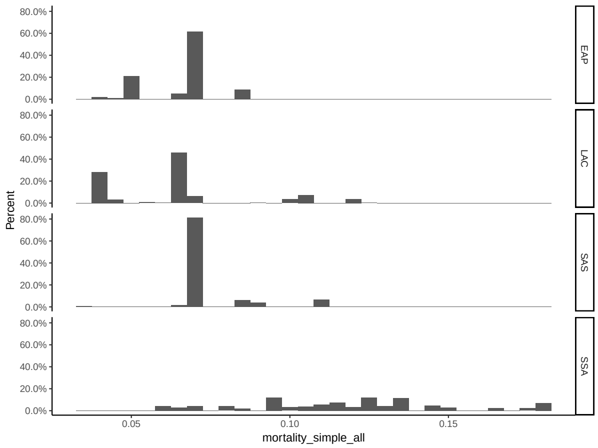
[TK are Sub-Saharan Africa DHS more likely to include never married, never partnered women in the surveys? This world explain the lower fertility. Generally, a question is whether I use everybody or only ever-married women, or show one or the other in the Appendix. The main argument for using everybody is that this is closest to TFR and that marriage rate may respond to development. Against using ever-married/partnered is that some regions have substantially higher fertility outside marriage/partnership and those would be missed. Furthermore, if there are significant difference in age of marriage/partnership that could bias the results. However, if there are many surveys where only ever-married women samples are available that would make those countries seem higher relative to Sub-Saharan Africa.]

6.1 The Problem of Common Support

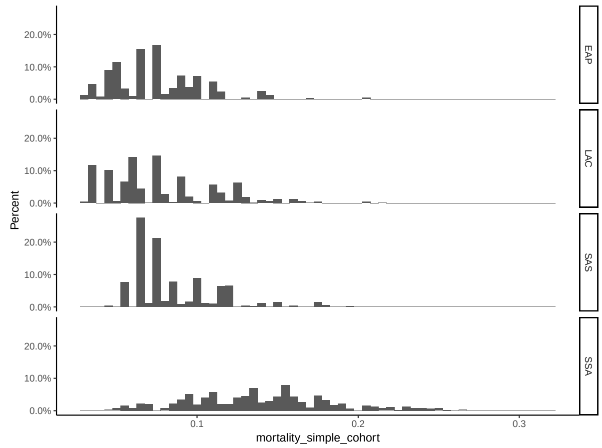
An critical issue is the potential lack of ”common support” in variables. We cannot tell whether Sub-Saharan Africa is different if we cannot observe situations where the regions are similar in explanatory variables. The main problem here is mortality since mortality is higher in Sub-Saharan Africa than the other regions. Prior research may have gotten around this problem by assuming that mortality is a linear function of mortality.

Figure 2 shows how four different mortality measures are distributed within each region for women 40 years or older. Using the simplest mortality measure (total mortality over total number of children born independently of their age of death) there is very little overlap between Sub-Saharan Africa and the other regions. Mortality rates in all regions but Sub-Saharan Africa are concentrated below 0.08 with only a limited number of observations above. For Sub-Saharan Africa, however, there are few observations with a mortality rate below 0.08 and none with a rate lower than 0.06. Instead most of the mortality measures are concentrated in the range from about 0.10 to close to 0.20.

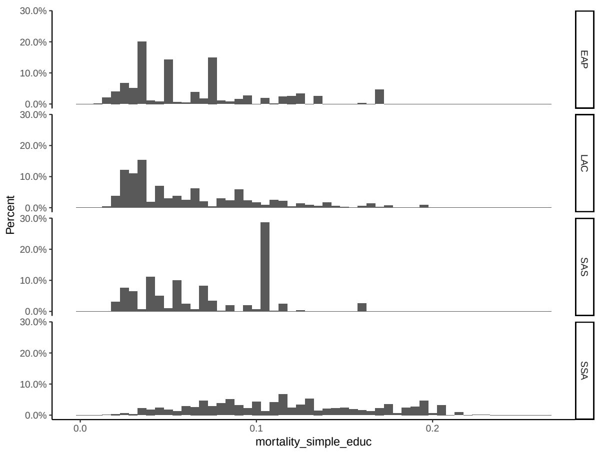
As mentioned, I devised three other mortality measures: by cohort, by education level, and by cohort and education level combined. Using these mortality measures can partly reduce the common support problem as shown in sub-Figures 2b–2d, but even for these measures are there relatively little overlap between Sub-Saharan Africa and the other regions.



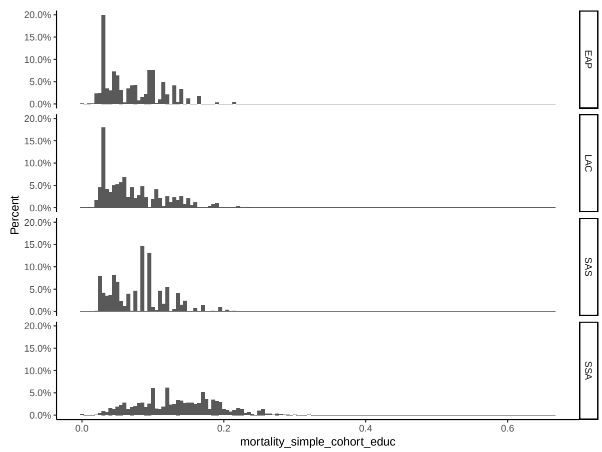
(a) Simplest Child Mortality Measure



(b) Child Mortality by Cohort



(c) Child Mortality by Education Level



(d) Child Mortality by Cohort and Education Level

Figure 2: Child Mortality Measures by Region

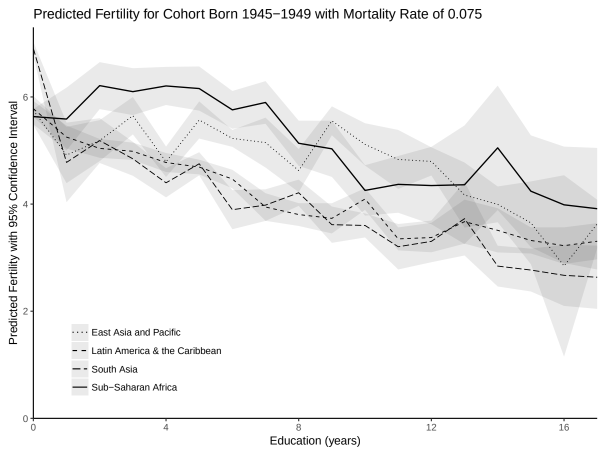
7 Complete Fertility

Figures 3 and 4 show predicted completed fertility at age 45 across regions for offspring mortality rates of between 0.05 and 0.10 and between 0.0 and 0.05 together with the confidence interval for the average fertility. The underlying estimates are by region for women aged 40 to 49, and the explanatory variables are dummies for age in years, dummies for mortality levels, dummies for five-year cohorts, dummies for years of education, and the interactions between the dummies for cohort and the dummies for years of education. The figure show cohorts from 1945–1949 to 1970–1974.[4]

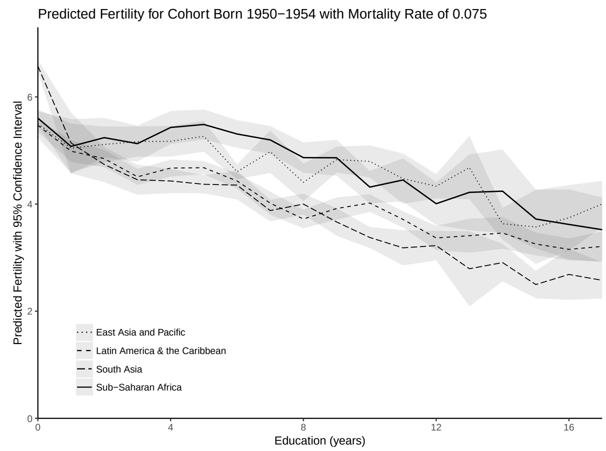
For the earlier cohorts there is little difference between Sub-Saharan Africa and East Asia and Pacific for most of the education levels and, similarly, Latin America and the Caribbean and South Asia have similar predicted completed fertility across years of education. From the 1960 cohorts on a new pattern emerge where there is little difference in predicted fertility between Sub-Saharan Africa and East Asia and Pacific—and with Latin America and the Caribbean only slightly below—for very low education (zero or one year of education) and from around seven or eight years of education and up. For education between two and seven years Sub-Saharan Africa does, however, have substantially higher completed fertility than the other regions. Furthermore, Figure 4 shows that, although there still are substantial differences in predicted average fertility between Sub-Saharan Africa and the other regions for two to seven years of education, the predicted fertility is more compressed across regions with lower fertility.

Hence, it does not appear that urban fertility in Sub-Saharan Africa is consistently significantly different from other regions and that the significant differences are isolated to women with primary education. This does lead to the question what is behind the substantial differences for women with primary education.

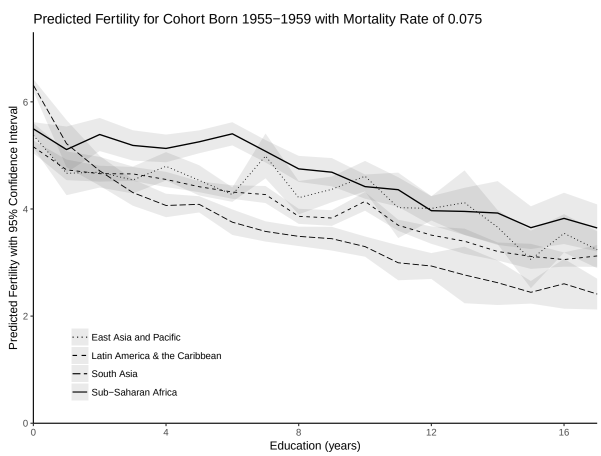
[4] The 1975-1979 cohort results do not have estimates for all interactions because of the smaller number of women in some cells. Similarly, I do not show cohorts before 1945 because the smaller sample sizes make the results noisy and some coefficients cannot be estimated.



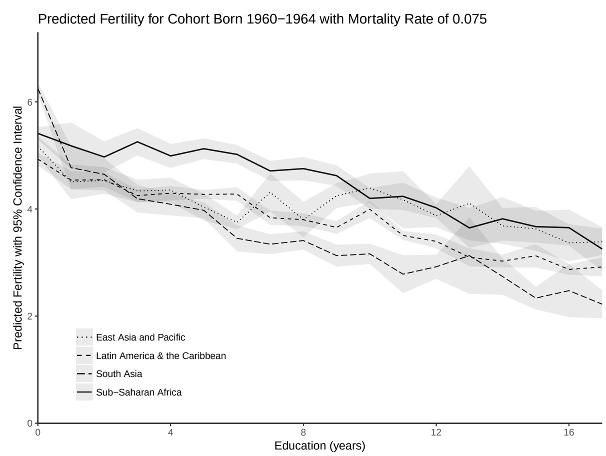
(a) 1945–1949



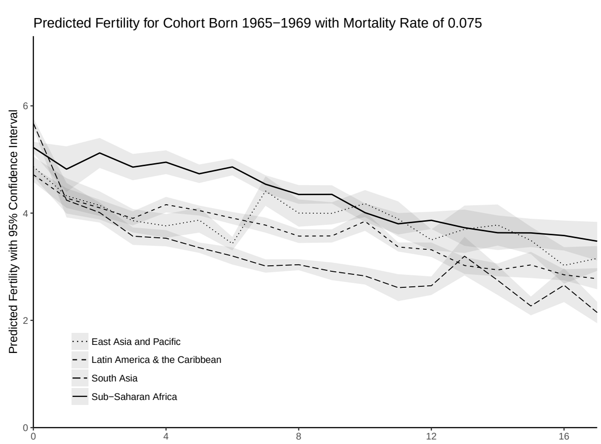
(b) 1950–1955



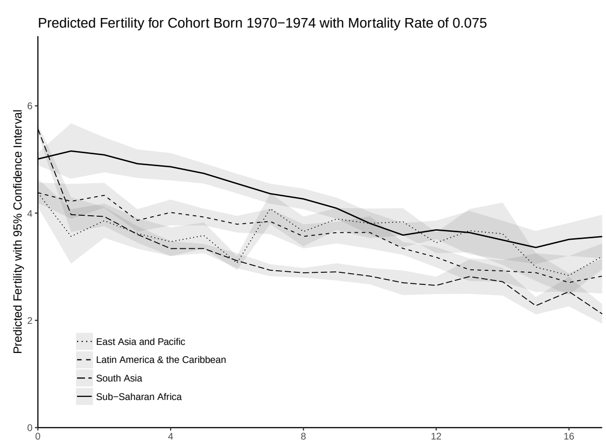
(c) 1955–1959



(d) 1960–1964

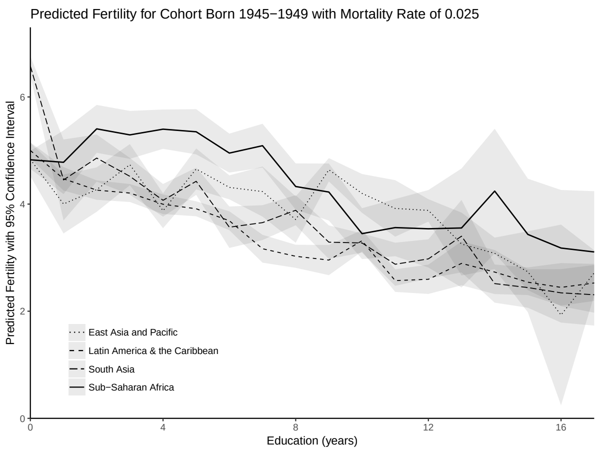


(e) 1965–1969

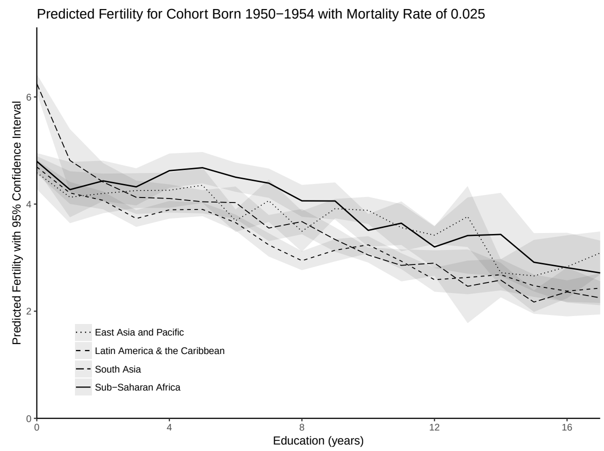


(f) 1970–1974

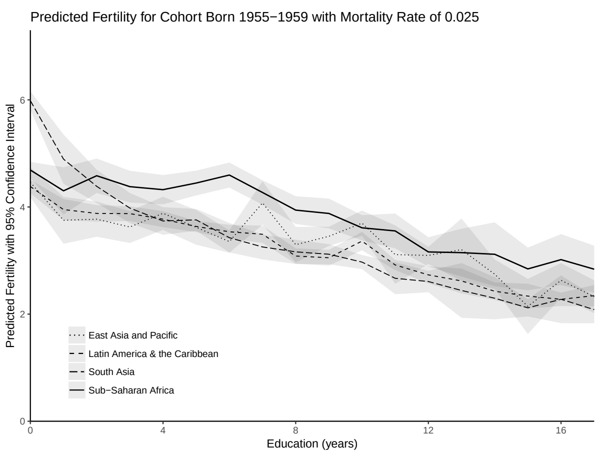
Figure 3: Predicted Completed Fertility at Age 45 by Cohort with Mortality Rate between 0.05 and 0.10



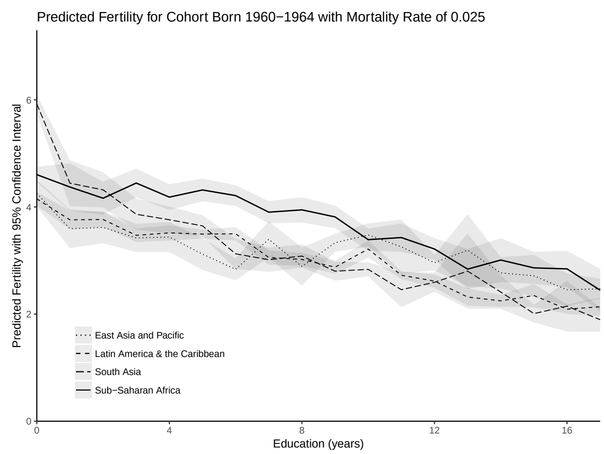
(a) 1945–1949



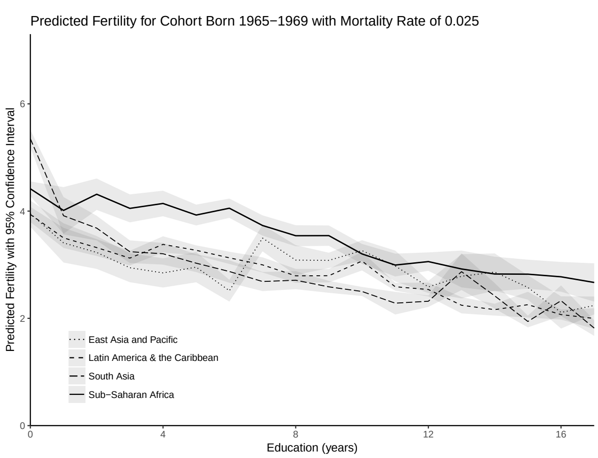
(b) 1950–1955



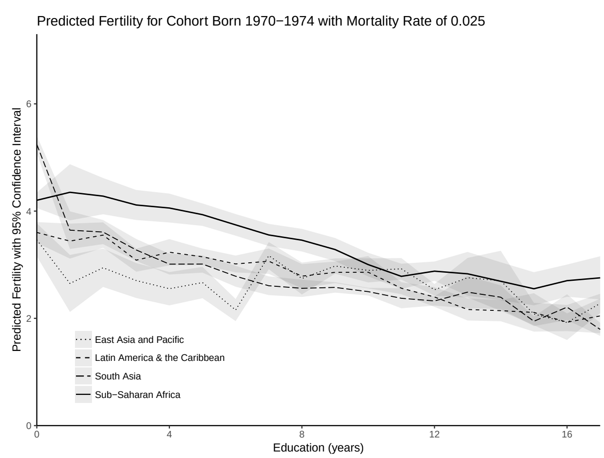
(c) 1955–1959



(d) 1960–1964



(e) 1965–1969



(f) 1970–1974

Figure 4: Predicted Completed Fertility at Age 45 by Cohort with Mortality Rate between 0.0 and 0.5

8 Incomplete Fertility

9 Age at First Birth

10 Conclusion

TK Not a perfect approach since it implicitly assumes that cultural norms are similar across urban and rural areas.

Table 1: Demographic and Health Surveys Used for Analysis

Country	Survey Years
Afghanistan	2015/16
Angola	2015/16
Bangladesh	1993/94, 1996/97, 1999/2000, 2004, 2007, 2011, 2014
Benin	1996, 2001, 2006, 2011/12, 2017/18
Bolivia	1989, 1993/94, 1998, 2003/04, 2008
Brazil	1986, 1991/92, 1996
Burkina Faso	1992/93, 1998/99, 2003, 2010
Burundi	1987, 2010/11, 2016/17
Cambodia	2000, 2005/06, 2010/11, 2014
Cameroon	1991, 1998, 2004, 2011
Central African Republic	1994/95
Chad	1996/97, 2004, 2014/15
Colombia	1986, 1990, 1995, 2000, 2004/05, 2009/10, 2015/16
Comoros	1996, 2012
Congo	2005, 2011/12
Congo Democratic Republic	2007, 2013/14
Cote d'Ivoire	1994, 1998/99, 2011/12
Dominican Republic	1986, 1991, 1996, 1999, 2002, 2007, 2013
Ecuador	1987
Ethiopia	2000, 2005, 2011, 2016
Gabon	2000/01, 2012
Gambia	2013
Ghana	1988, 1993/94, 1998/99, 2003, 2008, 2014
Guatemala	1987, 1995, 1998/99, 2014/15
Guinea	1999, 2005, 2012
Guyana	2009
Haiti	1994/95, 2000, 2005/06, 2012, 2016/17
Honduras	2005/06, 2011/12
India	1992/93, 1998/2000, 2005/06, 2015/16
Indonesia	1987, 1991, 1994, 1997, 2002/03, 2007, 2012, 2017
Kenya	1988/89, 1993, 1998, 2003, 2008/09, 2014
Lesotho	2004/05, 2009/10, 2014
Liberia	1986, 2006/07, 2013
Madagascar	1992, 1997, 2003/04, 2008/09
Malawi	1992, 2000, 2004/05, 2010, 2015/16
Maldives	2009, 2016
Mali	1987, 1995/96, 2001, 2006, 2012/13
Mexico	1987
Mozambique	1997, 2003/04, 2011
Myanmar	2015/16
Namibia	1992, 2000, 2006/07, 2013
Nepal	1995/96, 2000/01, 2005/06, 2010/11, 2016
Nicaragua	1997/98, 2001
Niger	1992, 1998, 2006, 2012
Nigeria	1990, 2003, 2008, 2013
Pakistan	1990/91, 2006/07, 2012/13, 2017/18
Paraguay	1990
Peru	1991/92, 1996, 2000, 2003/08, 2003/08, 2009, 2010, 2011, 2012
Philippines	1993, 1998, 2003, 2008, 2013, 2017
Rwanda	1992, 2000, 2005, 2007/08, 2010/11, 2014/15
Sao Tome and Principe	2008/09
Senegal	1986, 1992/93, 1997, 2005, 2010/11, 2012/13, 2014, 2015, 2016, 2017
Sierra Leone	2008, 2013
South Africa	1998, 2016
Sri Lanka	1987
Sudan	1989/90
Swaziland	2006/07
Tanzania	1991/92, 1996, 1999, 2004/05, 2009/10, 2015/16
Thailand	1987
Timor-Leste	2009/10, 2016
Togo	1988, 1998, 2013/14
Trinidad and Tobago	1987
Uganda	1988/89, 1995, 2000/01, 2006, 2011, 2016
Vietnam	1997, 2002
Zambia	1992, 1996, 2001/02, 2007, 2013/14
Zimbabwe	1988/89, 1994, 1999, 2005/06, 2010/11, 2015

Note. More information on the 233 individual surveys is available at dhsprogram.com. Survey years are based on the surveys, rather than the official years from the DHS program.

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