Fertility Transition in Africa: What do we know and what have we learned about Fertility Stalls?

David A. Sánchez-Páez[†] [‡]   Bruno Schoumaker[†]

Abstract

The purpose of this document is to review the literature on fertility stalls in Africa. The first section of the review provides a descriptive approach of the demographic transition since the 1950s, while the second, the unusual pace of fertility decline from the 1990s, from a comparative perspective. The third section summarizes the halts and reversals in fertility decline from the early 2000s. First, the methods used to define a fertility stall are described. Then, the stall periods and studies by country where the slowdowns occurred are identified and listed. The fourth section describes the analyses conducted of the fertility dynamics during stall periods, such as the changes in the proximate determinants of fertility, birth intervals, fertility desires, and fertility preferences. The fifth section summarizes the studies analyzing the potential causes of fertility stalls, such as education, wealth, HIV, and under-five mortality, among others. Finally, the sixth section draws conclusions from the reviewed studies and the seventh, proposes a research agenda from the gaps in literature.

Keywords: Africa; Fertility stalls; Fertility transition; Proximate determinants; Socioeconomic determinants.

[†] Centre for Demographic Research (DEMO), Université Catholique de Louvain. Place Montesquieu 1, Louvain-la-Neuve 1348, Belgium.

[‡] Corresponding author: david.sanchezpaez@uclouvain.be

Introduction: The (particular) demographic transition

In the early 1990s, scholars on Africa announced the first evidence of the fertility transition in Africa, the last region in the world to initiate fertility decline (Caldwell et al., 1992; Caldwell, 1994; Robinson & Harbison, 1995; Walle & Foster, 1990). Comparative studies identified three groups of countries regarding their stage in demographic transition (Cleland et al., 1994; Cohen, 1998; Kirk & Pillet, 1998). Botswana, Ghana, Kenya, Namibia, South Africa, and Zimbabwe were leading the fertility decline followed by Côte d'Ivoire, Cameroon, Madagascar, Nigeria, Rwanda, Senegal, Tanzania, Togo, and Zambia. The third group, the least advanced, included countries like Burkina Faso, Burundi, Liberia, Malawi, Mali, Niger, and Uganda.

Rapidly however, it was anticipated that the fertility transition in Africa, specifically in sub-Saharan Africa, was likely to differ from European and Asian transitions. Caldwell et al. (1992) argued that the onset of fertility decline would come from all ages and from both married and unmarried women demanding contraceptives to maintain or lengthen traditional birth intervals, rather from older women wishing to cease family building (Caldwell et al., 1992). The pace of fertility decline was also likely to be slow, it was noted, because of the "cultural, and socio-structural supports for high fertility" and the high demand for children among both men and women (Frank & McNicoll, 1987). It was also thought that the economic crises in African countries in the late 1980s and the rapid spread of HIV-AIDS across the continent could possibly lead to an 'African path' to low fertility (McNicoll, 1992). Interestingly, Lesthaeghe (1989) already speculated in the late 1980s that African countries could experience "a partial fertility transition […] with ultimate fertility levels well above replacement".

Sub-Saharan Africa has indeed shown a somewhat different transition from that of other developing countries (Bongaarts, 2017; Shapiro & Hinde, 2017). While new data in the 1990s confirmed that the demographic transition was underway, the slow pace of fertility decline in Africa was a cause of concern (Caldwell et al., 1992; Casterline, 2001; Cleland et al., 1994; Cohen, 1998; Garenne & Joseph, 2002; Indongo & Pazvakawambwa, 2012; Kirk & Pillet, 1998; Mbamaonyeukwu, 2000; Mturi & Joshua, 2011; Onuoha & Timaeus, 1995; Shapiro & Hinde, 2017; Tabutin & Schoumaker, 2004). By the turn of the 21st century, fresh survey data showed unexpected findings. A reversal or an interruption of fertility decline —stalled fertility— was found in Ghana, Kenya, and Nigeria at much higher rates than replacement level (Bongaarts, 2006; Shapiro & Tambashe, 2002; Westoff & Cross, 2006), and similar halts were also identified in the rural areas of Burkina Faso, Mali, Niger, Senegal, and Tanzania (Shapiro & Tambashe, 2002).

Since then, Africa's unique fertility transition has been discussed in several papers (Bongaarts, 2017; Bongaarts & Casterline, 2013; Casterline, 2017; Casterline & Agyei-Mensah, 2017; Eloundou-Enyegue et al., 2017; Gerland et al., 2017; Lesthaeghe, 2014; Moultrie et al., 2012). For instance, Bongaarts (2017) identified four characteristics that make Africa's transition different from the rest of the World. First, it started later than other less developed regions. Second, the level of fertility was higher at the time of onset of transition. Third, it started earlier compared to the level of development at the time of onset compared to other less developed countries. And fourth, the pace of decline and the improvement in development indicators are slower than elsewhere. Another unique feature of the African transition is related to long birth intervals. Moultrie et al. (2012) find that birth intervals have lengthened considerably in almost every African country. According to them, these long birth intervals reflect postponement of births rather than spacing of births, and more broadly reflect uncertainties in family building behavior (Timaeus & Moultrie, 2008, 2013). Finally, fertility stalls, i.e. interruptions of fertility declines, have been found in a large number of countries and subnational areas (Al Zalak & Goujon, 2017; Bongaarts, 2006, 2008; Garenne, 2008; Howse, 2015; Ouadah-Bedidi et al., 2012; Schoumaker, 2019b; Schoumaker & Sánchez-Páez, 2020; Shapiro et al., 2013; Shapiro & Gebreselassie, 2008), and are also part of the uniqueness of Africa's transitions.

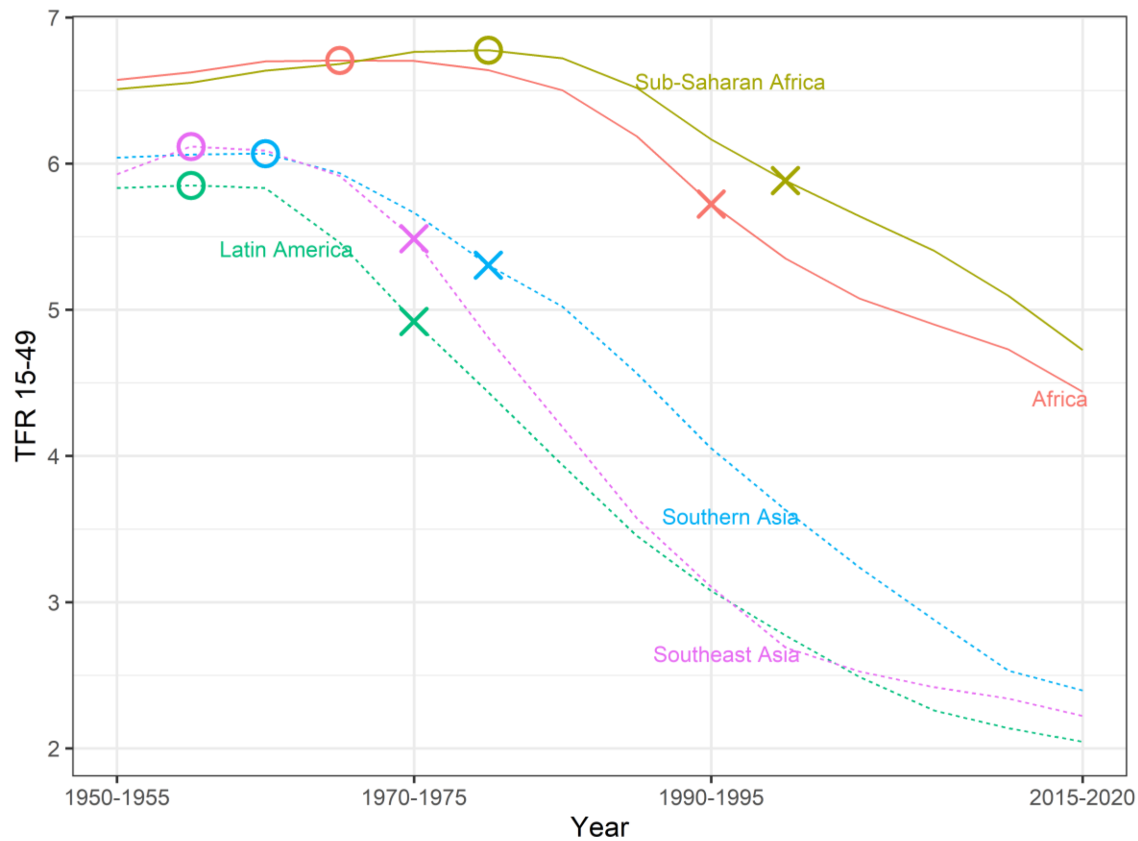
In this chapter we review the literature regarding fertility stalls in Africa since the 1990s. We first summarize fertility trends in Africa, comparing them with trends in other regions of the world. Next, we review existing studies on the identification of stalls, discussing some measurement issues and uncertainties regarding whether and where stalls have occurred. In the fourth section, we synthesize the literature on the demographic dynamics of fertility stalls, focusing mainly on knowledge about the proximate determinants in times of stalling fertility. In the fifth section, the literature on the causes of the stalls is explored. Finally, we discuss research perspectives and implications.

Fertility trends in Africa: A brief description

Figure 1 displays the fertility trends of Africa, sub-Saharan Africa, Latin America and the Caribbean, Southern Asia, and Southeast Asia using data from the World Population Prospects (United Nations, 2020). Circles show the highest value of total fertility rate (TFR) while the Xs indicate the time of onset, measured as a decline by 10% from the maximum TFR. In Latin America and Southern and Southeast Asia, the time elapsed between the maximum TFR and onset of decline was, on average, 15 years. For these three regions, the decline started in the 1970s. Five years later, all of them were considered as mid-transition regions, that is, the TFR was below 5 children per woman. The case of Africa, and particularly of sub-Saharan Africa, is different. At the time the other regions were at the onset of their fertility transition, Africa was reaching its maximum TFR. Moreover, Africa needed around 25 years to begin the transition —from the 1970s to mid-1990s— and 15 more years to reach 5 children per woman. The onset in sub-Saharan Africa occurred 5 years later than the average of Africa. Currently, TFR in Africa and sub-Saharan Africa is twice as high as in the other regions.

Africa took longer to reach mid-transition, reflecting the slow pace with which fertility has decreased (Shapiro & Hinde, 2017). Table 1 shows the variations of TFR between 5-year periods by region. The average fertility decrease in Africa and sub-Saharan Africa from the maximum TFR to the time of onset was 0.196 and 0.222 children per woman per 5-year period, respectively. In the same period, the reductions in Latin America, Southern Asia, and Southeast Asia were 0.310, 0.254, and 0.210 children per woman per 5-year period, respectively. The pace of fertility decline in Africa was slower than in the other regions. Moreover, the latter maintained a faster pace of decline even after the demographic transition began. On average, the average decline in fertility from the time of onset to 2015-2020 in the three regions is 0.320, 0.364, and 0.363 children per woman per 5-year period, while in Africa and sub-Saharan Africa is 0.257 and 0.290. The pace of decline in Africa after the time of onset is around 25% slower.

Figure 1: Fertility trends of less developed regions.



Source: World Population Prospects, United Nations, 2020.
Note: Circles and Xs stand for the maximum TFR and the time of onset, respectively.

Results from Figure 1 and Table 1 show that fertility in Africa, at the regional level, has been declining since the 1970s. However, there are dissimilarities between subregions. Figure 2 displays fertility trends by subregion in Africa. As above, circles and Xs stand for the maximum TFR and the time of onset, respectively.

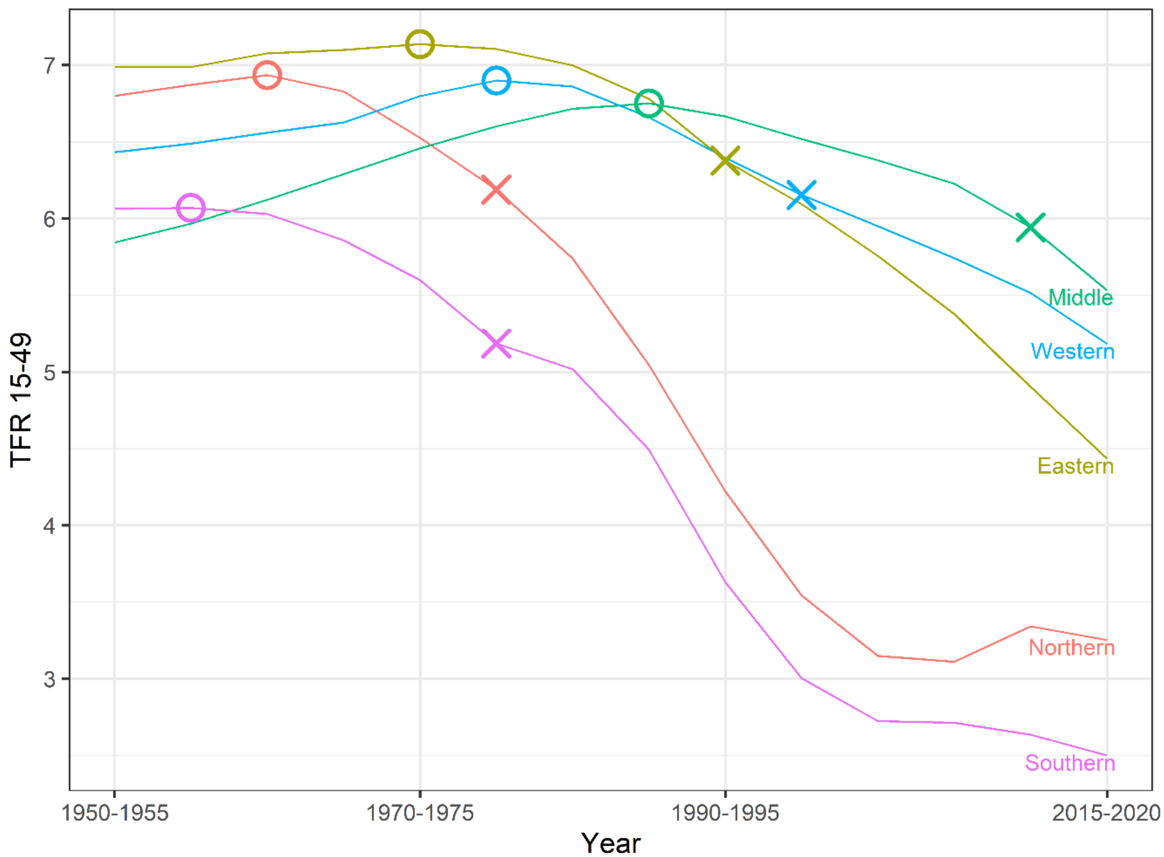
Table 1: Variations of TFR from the previous 5-year period by region.

Year	Africa		Sub-Saharan Africa		Latin America		Southern Asia		Southeast Asia	
	Δ	Avg.	Δ	Avg.	Δ	Avg.	Δ	Avg.	Δ	Avg.
1955-1960	0.051		0.044		0.019		0.021		0.190	
1960-1965	0.075		0.083		-0.018	-0.310	0.006		-0.028	-0.210
1965-1970	0.007		0.046		-0.374		-0.133	-0.254	-0.174	
1970-1975	-0.003	-0.196	0.083		-0.539		-0.270		-0.429	
1975-1980	-0.063		0.011		-0.485	-0.320	-0.359		-0.678	-0.363
1980-1985	-0.139		-0.054	-0.222	-0.498		-0.284	-0.364	-0.611	

1985-1990	-0.314		-0.202		-0.485		-0.456		-0.623	
1990-1995	-0.463		-0.353		-0.376		-0.513		-0.469	
1995-2000	-0.373	-0.257	-0.281		-0.305		-0.422		-0.416	
2000-2005	-0.274		-0.245	-0.290	-0.284		-0.394		-0.163	
2005-2010	-0.177		-0.235		-0.228		-0.357		-0.107	
2010-2015	-0.170		-0.307		-0.122		-0.348		-0.078	
2015-2020	-0.292		-0.372		-0.094		-0.136		-0.118	

Source: World Population Prospects, United Nations, 2020. Estimates are calculated by the authors.

Figure 2: Fertility trends by subregion in Africa.



Source: World Population Prospects, United Nations, 2020.
Note: Circles and Xs stand for the maximum TFR and the time of onset, respectively.

Northern and Southern Africa were the first two regions to begin the demographic transition. For the former, the maximum TFR was reached in 1960-1965, while for the latter in 1955-1960. In both cases, the time of onset was in 1975-1980 at levels of 6.2 and 5.2 children per woman, respectively. For the following 25 years, fertility declined consistently in both subregions until it stalled in the early 2000s. In Northern Africa, TFR slightly increased from 3.1 in the early 2000s to 3.3 in 2015-2020. In Southern Africa, TFR only marginally decreased from 2.7 to 2.5 in the 2000s. On average, from the maximum TFR to the time of onset, the pace of decrease was 0.249 (Northern Africa) and 0.221 (Southern Africa) children per woman per 5-year period (see Table 2). From the onset until the first reversals of fertility decline (2000-2005), the decrease was faster at a rate of 0.608 (Northern Africa) and 0.492 (Southern Africa) children per woman per 5-year period.

Eastern, Middle, and Western Africa have taken longer to begin the demographic transition. Eastern Africa reached the highest TFR recorded among all African subregions: 7.1 children in 1970-1975. Fertility then declined at a pace of 0.190 children per woman per 5-year period and the time of onset came 20 years later. Since then, TFR has decreased by 0.389 children per woman per 5-year period to reach 4.4 children in 2015-2020. In Western Africa, 20 years also elapsed between its peak TFR (6.9 children in 1975-1980) and the time of onset. Transition started in 1995-2000 at a TFR of 6.2, after it declined at a pace of 0.186 children per woman per 5-year period. The decrease accelerated to 0.243 children per woman per 5-year period to reach 5.2 children in 2015-2020. Middle Africa was the last subregion to begin the fertility transition. The maximum TFR, 6.8, was reached in 1985-1990 and the time of onset arrived 25 years later, after fertility decreased by 0.162 children per woman per 5-year period. Afterwards, the pace of decline accelerated to 0.411. In 2015-2020, TFR is 5.5. Both Middle and Western Africa, at the subregional level, are considered to be at an early stage of transition, while Eastern Africa is considered to be in mid-transition since 2010-2015.

Table 2: Variations of TFR from the previous 5-year period by subregion in Africa.

Year	Northern		Eastern		Middle		Western		Southern	
	Δ	Avg.	Δ	Avg.	Δ	Avg.	Δ	Avg.	Δ	Avg.
1955-1960	0.072		0.000		0.123		0.056		0.006	
1960-1965	0.064		0.090		0.156		0.071		-0.040	-0.221

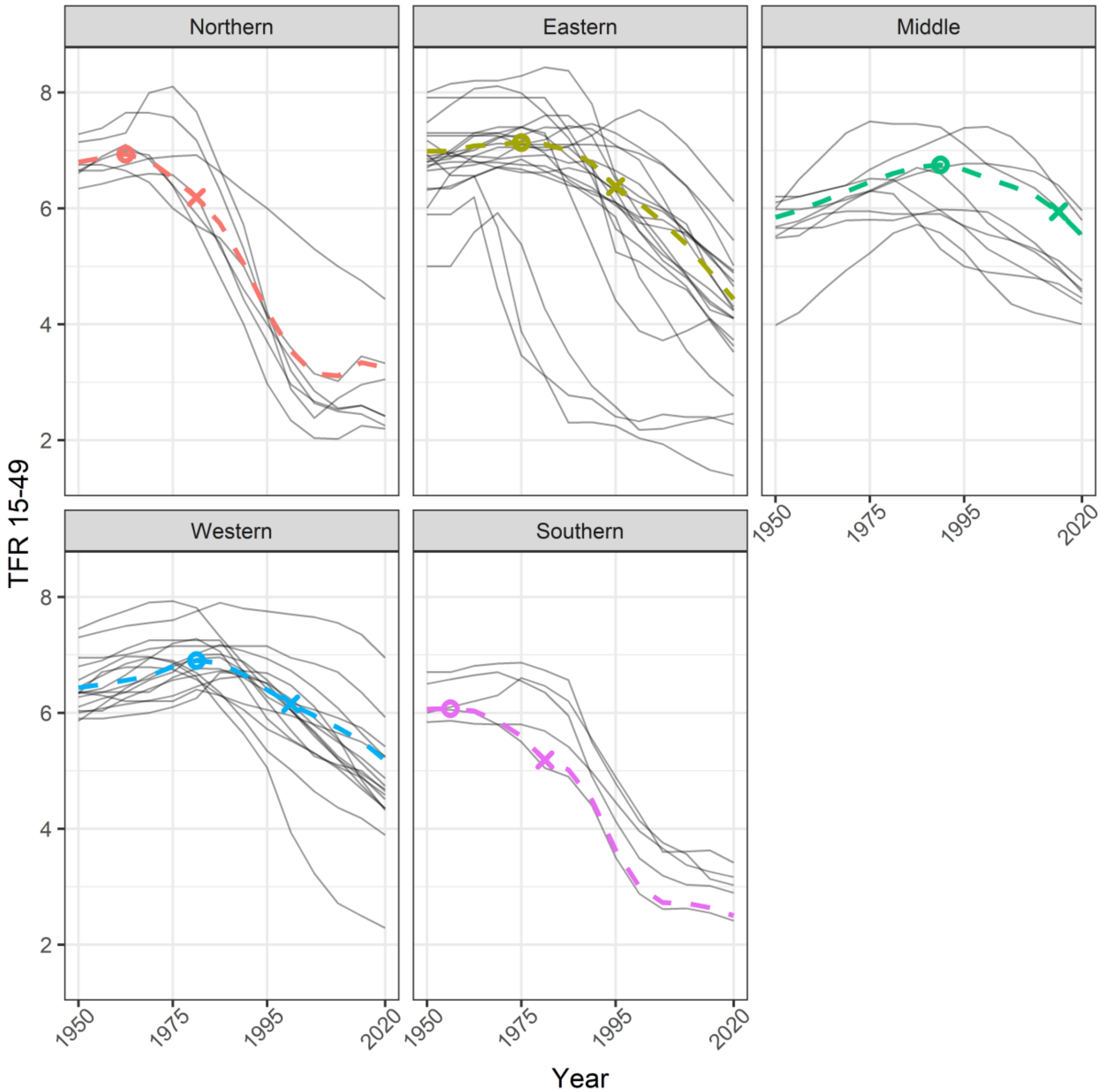
1965-1970	-0.106	-0.249	0.021		0.167		0.067		-0.172	
1970-1975	-0.303		0.038		0.168		0.172		-0.259	
1975-1980	-0.337		-0.031	-0.190	0.143		0.101		-0.414	
1980-1985	-0.447	-0.367	-0.107		0.115		-0.040	-0.186	-0.167	-0.336
1985-1990	-0.696		-0.218		0.035		-0.199		-0.525	
1990-1995	-0.824		-0.404		-0.085	-0.162	-0.265		-0.863	
1995-2000	-0.679		-0.284	-0.389	-0.148		-0.242		-0.627	
2000-2005	-0.393		-0.337		-0.137		-0.204	-0.243	-0.280	
2005-2010	-0.039		-0.379		-0.153		-0.208		-0.010	
2010-2015	0.231		-0.473		-0.285		-0.227		-0.079	
2015-2020	-0.090		-0.470		-0.411	-0.411	-0.332		-0.135	

Source: World Population Prospects, United Nations, 2020. Estimates are calculated by the authors.

Country-level analysis shows heterogeneity within subregions. Figure 3 displays fertility trends by country and subregion in Africa. The subregional average from Figure 2 is included for reference (colored dashed lines). In Southern Africa, the subregional average is highly influenced by South Africa since it is the most populated country in the subregion. In the other subregions, no country affects the average significantly. Country trends present patterns that make Africa unique. On the one hand, reversals and the slow and slowdown in the pace of fertility decline are found among many countries. On the other, high levels of fertility are found at the onset of the transition and in recent years. Detailed TFRs by country from 1950 to 2020 are shown in Annex Table 1.

Fertility transition in Northern Africa has been different from that in sub-Saharan Africa. While in the former fertility was dropping rapidly, in the latter it was still high or even increasing. Also, Northern Africa is culturally different as it has an Arab heritage. Moreover, Northern Africa is more developed than sub-Saharan Africa from various perspectives such as education, health and living standards. These differences have led researchers on the fertility transition to study separately sub-Saharan Africa and Northern Africa. However, our case is different. We include both of them in our analysis as they show evidence of fertility stalls, well above replacement level.

Figure 3: Fertility trends by country and subregion in Africa.



Source: World Population Prospects, United Nations, 2020.
Note: Circles and Xs stand for the maximum TFR and the time of onset, respectively.

Fertility stalls: How, when and where to find them?

As just discussed, fertility transition in Africa has been different from other low- and middle-income regions. Stalls are one of the specificities of African transitions that have attracted the attention of many researchers over the last 20 years.

In general terms, a fertility stall is the interruption of an ongoing fertility transition by a period of no significant change in fertility before the country reaches the end of the transition (Bongaarts, 2008). Even though there is a consensus on what a fertility stall should mean, its operationalization varies across authors. This has led to some countries being classified differently (stalling or not), even with the same data over the same periods (Agyei-Mensah, 2006; Bongaarts, 2006; Garenne, 2011; Machiyama, 2010; Schoumaker, 2019b; Shapiro & Gebreselassie, 2008). Regarding the data sources, most of the reviewed literature uses the Demographic and Health Surveys (DHS), while some studies use the World Population Prospects, Multiple Indicator Cluster Surveys (MICS), and national data provided by national institutions (e.g., surveys or censuses).

The first mention to fertility stalls goes back to the 1980s, when Gendell (1985, 1989) identified stalls in Costa Rica, South Korea and Sri Lanka. Although Gendell proposed a formal definition of stalled fertility[1], a simpler approach was used in the early works on stalls in Africa. In these, stalls are identified as periods of non-decreasing fertility (TFR) between two dates (usually two surveys). As early as 2002, Shapiro & Tambashe (2002) pointed out some unusual trends in fertility with this method. Although Shapiro & Tambashe (2002) did not consider the non-decreasing fertility as fertility stall (since it does take into account the stage in the transition process or previous pace of decline), several studies used this approach to determine whether fertility was declining or stalling (Askew et al., 2017; Bongaarts & Casterline, 2013; Eltigani, 2003; Ibisomi et al., 2014; Kabagenyi et al., 2015; Ndagurwa & Odimegwu, 2019; Odwe et al., 2015; Ouadah-Bedidi et al., 2012;

[1] Gendell (1985, 1989) proposes four requirements for a period to be considered as stalled fertility. First, the TFR should have dropped from 5.0 by at least 20%. Second, TFR should have been decreasing by 0.2 per year for at least five years before stalling. Third, substantial deceleration as at least a halving of the rate of decline in one period compared with the rate that immediately preceded it, if the first two requirements have been met. Fourth, cases where the stall occurred at rates near the replacement level should be excluded.

Palamuleni, 2017; Sayi, 2016; Shapiro et al., 2013; Shapiro & Gebreselassie, 2008; Westoff & Cross, 2006).

In parallel, Bongaarts adapted Gendell's criteria to the African context. For instance, Bongaarts (2006) proposes that a country has stalled fertility if its TFR fails to decline between two estimates while the country is in mid-transition. A decrease in TFR of less than about 0.25 births per woman in 5-years period is considered as a non-significant fertility decline (Bongaarts, 2008). In this regard, the generalization of mid-transition country replaces the first Gendell requirement. To be classified as a mid-transition country, the TFR should be below 5.0 and contraceptive prevalence among married women should be higher than 10% (Bongaarts, 2008). Also, Bongaarts does not include the relative slowdown proposed by Gendell since the pace of fertility decline in Africa is already slow. Instead, he states that the decrease in the TFR should be less than 0.25 children per woman in a 5-year period. Of the 22 African countries surveyed in the early 2000s, only Ghana and Kenya were classified in the stalled fertility group (Bongaarts, 2006). A second study including four more countries and new datasets increased the number of cases of stalled fertility in Africa at any period since the 1990s to fourteen: Cameroon, Côte d'Ivoire, Egypt, Ethiopia, Ghana, Kenya, Morocco, Mozambique, Nigeria, Rwanda, Tanzania, Uganda, Zambia, and Zimbabwe (Bongaarts, 2008). Non-decreasing fertility were also found in Chad, Guinea, and Mali but they were ruled out since they were considered as pre-transitional. This method served as a basis for methodological refinements when defining the existence or not of a halt in the fertility decline (Agyei-Mensah, 2006; Ezeh et al., 2009; Howse, 2015; Machiyama, 2010; Moultrie et al., 2008; Muza, 2019; Nzimande & Mugwendere, 2018; Schoumaker, 2009, 2019b).

Some researchers proposed refining the methods due to concerns about the robustness of estimates. For instance, Bongaarts (2008) proposes the decrease in TFR of more than about 0.25 in a 5-year period as one of the requirements prior considering a period as stalled. However, this threshold is to some extent ad-hoc. On the other hand, using the non-decreasing TFR definition could drive to debatable conclusions, since measurement and sampling errors exists in the estimates. In this regard, some researchers considered that all changes in the fertility trends, regardless of their magnitude, were relevant for fertility stalls, as long as they are statistically significant. For instance, Garenne (2008) tests the statistical significance (p-value < 0.05) of the change of slope from negative (fertility decline) to nil or positive (fertility stall). Using data from 1985 to 2008, Garenne (2008) classified Ghana, Kenya, and Nigeria in the group of countries having experienced fertility stalls. Further research added Madagascar, Rwanda, Senegal, Tanzania, and Zambia to the list (Garenne, 2011). Testing the statistical significance of the change in fertility from one period to the next has been used by several studies (Ibisomi et al., 2014; Nzimande & Mugwendere, 2018; Palamuleni, 2017; Schoumaker & Sánchez-Páez, 2020; Sneeringer, 2009).

Some authors have used methods not related with the criteria proposed by Gendell or his subsequent refinements. For instance, Al Zalak & Goujon (2017) find a fertility stall in Egypt since the early 2000s after reconstructing TFR by year and smoothing it using the locally weighted scatterplot smoothing (LOWESS) method. Moultrie et al. (2008) check for statistically significant differences in the rate of fertility decline over two time periods in South Africa (Rural KwaZulu-Natal) by testing whether two exponential curves fit the data better than a single exponential curve fitted to all the data. Ezeh et al. (2009) use probit models to test whether the change during a third period is equal to or greater than zero while changes in the previous two periods are negative in 4 countries of Eastern Africa. Goujon et al. (2015) compute fertility ratios by dividing the TFR of a 5-year period by the TFR of the previous 5-year period. Then, they define a fertility stall if the ratio is at or above 0.98.

Mixed evidence in classifying countries in the stalled fertility category (e.g., Ghana) led to take into account concerns about data quality. For instance, Schoumaker (2009) proposed the reconstruction of fertility rates by pooling full birth histories from several surveys for assessing changes in fertility trends. This idea was based on the possible underestimation of fertility in recent years in surveys because of birth displacements, omitted births, or sampling issues; therefore, changes (or the absence of it) in TFR could be explained by measurement errors and their variations over time rather than declining or stalling fertility. Of the 24 African countries analyzed between 1986 and 2006, only Kenya and Rwanda were confirmed as cases of stalled fertility (Schoumaker, 2009). From there, the interest in re-examining the stall periods began. Besides checking the problems in the data suggested by Schoumaker (2009), Machiyama (2010) included an analysis using women average parity and educational attainment. As a result, using Gendell's criteria on data from 9 sub-Saharan African countries, the stalls in Benin, Kenya, Rwanda, and Zambia were confirmed. Both studies used DHS for their analysis. In a further study, Schoumaker (2019b) compared different data sources in 32 sub-Saharan African countries to identify stalls. Published fertility rates were compared with reconstructed trends from full birth histories, as well as with trends from censuses and other surveys (mainly MICS). A consistency index was computed, with a score varying from –1 —strong support of fertility decline— to 1 —strong support of fertility stall— (Schoumaker, 2019b). From this, unambiguous evidence of stalls was found in Namibia and Zimbabwe, very strong evidence in Congo, Kenya, and Zambia, and strong evidence in Cameroon.

Table 3 presents a summary of the number of studies on fertility transition in Africa, classified according to whether they have identified fertility stalls or not. We group them by subregion using the United Nations groups, although we offer a detail by country. In the case of comparative analyses, we include them for each country covered by the study. All the studies were published after the 2000s since previous evidence confirmed only declining fertility periods. Studies checking for fertility stalls have covered virtually all countries of Africa. Annex table 2 includes full details of the studies reviewed in Table 3. Overall, 33 of the 46 analyzed countries were classified under the stalled category at some point. At the subnational level, stalls in capital cities are apparently more common than elsewhere, while most rural areas are still pre-transitional.

However, the conclusions vary substantially across studies, depending mainly on the method used to define the stall. For instance, for the same period countries such as Côte d'Ivoire, Senegal or Uganda are in and out of the stalled category in parallel studies. 9 studies find stalls in Ghana, while 14 conclude there is no stall. Similar conclusions emerge in Cameroon, Nigeria, or Rwanda. For other countries, there is widespread agreement, as in Congo, Egypt, or Kenya. In some others, it is clear that most studies do not find evidence of fertility stalls, as in Botswana, Chad, Madagascar, Malawi, or South Africa. Finally, the time of the study also leads to different conclusions as new information becomes available and as new stalls emerge, as in Cameroon, Namibia, Zambia, or Zimbabwe.

Table 3: Number of studies on fertility transition 2000-2020.

Country	Stall period	Place of stall			No stall
		National	Urban	Rural	
Northern Africa					
Algeria	2000-2010	1			1
Egypt	1993-1998, 2006-2014	5	2	1	2
Libya					2
Morocco	1992-2004	1			4
Sudan					3
Tunisia	2000-2010	1			1
Western Africa					

Country	Stall period	Place of stall			No stall
		National	Urban	Rural	
Benin	2001-2006, 2012-2017	5	2	1	14
Burkina Faso	1993-1999, 2003-2010	1		1	17
Côte d'Ivoire	1994-2011	3		2	14
Gambia	2004-2013	1	1		
Ghana	1993-2004, 2008-2014	9	3	1	14
Guinea	1999-2012	4	3	3	9
Guinea-Bissau					1
Liberia					9
Mali	1987-2012	2	1	1	13
Niger	1992-2006	5	2	2	12
Nigeria	2003-2013	8	2	1	12
Senegal	1997-2005, 2011-2016	3	2	2	14
Sierra Leone					2
Togo	1998-2013		1		12
Middle Africa					
Cameroon	1998-2011	11	4	4	8
Central African Republic					5
Chad	2004-2015			2	12
Congo	2005-2011	5	2	1	
D.R. Congo	2007-2013	3	2	1	2
Equatorial Guinea					1
Gabon	2000-2012	2	2	1	4
Eastern Africa					
Burundi	1980-2010		1		5
Comoros					6
Eritrea					6

Country	Stall period	Place of stall			No stall
		National	Urban	Rural	
Ethiopia	2000-2005, 2011-2016	1	1	1	12
Kenya	1998-2003	21	3	2	5
Madagascar	1992-1997	2	1		14
Malawi	2004-2010	1			19
Mozambique	1997-2011	8	1	2	9
Rwanda	2000-2005	10	2	2	9
Somalia					1
Tanzania	1996-2010	12	3	4	7
Uganda	1995-2006	2	2		18
Zambia	1996-2007	11	2	3	8
Zimbabwe	1999-2015	10	2	3	14
Southern Africa					
Botswana					3
Eswatini					3
Lesotho	2009-2014		2		6
Namibia	2007-2013	2	1	1	14
South Africa	1990-2013	2		2	10

Note: Full details of the studies included in this table are provided in Annex table 2.

Fertility dynamics in stall periods

In this section, we focus on the proximate determinants of fertility and their changes in periods of fertility stalls. This popular framework allows identifying the contribution of key behavioral and biological factors in the variations of fertility (Bongaarts, 1978, 2015). Among the eight proximate determinants, four are usually the focus of attention, as they have the largest effects on fertility differences and changes: sexual activity, contraceptive use, postpartum insusceptibility, and induced abortion.

Many of the scholars researching fertility stalls in Africa have attempted to explain the reversals in fertility decline through the proximate determinants of fertility. We would expect to find a direct relation between fertility stalls and earlier age at union or increased sexual activity, lower contraceptive use, shorted periods of postpartum insusceptibility, or declines in abortion. However, results show mixed evidence.

An early age at first **union or marriage** increases the time that a women is exposed to childbearing. Factors associated with increasing age at marriage include education and income, while with lower age include religion, polygyny, and urbanization (Garenne, 2004). On average, age at marriage has increased in Africa (Gebreselassie, 2012; Shapiro & Tenikue, 2017; Tabutin & Schoumaker, 2020; United Nations, 2002). It has contributed to lower fertility (Agyei-Mensah & Owoo, 2015; Burger et al., 2012; Finlay et al., 2018; Guillaume, 2003; Johnson et al., 2011; Laelago et al., 2019), especially in urban areas (Garenne, 2004; Shapiro & Tenikue, 2017). As far as fertility stalls are concerned, some studies show that age at marriage decreased during periods of stalled fertility, while others do not. For instance, in Algeria and Tunisia age at marriage decreased at the same time fertility stopped declining (Ouadah-Bedidi et al., 2012). Also, as expected, the increase in the proportion of married women was related to the increase in fertility in Zambia from 2002 to 2007 (Chola & Michelo, 2016). In contrast, TFR and age at marriage went up together in Benin, Cameroon, Guinea, Malawi, Mozambique, Nigeria, Uganda, and Zambia (Finlay et al., 2018), Egypt (Eltigani, 2003), Kenya (Bongaarts, 2006; Finlay et al., 2018; Garenne, 2008), Madagascar and Rwanda (Garenne, 2008), Namibia (Indongo & Pazvakawambwa, 2012), or Tanzania (Finlay et al., 2018; Garenne, 2008). While this may seem counterintuitive, it indicates that — although increasing age at marriage is expected to lead to lower fertility — this effect is counterbalanced by other proximate determinants.

Actually, in most countries, marriage does not account for fertility stalls since it has remained at the same level as before the stagnation in fertility, as in Eastern Africa (Ezeh et al., 2009), Ghana (Bongaarts, 2006; Garenne, 2008), or Zimbabwe (Nzimande & Mugwendere, 2018; Sayi, 2016). Unlike in other developing regions, the connection between marriage and fertility in sub-Saharan Africa is also weak since premarital fertility is common (Garenne & Joseph, 2002; Johnson et al., 2011). In this regard, in countries such as Botswana, Kenya, Madagascar, Rwanda, and Tanzania the trends of age at first marriage and age at first birth followed opposite directions, translating in increasing premarital fertility (Gaisie, 1998; Garenne, 2008; Ndahindwa et al., 2014). In the case of Zimbabwe, no significant changes in age at first birth were found at the time of stall (Sayi, 2016), although the marital fertility inhibition decreased over time (Muza, 2019).

Contraceptive use is the proximate determinant that has attracted the most attention from researchers exploring the stalls, for three main reasons. First, contraception are major factors to limit and to space births. Second, they help to prevent sexual transmitted diseases. Third, contraceptive prevalence is also used as criterion for a country to be considered in demographic transition (Bongaarts, 2008; Nzimande & Mugwendere, 2018; Schoumaker, 2019b). However, we find only mixed evidence on the association between contraception and fertility stalls.

As one might expect, increasing use of contraceptives has been connected to declining fertility periods in many countries (Finlay et al., 2018; Rossier & Corker, 2017; Shapiro et al., 2013), such as in Botswana (Gaisie, 1998), Eswatini (Chemhaka & Odimegwu, 2019), Ethiopia (Laelago et al., 2019), Malawi (Palamuleni, 2010), Namibia (Indongo & Pazvakawambwa, 2012; Shapiro & Gebreselassie, 2008; Shemeikka et al., 2005), South Africa (Burger et al., 2012; Moultrie & Timaeus, 2003), Uganda (Kabagenyi et al., 2015), or Zimbabwe (Mturi & Joshua, 2011). In several countries, contraceptive use contributes to explaining stalls, as it leveled off or decreased at the time of fertility stalls: in Cameroon (Jadhav & Short Fabic, 2019), D.R. Congo (Jadhav & Short Fabic, 2019; Romaniuk, 2011), Ghana (Agyei-Mensah, 2006; Bongaarts, 2006; Jadhav & Short Fabic, 2019), Kenya (Askew et al., 2017; Bongaarts, 2006; Ezeh et al., 2009; Garenne, 2008; Westoff & Cross, 2006), Mozambique (Jadhav & Short Fabic, 2019), Namibia (Jadhav & Short Fabic, 2019; Palamuleni, 2017), Niger (Jadhav & Short Fabic, 2019), Nigeria and Rwanda (Garenne, 2008), Tunisia (Ouadah-Bedidi et al., 2012), Uganda (Ezeh et al., 2009), and Zimbabwe (Nzimande & Mugwendere, 2018; Sayi, 2016). However, changes in fertility are not always accounted for by changes in contraceptive use (Shapiro & Gebreselassie, 2008). Despite the increasing contraceptive prevalence, fertility stalled at the same time in some countries. This is the case of Algeria (Ouadah-Bedidi et al., 2012), Benin (Johnson et al., 2011), Cameroon (Johnson et al., 2011; Shapiro & Gebreselassie, 2008), Guinea, Kenya, Mozambique, and Senegal (Shapiro & Gebreselassie, 2008), Egypt (Al Zalak & Goujon, 2017; Eltigani, 2003; United Nations, 2002), Ghana (Askew et al., 2017; Garenne, 2008; Shapiro & Gebreselassie, 2008), Madagascar (Garenne, 2008), Rwanda (Johnson et al., 2011; Shapiro & Gebreselassie, 2008; Westoff, 2013), South Africa (Moultrie et al., 2008), Tanzania (Ezeh et al., 2009; Garenne, 2008; Johnson et al., 2011), Zambia (Johnson et al., 2011), and Zimbabwe (Ezeh et al., 2009; Muza, 2019). In many of these countries, total demand for contraceptives has stalled —no additional women are willing to use contraceptives— while unmet need still remains at high levels —women cannot access nor use contraceptives even though they have intentions of doing so— (Bongaarts & Casterline, 2013). These high levels translate in unwanted fertility. Evidence shows a link between stalled fertility and unwanted fertility in Ghana (Askew et al., 2017), Kenya (Askew et al., 2017; Ezeh et al., 2009), Tanzania and Uganda (Ezeh et al., 2009), and Zimbabwe (Sayi, 2016). Regarding the place of residence, increase in contraceptive use is more common in urban areas and it is connected to fertility decline (Gebreselassie, 2012; Ross et al., 2004; Shapiro, 2010; Shapiro & Tambashe, 2002;

Shapiro & Tenikue, 2017). Moreover, periods where contraceptive use leveled off in urban areas are linked to stalled fertility, especially in capital cities of sub-Saharan Africa (Sánchez-Páez & Schoumaker, 2020).

Average duration of **postpartum infecundability** (or insusceptibility) summarizes both the length of amenorrhea (which depends on the length of breastfeeding) and postpartum abstinence. Historically, sub-Saharan Africa has been characterized by longer periods of postpartum insusceptibility than other developing regions, resulting in longer birth intervals (Bongaarts & Casterline, 2013) with a strong inhibiting effect on fertility (Agyei-Mensah & Owoo, 2015; Capo-chichi & Juarez, 2001; Palamuleni, 2010). For instance, the fertility inhibiting effect of postpartum infecundability has already contributed to the drop in fertility through longer periods of breastfeeding or abstinence in some countries such as Benin (Capo-chichi & Juarez, 2001; Finlay et al., 2018), Burkina Faso, Ghana, Madagascar, Mali, Namibia, Niger, Rwanda, Senegal, Tanzania, and Zimbabwe (Finlay et al., 2018), Côte d'Ivoire (Finlay et al., 2018; Guillaume, 2003), Ethiopia (Finlay et al., 2018; Laelago et al., 2019), or Malawi (Palamuleni, 2010). In contrast, as far as fertility stalls are concerned, postpartum insusceptibility is the only proximate determinant with no mixed evidence. At the national level, reversals in fertility decline and shorter periods of insusceptibility were found in Cameroon, Guinea, Kenya, Malawi, Mozambique, Nigeria, Uganda, and Zambia (Finlay et al., 2018), D.R. Congo (Romaniuk, 2011), Ghana (Agyei-Mensah, 2006; Agyei-Mensah & Owoo, 2015), Egypt (Al Zalak & Goujon, 2017), Namibia (Palamuleni, 2017), and Zimbabwe (Muza, 2019). At the subnational level, Sánchez-Páez and Schoumaker (2020) found that the declining postpartum insusceptibility is the single most important factor of fertility stalls in capital cities in sub-Saharan Africa. If not accompanied by a sufficient increase in contraceptive use-effectiveness (Lesthaeghe, 2014; Tabutin & Schoumaker, 2004, 2020), shortened postpartum insusceptibility are expected to lead to more stalls.

The role of **abortion** in fertility stalls has been much less analyzed due to scarcity of information. Estimates of the abortion rate in Africa are around 34 per 1,000 women (Sánchez-Páez & Ortega, 2019; Singh et al., 2018). Evidence shows that abortion rates increase at the beginning of transition (Dickson et al., 2018; Rossier & Corker, 2017), and possibly play a substantial role in fertility regulation in some settings, such as large cities (e.g. Accra, Cotonou, and Dakar. See Capo-chichi & Juarez (2001), Garenne & Joseph (2002), and Agyei-Mensah (2006)). Abortion could contribute to fertility stalls if it becomes less common. Using the Bongaarts model to identify the role of proximate determinants in capital cities in Africa, Sánchez-Páez and Schoumaker 2020 find that a large share of stalls are not explained by the three previous proximate determinants, suggesting changes in abortion practices may be part of the explanation. Unfortunately very little information is available, and special efforts should be made to improve estimates of abortions. On that basis, the effect of abortion on fertility, including on stalls, could be better addressed.

In addition to proximate determinants, research has also focused on **fertility preferences.** Africa has long been considered and defined as a pronatalist region (Bongaarts, 2017; Bongaarts & Casterline, 2013; Caldwell et al., 1992; Casterline, 2017; Ibisomi, 2008; Lesthaeghe, 1989), and African women still declare they want large families, partly reflecting cultural traditions. For instance, in Nigeria ideal family size remains high as society, first, honors fertile women and, second, it considers children should take care of the elderly (Ibisomi, 2008). Also, for many African women, the number of children becomes the most important object of reproductive management (Johnson-Hanks, 2007). Overall, desired family size in sub-Saharan Africa has stagnated at around four children in recent years (Casterline & Agyei-Mensah, 2017), and most births are reported as wanted. Since African women tend to translate their fertility preferences into birth outcomes (Cleland et al., 2019), high ideal family size will probably not allow fertility to decline rapidly. In this regard, stalled periods are correlated with stagnating or increasing wanted fertility in Algeria and Tunisia (Ouadah-Bedidi et al., 2012), Egypt (Al Zalak & Goujon, 2017; Eltigani, 2003; El-Zeini, 2008), Ghana (Agyei-Mensah, 2006; Askew et al., 2017; Bongaarts, 2006), Kenya (Askew et al., 2017; Bongaarts, 2006; Westoff & Cross, 2006), and Zimbabwe (Ndagurwa & Odimegwu, 2019; Nzimande & Mugwendere, 2018; Sayi, 2016). Also, the same association was found in most sub-Saharan African capitals (Sánchez-Páez & Schoumaker, 2020), where the demand for children also remains high (Casterline & Agyei-Mensah, 2017; Fuchs & Goujon, 2014; Gerland et al., 2017; Howse, 2015; Sánchez-Páez & Schoumaker, 2020). Conversely, lower demand for children is linked to lower fertility in another studies in Kenya (Blacker et al., 2005), Namibia (Indongo & Pazvakawambwa, 2012) and Uganda (Blacker et al., 2005; Kabagenyi et al., 2015). In contrast, the decrease in desired family size and wanted fertility do not account for the fertility stall in Rwanda (Westoff, 2013). All in all, high and fairly stable ideal family sizes appear to be correlated with fertility stalls.

Finally, some research has also addressed the **age patterns of fertility** in times of stalling. For instance, age-specific fertility rate shows decreasing fertility by age when fertility stalled in Egypt, except for those aged 15-24 (Al Zalak & Goujon, 2017; Eltigani, 2003). In the case of Kenya, there was a significant increase in fertility of women aged 25-29 at the time of the stall (Odwe et al., 2015). Nevertheless, and for all age groups, fertility is currently lower than it used to be (Shapiro & Gebreselassie, 2008). However, surprisingly few research has focused on age-specific factors in fertility stalls.

Annex table 3 summarizes the literature review of studies that have analyzed the fertility dynamics during stall periods.

Potential causes of fertility stalls

Besides the fertility dynamics during periods of stagnated fertility, scholars have been interested in finding the underlying causes of the stalls. Among the most cited socioeconomic reasons are leveling off in education, high prevalence of HIV/AIDS, slow increases in national income or wealth, non-decreasing infant and child mortality, rising or persistent female unemployment, and weak family planning (FP) programs. As before, results show mixed evidence in some of them.

The effects of increasing the level of **education** or improving its quality have perhaps the most lasting impacts on a society. Literature shows the benefits of better education and its support to development and well-being. One of them is the potential contribution to the reduction of fertility since more educated women have lower fertility (Askew et al., 2017; Gebreselassie, 2012; Hertrich, 2017; Shapiro, 2015; Shapiro & Tenikue, 2017; Westoff & Cross, 2006). It both decreases unwanted fertility through increased contraceptive use and wanted fertility through reduction of desired family size (Bongaarts, 2017; Caldwell et al., 1992; Casterline, 2017; Fuchs & Goujon, 2014; Lesthaeghe, 1989; Uchudi, 2001). Also, education contributes to decrease fertility by delaying sexual activity, marriage and initiation of childbearing (Chemhaka & Odimegwu, 2019; United Nations, 2002). In this regard, comparative studies in 18, 24, 25, and 28 African countries show that having more educated women is correlated to lower fertility (Kebede et al., 2019; Shapiro, 2010; Shapiro et al., 2013; Shapiro & Gebreselassie, 2008). Analyses of changes also show that increasing female education is correlated to decreasing fertility in several countries[2]: Benin (Capo-chichi & Juarez, 2001), Eswatini (Chemhaka & Odimegwu, 2019), Ghana (Agyei-Mensah & Owoo, 2015; Derose & Ezeh, 2005), Namibia (Indongo & Pazvakawambwa, 2012), Rwanda (Ndahindwa et al., 2014; Westoff, 2013), Uganda (Kabagenyi et al., 2015), South Africa (Moultrie & Timaeus, 2003), and Zambia (Chola & Michelo, 2016). As far as fertility stalls are concerned, it has been shown that they occurred after periods of non-increasing schooling in several countries, as in Côte d'Ivoire and Cameroon (Kebede et al., 2019), D.R. Congo (Kebede et al., 2019; Romaniuk, 2011), Congo, Niger, Nigeria, and Zambia (Goujon et al., 2015; Kebede et al., 2019), Gambia, Mali, and Mozambique (Goujon et al., 2015), Kenya (Askew et al., 2017; Bongaarts, 2006; Ezeh et al., 2009; Goujon et al., 2015; Kebede et al., 2019; Odwe et al., 2015), and Tanzania (Ezeh et al., 2009; Goujon et al., 2015; Kebede et al., 2019). For instance, Goujon et al. (2015) use reconstructed data on population by age and education to show that 8 out of 10 countries classified under the stall category had a stall in the progress of education during the 1980s. Conversely, stalls in fertility are less common in countries with no evidence of an education stall (Goujon et al., 2015). Later, they concluded that less uneducated women would predict lower fertility although it does not fully account for stalls (Kebede et al., 2019). In contrast, no supporting evidence has been found in Algeria, Egypt, and Tunisia, where fertility and schooling raised in parallel (Al Zalak & Goujon, 2017; Ouadah-Bedidi et al., 2012). In Egypt, high levels of unemployment among the most educated women translated in the increase of fertility. On the other hand, mixed evidence exists in Ghana (Agyei-Mensah, 2006; Askew et al., 2017; Bongaarts, 2006)

[2] However, earlier evidence from two comparative studies, both in the same 29 countries (Garenne & Joseph, 2002; Shapiro & Tambashe, 2002), and country-case studies in Egypt (Amin & Lloyd, 2002), Kenya (Shreffler & Dodoo, 2009), and Mozambique (Hayford & Agadjanian, 2012), shows fertility decline during the 1990s is not fully accounted by increased education.

and Zimbabwe (Ezeh et al., 2009; Goujon et al., 2015; Kebede et al., 2019; Ndagurwa & Odimegwu, 2019) since results show education account for stalls in some studies while it does not in others.

Female labor increases the opportunity cost of having a child. In Africa, women are usually in charge of parenting and their time should be shared between working and caring for the children. Hence, there is an inverse relation between fertility and female labor. The mechanism consists in lowering the desired number of children in exchange for greater involvement in work (Casterline, 2017; Dodoo & Frost, 2008; Uchudi, 2001). For instance, increased female participation in the labor market in Namibia contributed to the decline in fertility in the early 2000s (Indongo & Pazvakawambwa, 2012). Africa is still the region with the lowest female labor in the world although it has increased since the 2000s. Around 16% of African women are currently working in contrast to 48% and 63% in South and Southeast Asia and Latin America, respectively (World Bank, 2020). However, this lower rate should be nuanced as a significant share of female work in Africa is informal or in the agriculture, and not visible in the statistics (Romaniuk, 2011).

In this regard, long-term **female unemployment** can lead women to rethink their desired number of children. In Egypt, the persistent high rate of unemployment among women over age 25 contributed to the increase in fertility (Al Zalak & Goujon, 2017). Also, less women were working than before at the time of stalled fertility in Nigeria and Rwanda (Garenne, 2008). In contrast, increases in female labor were registered during the stalled periods in Ghana and Madagascar (Garenne, 2008), Kenya and Tanzania (Ezeh et al., 2009; Garenne, 2008), Uganda (Ezeh et al., 2009), and Zimbabwe (Ezeh et al., 2009; Muza, 2019; Ndagurwa & Odimegwu, 2019). Overall, there is no consistent relationship between female unemployment and stalls.

Under-five mortality in Africa has decreased from 180 in 1990 to 78 children per thousand in 2018 (United Nations, 2020). Infant mortality has also decreased steadily since the 1990s. Currently, it is around 53 infants per thousand live-births; nevertheless, it is almost four times higher than in the other two regions. Under-five mortality has also increased in several countries in the 1990s (Tabutin & Schoumaker, 2004). Regarding neonatal mortality, the pattern is similar. Africa has a rate of 28 newborns per thousand live-births, being on average 3.5 times higher than Latin America and South and Southeast Asia.

According to the demographic transition theory, mortality decline – and especially child mortality decline – is a key factor in the fertility decline (Bongaarts, 2008; Caldwell et al., 1992; Casterline, 2017; Shapiro, 2010, 2015; Shapiro et al., 2013; Shapiro & Gebreselassie, 2008; Shapiro & Tambashe, 2002). In sub-Saharan Africa, the reduction in under-five mortality explains 30% and 35% of the total decline in fertility in urban and rural areas in 31 countries (Shapiro & Tenikue, 2017). In both Benin and Ghana, research show substantial reductions in fertility after decreases in under-five mortality (Agyei-Mensah & Owoo, 2015; Capo-chichi & Juarez, 2001). And leveling off in under-five mortality was accompanied with fertility stalls in Ghana (Agyei-Mensah, 2006; Bongaarts, 2006; Garenne, 2008), Kenya (Bongaarts, 2006; Garenne, 2008; Gebreselassie, 2012; Westoff & Cross, 2006), and Zimbabwe (Gebreselassie, 2012). In contrast, stalled fertility occurred despite decreasing infant and child mortality in Cameroon, Chad, Congo, D.R. Congo, Côte d'Ivoire, Gabon, Lesotho, Niger, and Zambia (Shapiro & Tenikue, 2017), Rwanda (Garenne, 2008; Gebreselassie, 2012; Westoff, 2013), Madagascar, Nigeria and Tanzania (Garenne, 2008).

Since **HIV** was declared as pandemic in the late 1980s, African Governments, especially in sub-Saharan Africa, shifted priorities towards reducing the infected cases and contain the infection (Askew et al., 2017). Most of global cases of HIV/AIDS are concentrated in sub-Saharan Africa.

Recent estimates show HIV prevalence is around 4%, which is 20% lower than its highest peak in 1997 and almost ten times higher than in Latin America (World Bank, 2020). HIV has several effects on fertility. It contributes to lower fertility by, decreasing sexual activity to avoid getting infected and marital dissolution after infection, as in Ghana Ghana (Agyei-Mensah, 2006) and Kenya (Magadi & Agwanda, 2010), and by increasing the use of condoms during sexual intercourse to prevent contagion, as in Namibia (Shemeikka et al., 2005). The increase in intrauterine deaths, as in Kenya (Magadi & Agwanda, 2010) and South Africa (Moultrie & Timaeus, 2003), also contribute to lower fertility. On the other hand, HIV may also contribute positively to fertility through several mechanisms. The increase in under-five mortality, as in countries strongly affected by HIV-AIDS, may lead to birth replacement. For instance, in Kenya (Magadi & Agwanda, 2010; Westoff & Cross, 2006) and South Africa (Houle et al., 2016) women who have recently lost a child report wanting another one. Birth intervals are also decreased, including through reduced breastfeeding, as in Kenya (Magadi & Agwanda, 2010) and South Africa (Garenne et al., 2007). In addition, new and more effective treatments for the prevention in mother-to-child transmission could increase the possibility of bearing more children. Apparently, women infected with HIV are increasing their fertility in South Africa due to the lower risk of transmission (Moultrie et al., 2008). As a result, the fertility trend will depend on which of the two effects counterbalance the other, and how they evolve over time. For instance, Lewis et al. (2004) using pooled data from Burkina Faso, Cameroon, Ghana, Kenya, Madagascar, Mali, Senegal, Tanzania, Togo, Uganda, Zambia, and Zimbabwe, show that an increase in HIV prevalence of one percentage point leads to a decline in total fertility of 0.37%. In contrast, Gori et al. (2020) conclude that HIV has triggered reversals of fertility in sub-Saharan Africa. In this regard, HIV prevalence was found as one of the causes of stalled fertility, mainly due to replacement births, in Kenya (Magadi & Agwanda, 2010; Westoff & Cross, 2006) and South Africa (Garenne et al., 2007; Houle et al., 2016). HIV might also substantially delay the fertility transition in SSA by halting economic development (Gori et al., 2020).

As mentioned above, African Governments focused their efforts on the HIV pandemic. Budgetary constraints forced them to prioritize certain initiatives to the detriment of others, such as **family planning (FP) programs**. The idea behind FP programs is to increase the total demand for contraception, promote the supply of contraceptives, and reduce unmet need (Bongaarts, 2011). Thus, reducing fertility could be addressed by decreasing both, desired and unwanted fertility (Casterline & Agyei-Mensah, 2017). In general terms, the lack of organized FP programs in Africa have been identified as part of the problem leading to fertility stalls since they have generally been considered as weak and of low priority for Governments (Bongaarts, 2008, 2017; Fuchs & Goujon, 2014; Ross et al., 2004). However, in the specific case of Ghana, no link was found between the FP programs and the stalls (Bongaarts, 2006), unlike Kenya, where there were shortages of contraceptive supplies while fertility was stalling (Westoff & Cross, 2006). It is worth noting, Ghana is one of the cases where the stalled period was recognized as possibly spurious. Although strong FP programs contribute to fertility decline, especially in pre-transitional countries (Bongaarts, 2017; Jadhav & Short Fabic, 2019; Lesthaeghe, 2014), evidence regarding the link between investments in family planning programs and fertility stalls in Africa is limited. For instance, we only have found evidence for D.R. Congo, where the lack of a national FP program reflects the increasing fertility (Romaniuk, 2011).

Wealth is usually inversely correlated with fertility, with the expectation of wealthier families having fewer children (Bongaarts, 2017). To rank families according to wealth, researchers have used indicators at the micro level —household income or wealth indexes computed from housing characteristics— and at the macro level —gross domestic product (GDP) per capita—. In either case, they aim to measure the well-being of a family or the stage of development of a country from an economic perspective. Africa is the least developed region with the lowest income levels in the world despite GDP per capita has increased steadily since the mid-1990s. Currently, per capita GDP in Africa is almost six times lower than in Latin America and four times lower than in South and Southeast Asia (World Bank, 2020). In the case of Africa, literature finds mixed evidence since, in some cases, there exists an inverse relation between fertility and wealth (Bongaarts, 2017; Casterline, 2001; Chola & Michelo, 2016; Finlay et al., 2018; Fuchs & Goujon, 2014; Kabagenyi et al., 2015; Lesthaeghe, 1989), while in others, fertility decline is not explained by wealth indicators (Garenne & Joseph, 2002; Gurmu & Mace, 2008; Shapiro, 2010; Shapiro et al., 2013; Shapiro & Gebreselassie, 2008; Shapiro & Tambashe, 2002). From country-case research, the link between wealth and fertility stalls also presents mixed evidence. Some studies find stagnating wealth accounts for fertility stalls, such as in Egypt (Eltigani, 2003), Kenya (Askew et al., 2017; Bongaarts, 2006; Garenne, 2008), Madagascar, Nigeria, and Tanzania (Garenne, 2008); in contrast, many others find it does not account for stalls, as in Ghana (Askew et al., 2017; Bongaarts, 2006; Garenne, 2008), Kenya, Tanzania and Uganda (Ezeh et al., 2009), Rwanda (Garenne, 2008; Westoff, 2013), and Zimbabwe (Ezeh et al., 2009; Muza, 2019).

Annex table 4 summarizes the literature review of studies that have analyzed the potential causes of fertility stalls.

Conclusions

Fertility decline provides health and economic benefits, and improves the lives of women and children (Bongaarts & Casterline, 2013). Current African population is around 1,340 million and, according to the ongoing rates of fertility decline, is expected to triple by the end of the century

(United Nations, 2020). The pace of decline in Africa, and especially in sub-Saharan countries, will play a large role in the magnitude of future growth in world population (Gerland et al., 2017). Pace of decline is a positive function of social and economic change, economic aspirations and expectations, improvement in the provision of birth control services, and reduction in the psychological and social costs of birth control (Casterline, 2001). Uncertainty and failure to meet the objectives of these determinants have led to the transition taking longer than expected and to the process being exceptional. What matters is not stalling of itself, but persistent high levels of fertility and the slow pace of change (Howse, 2015). Yet, studying stalls are important as they represent somewhat extreme situations, and highlight the slow and uncertain path in fertility transitions.

Since the 1980s, the future of Africa's population has attracted the interest of researchers. The African uniqueness was already foreseen 30 years ago when a stagnation in the fall of fertility was predicted at around 4 or 5 children per woman (Lesthaeghe, 1989). Since then, the demographic transition in Africa has indeed been different from that in other low- and middle-income regions, and the future of Africa's population still remains uncertain. A key factor in this uncertainty is the speed at which fertility will decline, including whether ongoing stalls will persist and/or new stalls will be found. This document synthesized existing literature on the stalls. We summarize some of the main findings, and discuss some research agenda and policy implications.

1. Fertility stalls in sub-Saharan Africa have been identified in a large number of countries at some point. About three-quarters of African countries have been included in the stalled category at any point over the last 20 years. There is no general agreement on the number of stalls, when they occurred and which countries did indeed experience fertility stalls. Differences in definitions of stalls and methods, as well as data quality issues, may lead to

varying conclusions. Despite the uncertainty regarding some stalls, it is clear that stalls have occurred in a number of countries, and have been widespread in urban areas. They are not a feature of the past, and are part of Africa's uniqueness with regard to fertility transition. They may also be a significant aspect of future transitions in Africa.

2. It is important to focus on trends within countries. Stalls at the national level do not necessarily mean that stalls occur at subnational levels, as they may reflect composition effects (Schoumaker, 2019b). In contrast, stalls may be found in urban areas without occurring in rural areas or at the national level. In fact, recent evidence shows that stalls are more common in capital cities than in other urban and rural areas, even in settings without fertility reversal at the national level (Schoumaker & Sánchez-Páez, 2020). As far as urban areas are often pioneers in terms of demographic changes, the widespread stalls in urban areas may herald future stalls at the national level.

3. A key factor in stalls – whether at the country level or in urban areas — seems to be the fairly high and stable demand for children. As discussed before, African societies have unique pronatalist features (Caldwell et al., 1992; Casterline, 2017). For instance, in some countries preference for a son, fears of side effects of contraception and the perceived low cost of childrearing are major obstacles to the acceptance of smaller families (El-Zeini, 2008). Existing studies suggest that fertility stalls are – at least to some extent – stalls in wanted fertility, and that failure of the ideal number of children to decline has contributed to stalls (Ndagurwa & Odimegwu, 2019; Nzimande & Mugwendere, 2018). Unless fertility preferences decrease substantially, it is probable that stalls will persist and other stalls will occur. Analyzing the reasons for the stalling fertility preferences – whether they are cultural, economic, and social – should thus be a priority for understanding stalls in fertility.

4. Despite the finding that a high demand for children is probably an important driver of stalls, the role family planning programs and interventions should not to be neglected. Fertility stalls occurred in some countries (e.g. Kenya) at a time when investments in family planning programs were slowed down, and shortages in contraception contributed to the stall. Even if unwanted fertility is lower than wanted fertility, it remains an issue. Moreover, if demand for children decreases, securing the fertility transition will clearly depend on strengthening FP programs. Although contraceptive prevalence has increased over the years, unmet need has also grown. High desired family size, high unmet need — obstacles to get contraceptives —, and ineffective ways to stop childbearing are responsible of high fertility (Bongaarts & Casterline, 2013; Casterline & Agyei-Mensah, 2017). The implementation or strengthening of FP programs by African governments can modify contraceptive demand, as suggested by the Rwanda experience (Bongaarts, 2011). Improved access to and increased use of modern methods of contraception, improving supply and diversity of methods, encouraging use even when breastfeeding, and bringing in new users of contraceptives would reduce unmet need and avoid plateauing in the demand for contraceptives (Askew et al., 2017; Ross et al., 2004).

5. Child mortality, HIV-AIDS, changes in wealth, female employment, and female education have all – to varying extents – been analyzed in the search for causes of stalls. Overall, the evidence is mixed, and varies across countries. Even if improvements in socioeconomic variables have a proven effect on fertility decline, the reversal of one of them does not necessarily translate into a fertility stall. While slowdowns in education have been found to influence fertility stalls, it is only part of the explanation. Deteriorating economic conditions do not systematically lead to higher fertility. Stops and reversals in trends in child mortality do not necessarily lead to, or explain, fertility stalls. Overall, stagnation is more likely to occur

as a result of the interaction of some variables than the individual effect of a single one, unless its impact is extremely strong. In short, the causes of fertility stalls cannot also be generalized to all cases, and there is no exact formula to explain the stalls in all countries. Mixed evidence on the determinants of fertility and on the causes that may determine it suggests that the analysis should be done on a case-by-case basis.

6. Moreover, analyses are fraught with difficulties. The impact of changes are probably lagged, such as the effect of mortality on fertility. Effects may be non-linear. Some factors – such as the spread of HIV-AIDS – may have several effects on fertility in opposite directions, which may unfold differently over time. Absence of strong evidence regarding the effects of these variables on stalls does not mean they are not important. Taking a long-term perspective, it is likely that a sustainable fertility decline will not occur with some improvements in health, education, and standard of living. One of the factors contributing to slow fertility decline in Africa is its poor socioeconomic development. Although these indicators do not fully account for stalls since mixed evidence has been found, they are highly correlated to periods of declining fertility (Garenne, 2008; Kebede et al., 2019; Shapiro, 2010; Shapiro & Gebreselassie, 2008; Shapiro & Tambashe, 2002). Moreover, female education and labor contribute to reduce the desired number of children (Casterline, 2017). Improvements in both indicators will favor a better standard of living for African women.

7. As far as the proximate determinants of fertility are concerned, the role of postpartum insusceptibility in explaining stalls seems to have been somewhat neglected. Shortening of the insusceptibility period is one of the factors consistently associated with stalls. The contribution of the decrease in postpartum insusceptibility to increasing fertility is nothing new, as shown in the early 1980s in Africa (Bongaarts et al., 1984). It seems it is also an

important factor in stalls, including in capital cities. Unless this decrease is offset by contraceptive use, stalls are likely to endure. While abortion may also influence fertility trends, we lack information on the levels and trends of abortion, and on its role on fertility stalls. If it were to decrease, increase in access to contraception would be all the more important.

8. Some other aspects also seem to have been somewhat neglected in existing research. For instance, few studies look at changes by age groups, or take a cohort perspective. Parity progression ratios have also not been used, but could be useful – for instance to evaluate the role of gender composition of living children on the progression to higher parities. The role of men has also often been neglected in fertility analysis, even though they have a higher TFR than women (Schoumaker, 2019a). Africa is still patriarchal, which favors fertility to remain at high levels (Dodoo & Frost, 2008) and men affect, among others, the decision of using contraceptives (Uchudi, 2001). Evidence from Zimbabwe shows female characteristics do not account exclusively for fertility stalls. Both men and women help explaining fertility trends. The reversal of fertility decline in Zimbabwe is also attributable to men (Ndagurwa & Odimegwu, 2019).

9. Predicting forthcoming stalls may be more difficult than it seems. There may be clues that warn that the fall in fertility will be halted or at least slowed down mainly, as shown by trends in the proximate determinants of fertility and in ideal family size. But things could change rapidly and unexpectedly. It may prove as difficult as predicting when fertility decline will resume after a stall. More fine-grained description of demographic dynamics of the stalls, such as identifying the spread of family limitation (Lerch & Spoorenberg, 2020) may help understanding and predicting these trends.

Research agenda

Further research is thus needed to continue the process of understanding the dynamics of fertility stalls. There are still gaps in the literature that need to be filled.

1. There are certain cases of stalls, such as Kenya, Ghana or Rwanda, to which the literature has devoted much effort to study and document. However, recent findings show that there is strong evidence of fertility stagnation in countries such as Cameroon, Congo, Egypt, Namibia, Zambia or Zimbabwe but they have been little explored. There is still a need to study the dynamics of fertility at the country level in countries where little is known about the halts and reversals of fertility decline. Also, as new data is released, monitoring fertility rates can contribute to predict possible fertility stalls.

2. Most research has been conducted at the national level neglecting the dynamics at the subnational level. Recent evidence shows that some stalls at the country level can be explained, at least partly, by composition effects instead of generalized halts in fertility decline. Research is needed to understand the differences of the fertility transition in urban and rural areas.

3. Research has focused primarily on contraceptive use, and to a lesser extent on sexual activity, to explain fertility patterns in Africa. However, evidence is lacking on the causes leading to reduced breastfeeding and postpartum abstinence and, therefore, their effects on fertility.

4. Literature should delve into the demographic transition driven by the lengthening of birth intervals and the extent to which they mean a decrease in demand for children or for the postponement of childbearing. More generally, since period TFRs are sensitive to drastic changes in birth intervals and, research linking birth intervals and stalls may be of interest, as

would be research comparing period TFR and cohort fertility, and analyzing age-specific fertility rate patterns.

5. Africa has been defined as a pronatalist region; however, little is known about the most sensitive determinants that contribute to high levels of demand for children and the reasons why the improvement in socioeconomic conditions has not been accompanied by a fall in fertility, as has been seen in other less developed regions.

6. While some studies have focused on the role of HIV in declining fertility, research linking it to stalls are still lacking. We need to know whether the fertility stalls that occurred after 2000 is a rebound effect caused by the displacement of births that would have occurred in the 1990s but were avoided due to HIV or whether they are due to replacement births.

7. Education is one of the variables that has been linked more frequently to fertility, either for its contribution to declines or to explain the absence of declines, i.e., fertility stalls. Nevertheless, although other socioeconomic characteristics, such as female labor, child mortality or wealth, appear as potential causes of fertility stagnation, little research has focused on them. The mixed evidence found so far provides an opportunity to refine the analyses and explore in greater detail the causal relationships between women's socioeconomic characteristics and their fertility.

8. More and more research is analyzing fertility differences between men and women, as well as their roles in reproductive decisions. The direct influence of men on women's fertility outcomes and whether or not they are contributing to continued high fertility rates in Africa needs to be further explored.

Acknowledgements

We thank Dominique Tabutin for his comments on an earlier version of this chapter. This work was supported by the Fonds de la Recherche Scientifique – FNRS under Grant No. T.0210.19 (STALLS).

References

Agyei-Mensah, S. (2006). Fertility transition in Ghana: Looking back and looking forward. *Population, Space and Place*, *12*(6), 461–477. https://doi.org/10.1002/psp.425

Agyei-Mensah, S., & Owoo, N. S. (2015). Explaining regional fertility variations in Ghana. *Journal of Population Research*, *32*(3), 157–172. https://doi.org/10.1007/s12546-015-9147-7

Al Zalak, Z., & Goujon, A. (2017). Exploring the fertility trend in Egypt. *Demographic Research*, *37*(32), 995–1030. https://doi.org/10.4054/DemRes.2017.37.32

Amin, S., & Lloyd, C. B. (2002). Women's lives and rapid fertility decline: Some lessons from Bangladesh and Egypt. *Population Research and Policy Review*, *21*(4), 275–317. https://doi.org/10.1023/A:1020030616075

Arnaldo, C. (2004). Regional fertility trends in Mozambique. *Journal of Population Research*, *21*(2), 177–197. https://doi.org/10.1007/BF03031897

Askew, I., Maggwa, N., & Obare, F. (2017). Fertility transitions in Ghana and Kenya: Trends, determinants, and implications for policy and programs. *Population and Development Review*, *43*(S1), 289–307. https://doi.org/10.1111/padr.12010

Blacker, J., Opiyo, C., Jasseh, M., Sloggett, A., & Ssekamatte-Ssebuliba, J. (2005). Fertility in Kenya and Uganda: A comparative study of trends and determinants. *Population Studies*, *59*(3), 355–373. https://doi.org/10.1080/00324720500281672

Bongaarts, J. (1978). A framework for analyzing the proximate determinants of fertility. *Population and Development Review*, *4*(1), 105–132. https://doi.org/10.2307/1972149

Bongaarts, J. (2006). The causes of stalling fertility transitions. *Studies in Family Planning*, *37*(1), 1–16. https://doi.org/10.1111/j.1728-4465.2006.00079.x

Bongaarts, J. (2008). Fertility transitions in developing countries: Progress or stagnation? *Studies in Family Planning*, *39*(2), 105–110. https://doi.org/10.1111/j.1728-4465.2008.00157.x

Bongaarts, J. (2011). Can Family Planning programs reduce high desired family size in sub-Saharan Africa? *International Perspectives on Sexual and Reproductive Health*, *37*(4), 209–216. https://www.guttmacher.org/sites/default/files/article_files/3720911.pdf

Bongaarts, J. (2015). Modeling the fertility impact of the proximate determinants: Time for a tune-up. *Demographic Research*, *33*(19), 535–560. https://doi.org/10.4054/DemRes.2015.33.19

Bongaarts, J. (2017). Africa's unique fertility transition. *Population and Development Review*, *43*(S1), 39–58. https://doi.org/10.1111/j.1728-4457.2016.00164.x

Bongaarts, J., & Casterline, J. B. (2013). Fertility transition: Is sub-Saharan Africa different? *Population and Development Review*, *38*(Suppl. 1), 153–168. https://doi.org/10.1111/j.1728-4457.2013.00557.x

Bongaarts, J., Frank, O., & Lesthaeghe, R. (1984). The proximate determinants of fertility in sub-Saharan Africa. *Population and Development Review*, *10*(3), 511–537. https://doi.org/10.2307/1973518

Burger, R. P., Burger, R., & Rossouw, L. (2012). The fertility transition in South Africa: A retrospective panel data analysis. *Development Southern Africa*, *29*(5), 738–755. https://doi.org/10.1080/0376835X.2012.731779

Caldwell, J. C. (1994). Fertility in sub-Saharan Africa: Status and prospects. *Population and Development Review*, *20*(1), 179–187. https://doi.org/10.2307/2137636

Caldwell, J. C., Orubuloye, I. O., & Caldwell, P. (1992). Fertility decline in Africa: A new type of transition? *Population and Development Review*, *18*(2), 211–242. https://doi.org/10.2307/1973678

Capo-chichi, V., & Juarez, F. (2001). Is fertility declining in Benin? *Studies in Family Planning*, *32*(1), 25–40. https://doi.org/10.1111/j.1728-4465.2001.00025.x

Casterline, J. B. (2001). The pace of fertility transition: National patterns in the second half of the Twentieth Century. *Population and Development Review*, *27*(S1), 17–52. https://www.jstor.org/stable/3115248

Casterline, J. B. (2017). Prospects for fertility decline in Africa. *Population and Development Review*, *43*(S1), 3–18. https://doi.org/10.1111/padr.12055

Casterline, J. B., & Agyei-Mensah, S. (2017). Fertility desires and the course of fertility decline in sub-Saharan Africa. *Population and Development Review*, *43*(S1), 84–111. https://doi.org/10.1111/padr.12030

Chemhaka, G. B., & Odimegwu, C. (2019). The proximate determinants of fertility in Eswatini. *African Journal of Reproductive Health*, *23*(2), 65–75. https://doi.org/10.29063/ajrh2019/v23i2.7

Chemhaka, G. B., Odimegwu, C., Zwane, E., Chadoka, N., & Gumbo, J. D. (2016). Estimation of Swaziland fertility: What do the methods tell us? *Southern African Journal of Demography*, *17*(1), 7–66.

Chola, M., & Michelo, C. (2016). Examining the underlying determinants of fertility rates in Zambia: Evidence form the 2007 Zambia Demographic and Health Survey. *African Population Studies*, *30*(2), 2318–2327. https://doi.org/10.11564/30-2-829

Cleland, J., Machiyama, K., & Casterline, J. B. (2019). Fertility preferences and subsequent childbearing in Africa and Asia: A synthesis of evidence from longitudinal studies in 28 populations. *Population Studies*, 1–21. https://doi.org/10.1080/00324728.2019.1672880

Cleland, J., Onouha, N., & Timaeus, I. (1994). *The onset of fertility transition in sub-Saharan Africa* (T. Locoh & V. Hertich, Eds.; pp. 1–20). Ordina Editions. https://pdfs.semanticscholar.org/0ff6/d57ab3056538a8048eff6e82edce46305265.pdf

Cohen, B. (1998). The emerging fertility transition in sub-Saharan Africa. *World Development, 26*(8), 1431–1461. https://doi.org/10.1016/S0305-750X(98)00058-8

Derose, L. F., & Ezeh, A. C. (2005). Men's influence on the onset and progress of fertility decline in Ghana, 1988–98. *Population Studies, 59*(2), 197–210. https://doi.org/10.1080/00324720500099496

Dickson, K. S., Adde, K. S., & Ahinkorah, B. (2018). Socio - economic determinants of abortion among women in Mozambique and Ghana: Evidence from Demographic and Health Survey. *Archives of Public Health, 76*, 36–46. https://doi.org/10.1186/s13690-018-0286-0

Dodoo, F. N.-A., & Frost, A. E. (2008). Gender in African population research: The fertility/ reproductive health example. *Annual Review of Sociology, 34*, 431–452. https://doi.org/10.1146/annurev.soc.34.040507.134552

Eloundou-Enyegue, P., Giroux, S., & Tenikue, M. (2017). African transitions and fertility inequality: A demographic Kuznets hypothesis. *Population and Development Review*, *43*(Suppl. 1), 59–83. https://doi.org/10.1111/padr.12034

Eltigani, E. E. (2003). Stalled fertility decline in Egypt, why? *Population and Environment*, *25*(1), 41–59. https://doi.org/10.1023/A:1025547622370

El-Zeini, L. O. (2008). The path to replacement fertility in Egypt: Acceptance, preference, and achievement. *Studies in Family Planning*, *39*(3), 161–176. https://doi.org/10.1111/j.1728-4465.2008.164.x

Ezeh, A. C., Mberu, B. U., & Emina, J. O. (2009). Stall in fertility decline in Eastern African countries: Regional analysis of patterns, determinants and implications. *Philosophical Transactions of the Royal Society B, 364*(1532), 2991–3007. https://doi.org/10.1098/rstb.2009.0166

Finlay, J. E., Mejía-Guevara, I., & Akachi, Y. (2018). Inequality in total fertility rates and the proximate determinants of fertility in 21 sub-Saharan African countries. *PLoS ONE*, *13*(9), e0203344. https://doi.org/10.1371/journal.pone.0203344

Frank, O., & McNicoll, G. (1987). An interpretation of fertility and population policy in Kenya. *Population and Development Review*, *13*(2), 209–243. https://doi.org/10.2307/1973192

Fuchs, R., & Goujon, A. (2014). *World population and human capital in the 21st century* (W. Lutz, W. P. Butz, & S. KC, Eds.; pp. 147–225). Oxford University Press. https://doi.org/10.1093/acprof: oso/9780198703167.003.0004

Gaisie, S. K. (1998). Fertility transition in Botswana. *Journal of Contemporary African Studies, 16*(2), 277–296. https://doi.org/10.1080/02589009808729631

Garenne, M. (2008). Situations of fertility stall in sub-Saharan Africa. *African Population Studies*, *23*(2), 173–188. https://doi.org/10.11564/23-2-319

Garenne, M., & Joseph, V. (2002). The timing of the fertility transition in sub-Saharan Africa. *World Development*, *30*(10), 1835–1843. https://doi.org/10.1016/S0305-750X(02)00069-4

Garenne, M. L. (2004). Age at marriage and modernisation in sub-Saharan Africa. *Southern African Journal of Demography*, *9*(2), 59–79.

Garenne, M. L. (2011). Testing for fertility stalls in demographic and health surveys. *Population Health Metrics*, *9*, 59. https://doi.org/10.1186/1478-7954-9-59

Garenne, M. L., Tollman, S. M., Collinson, M. A., & Kahn, K. (2007). Fertility trends and net reproduction in Agincourt, rural South Africa, 1992–2004. *Scandinavian Journal of Public Health*, *35*(Suppl. 69), 68–76. https://doi.org/10.1080/14034950701355650

Gebreselassie, T. (2012). *The demographic transition and development in Africa: The unique case of Ethiopia* (C. Teller & A. Hailemariam, Eds.; pp. 19–44). Springer. https://doi.org/10.1007/978-90-481-8918-2_2

Gendell, M. (1985). *Stalls in the fertility decline in Costa Rica, Korea, and Sri Lanka. World Bank Staff Working Papers No. 693* [Research report]. World Bank. http://documents.worldbank.org/curated/en/654971468770654787/Stalls-in-the-fertility-decline-in-Costa-Rica-Korea-and-Sri-Lanka

Gendell, M. (1989). Stalls in the fertility decline in Costa Rica and South Korea. *International Family Planning Perspectives*, *15*(1), 15–21. https://doi.org/10.2307/2133274

Gerland, P., Biddlecom, A., & Kantorova, V. (2017). Patterns of fertility decline and the impact of alternative scenarios of future fertility change in sub-Saharan Africa. *Population and Development Review*, *43*(Suppl. 1), 21–38. https://doi.org/10.1111/padr.12011

Gori, L., Lupi, E., Manfredi, P., & Sodini, M. (2020). A contribution to the theory of economic development and the demographic transition: Fertility reversal under the HIV epidemic. *Journal of Demographic Economics*, *86*(2), 125–155. https://doi.org/10.1017/dem.2019.21

Goujon, A., Lutz, W., & KC, S. (2015). Education stalls and subsequent stalls in African fertility: A descriptive overview. *Demographic Research*, *33*(47), 1281–1296. https://doi.org/10.4054/DemRes.2015.33.47

Guillaume, A. (2003). The role of abortion in the fertility transition in Abidjan (Côte d'Ivoire) during the 1990s. *Population*, *58*(6), 657–686. https://doi.org/10.3917/popu.306.0741

Gurmu, E., & Mace, R. (2008). Fertility decline driven by poverty: The case of Addis Ababa, Ethiopia. *Journal of Biosocial Science*, *40*(3), 339–358. https://doi.org/10.1017/S002193200700260X

Hayford, S. R., & Agadjanian, V. (2012). From desires to behavior: Moderating factors in a fertility transition. *Demographic Research*, *26*(20), 511–542. https://doi.org/10.4054/DemRes.2012.26.20

Hertrich, V. (2017). Trends in age at marriage and the onset of fertility transition in sub-Saharan Africa. *Population and Development Review*, *43*(Suppl. 1), 112–137. https://doi.org/10.1111/padr.12043

Houle, B., Pantazis, A., Kabudula, C., Tollman, S., & Clark, S. J. (2016). Social patterns and differentials in the fertility transition in the context of HIV/AIDS: Evidence from population surveillance, rural South Africa, 1993 – 2013. *Population Health Metrics*, *14*(1), 10–20. https://doi.org/10.1186/s12963-016-0079-z

Howse, K. (2015). What is fertility stalling and why does it matter? *Population Horizons*, *12*(1), 13–23. https://doi.org/10.1515/pophzn-2015-0003

Ibisomi, L. D. G. (2008). Fertility transition in Nigeria: Exploring the role of desired number of children. *African Population Studies*, *23*(2), 207–222. https://doi.org/10.11564/23-2-321

Ibisomi, L., Williams, J., Collinson, M. A., & Tollman, S. (2014). The stall in fertility decline in rural, northeast, South Africa: The contribution of a self-settled, Mozambican, refugee sub-population. *African Population Studies*, *28*(Suppl. 1), 590–600. https://doi.org/10.11564/28-0-517

Indongo, N., & Pazvakawambwa, L. (2012). Determinants of fertility in Namibia. *African Journal of Reproductive Health*, *16*(4), 50–57. https://www.ajrh.info/index.php/ajrh/article/view/1195

Jadhav, A., & Short Fabic, M. (2019). Dynamic stagnation: Reasons for contraceptive non-use in context of fertility stall. *Gates Open Research*, *3*, 1458. https://doi.org/10.12688/gatesopenres.12990.1

Johnson, K., Abderrahim, N., & Rutstein, S. O. (2011). *Changes in the direct and indirect determinants of fertility in sub-Saharan Africa. DHS Analytical Studies No. 23* (DHS Analytical Studies No. 23). ICF Macro. https://dhsprogram.com/pubs/pdf/AS23/AS23.pdf

Johnson-Hanks, J. (2007). Natural intentions: Fertility decline in the African Demographic and Health Surveys. *American Journal of Sociology*, *112*(4), 1008–1043. https://doi.org/10.1086/508791

Kabagenyi, A., Reid, A., Rutaremwa, G., Atuyambe, L. M., & Ntozi, J. P. M. (2015). Has Uganda experienced any stalled fertility transitions? Reflecting on the last four decades (1973–2011). *Fertility Research and Practice, 1*(1), 14–23. https://doi.org/10.1186/s40738-015-0006-1

Kebede, E., Goujon, A., & Lutz, W. (2019). Stalls in Africa's fertility decline partly result from disruptions in female education. *Proceedings of the National Academy of Sciences*, *116*(8), 2891–2896. https://doi.org/10.1073/pnas.1717288116

Kirk, D., & Pillet, B. (1998). Levels, trends, and differentials in sub-Saharan Africa in the 1980s and 1990s. *Studies in Family Planning*, *29*(1), 1–22. https://doi.org/10.2307/172178

Laelago, T., Habtu, Y., & Yohannes, S. (2019). Proximate determinants of fertility in Ethiopia; an application of revised Bongaarts model. *Reproductive Health*, *16*(13), 1–9. https://doi.org/10.1186/s12978-019-0677-x

Lerch, M., & Spoorenberg, T. (2020). The emergence of birth limitation as a new stage in the fertility transition in sub-Saharan Africa. *Demographic Research*, *42*(30), 827–858. https://doi.org/10.4054/DemRes.2020.42.30

Lesthaeghe, R. (1989). *Reproduction and social organization in sub-Saharan Africa* (R. J. Lesthaeghe, Ed.; pp. 475–506). University of California Press. https://publishing.cdlib.org/ucpressebooks/view?docId=ft2m3nb1cw&chunk.id=d0e50582&toc.depth=1&toc.id=d0e50582&brand=ucpress

Lesthaeghe, R. (2014). *The fertility transition in sub-Saharan Africa into the 21st century* (Research report 14-823). Population Studies Center, University of Michigan.

Lewis, J. J. C., Ronsmans, C., Ezeh, A., & Gregson, S. (2004). The population impact of HIV on fertility in sub-Saharan Africa. *AIDS*, *18*(Suppl. 2), S35–S43. https://doi.org/10.1097/00002030-200406002-00005

Machiyama, K. (2010). *A re-examination of recent fertility declines in Sub-Saharan Africa. DHS Working Papaers No. 68*. ICF Macro. https://dhsprogram.com/pubs/pdf/WP68/WP68.pdf

Magadi, M. A., & Agwanda, A. O. (2010). Investigating the association between HIV/AIDS and recent fertility patterns in Kenya. *Social Science & Medicine*, *71*(2), 335–344. https://doi.org/10.1016/j.socscimed.2010.03.040

Mbamaonyeukwu, C. J. (2000). Signs of fertility transition in Nigeria. *African Population Studies*, *15*(1), 23–42.

McNicoll, G. (1992). Changing fertility patterns and policies in the Third World. *Annual Review of Sociology*, *18*, 85–108. https://doi.org/10.1146/annurev.so.18.080192.000505

Moultrie, T. A., Hosegood, V., McGrath, N., Hill, C., Herbst, K., & Newell, M.-L. (2008). Refining the criteria for stalled fertility declines: An application to rural KwaZulu-Natal, South Africa, 1990–2005. *Studies in Family Planning*, *39*(1), 39–48. https://doi.org/10.1111/j.1728-4465.2008.00149.x

Moultrie, T. A., Sayi, T. S., & Timaeus, I. M. (2012). Birth intervals, postponement, and fertility decline in Africa: A new type of transition? *Population Studies*, *66*(3), 241–258. https://doi.org/10.1080/00324728.2012.701660

Moultrie, T. A., & Timaeus, I. M. (2003). The South African fertility decline: Evidence from two censuses and a Demographic and Health Survey. *Population Studies*, *57*(3), 265–283. https://doi.org/10.1080/0032472032000137808

Mturi, A., & Joshua, K. (2011). Falling fertility and increase in use of contraception in Zimbabwe. *African Journal of Reproductive Health*, *15*(2), 31–44. https://doi.org/10.4314/ajrh.v15i2.69621

Muhwava, W. (2002). The onset of fertility transition in Zimbabwe: A re-analysis of censusand survey data using robust demographic techniques. *African Population Studies*, *17*(1), 1–17.

Muza, C. (2019). The fertility revolution in Zimbabwe with special regards to proximate determinants of fertility. *AUC Geographica*, *54*(2), 182–193. https://doi.org/10.14712/23361980.2019.16

Ndagurwa, P., & Odimegwu, C. (2019). Decomposition of Zimbabwe's stalled fertility change: A two-sex approach to estimating education and employment effects. *Journal of Population Research*, *36*, 35–63. https://doi.org/10.1007/s12546-019-09219-8

Ndahindwa, V., Kamanzi, C., Semakula, M., Abalikumwe, F., Hedt-Gauthier, B., & Thomson, D. R. (2014). Determinants of fertility in Rwanda in the context of a fertility transition: A secondary analysis of the 2010 Demographic and Health Survey. *Reproductive Health*, *11*, 87–95. https://doi.org/10.1186/1742-4755-11-87

Nzimande, N., & Mugwendere, T. (2018). Stalls in Zimbabwe fertility: Exploring determinants of recent fertility transition. *Southern African Journal of Demography*, *18*(1), 59–110. https://www.jstor.org/stable/e90022345

Odwe, G., Agwanda, A., & Khasakhala, A. (2015). *Trends in socio-economic differentials in fertility in Kenya. Paper presented at PAA 2015 Annual Meeting*. https://paa2015.princeton.edu/papers/152428

Onuoha, N. C., & Timaeus, I. M. (1995). Has a fertility transition begun in West Africa? *Journal of International Development*, *7*(1), 93–116. https://doi.org/10.1002/jid.3380070107

Ouadah-Bedidi, Z., Vallin, J., & Bouchoucha, I. (2012). Unexpected developments in Maghrebian fertility. *Population & Societies*, *486*, 1–4. https://www.ined.fr/en/publications/editions/population-and-societies/unexpected-developments-maghrebian-fertility/

Palamuleni, M. E. (2010). Fertility decline in Malawi: An analysis of the proximate determinants. *Journal of Social Development in Africa*, *25*(1), 1–8. https://doi.org/10.4314/jsda.v25i1.54277

Palamuleni, M. E. (2013). Estimates of fertility for South Africa based on Rele method, 1996-2011. *Journal of Human Ecology*, *43*(3), 257–265. https://doi.org/10.1080/09709274.2013.11906633

Palamuleni, M. E. (2017). Determinants of fertility decline in Namibia: An analysis of the Proximate Determinants. *Bangladesh E-Journal of Sociology*, *14*(2), 41–63. http://www.bangladeshsociology.org/Determinants14.2.pdf

Robinson, W. C., & Harbison, S. F. (1995). The fertility decline in Kenya. *Journal of International Development*, *7*(1), 81–92. https://doi.org/10.1002/jid.3380070106

Romaniuk, A. (2011). Persistence of high fertility in tropical Africa: The case of the Democratic Republic of the Congo. *Population and Development Review*, *37*(1), 1–28. https://doi.org/10.1111/j.1728-4457.2011.00388.x

Ross, J., Abel, E., & Abel, K. (2004). Plateaus during the rise of contraceptive prevalence. *International Family Planning Perspectives*, *30*(1), 39–44. https://www.guttmacher.org/journals/ipsrh/2004/03/plateaus-during-rise-contraceptive-prevalence

Rossier, C., & Corker, J. (2017). Contemporary use of traditional contraception in sub-Saharan Africa. *Population and Development Review*, *43*(Suppl. 1), 192–215. https://doi.org/10.1111/padr.12008

Sayi, T. S. (2016). *Stall fertility decline in Zimbabwe. Paper presented at PAA 2016 Annual Meeting*. https://uaps2015.princeton.edu/papers/151666

Sánchez-Páez, D. A., & Ortega, J. A. (2019). Reported patterns of pregnancy termination from Demographic and Health Surveys. *PLOS ONE*, *14*(8), e0221178. https://doi.org/10.1371/journal.pone.0221178

Sánchez-Páez, D. A., & Schoumaker, B. (2020). *The role of proximate determinants and ideal family size on fertility stalls in capital cities of sub-Saharan Africa. Paper presented at PAA 2020 Annual Meeting*.

Schoumaker, B. (2009). *Stalls in fertility transition in Sub-Saharan Africa: Real or spurious?* UCLouvain, Centre for Demographic Research. Working Paper No. 30. https://cdn.uclouvain.be/public/Exports%20reddot/demo/documents/DT_SPED_30_corrige.pdf

Schoumaker, B. (2019a). Male fertility around the world and over time: How different is it from female fertility? *Population and Development Review*, *45*(3), 459–487. https://doi.org/10.1111/padr.12273

Schoumaker, B. (2019b). Stalls in fertility transitions in sub-Saharan Africa: Revisiting the evidence. *Studies in Family Planning*, *50*(3), 257–278. https://doi.org/10.1111/sifp.12098

Schoumaker, B., & Sánchez-Páez, D. A. (2020). *Identifying fertility stalls by place of residence in sub-Saharan Africa. Paper presented at PAA 2020 Annual Meeting*.

Shapiro, D. (2010). Women's education and fertility transition in sub-Saharan Africa. *Vienna Yearbook of Population Research*, *10*(1), 9–30. https://doi.org/10.1553/populationyearbook2012s9

Shapiro, D. (2015). Accelerating fertility decline in sub-Saharan Africa. *Population Horizons*, *12*(1), 3–12. https://doi.org/10.1515/pophzn-2015-0002

Shapiro, D., & Gebreselassie, T. (2008). Fertility transition in sub-Saharan Africa: Falling and stalling. *African Population Studies, 23*(1), 3–23. https://doi.org/10.11564/23-1-310

Shapiro, D., & Hinde, A. (2017). On the pace of fertility decline in sub-Saharan Africa. *Demographic Research*, *37*(40), 1327–1338. https://doi.org/10.4054/DemRes.2017.37.40

Shapiro, D., Kreider, A., Varner, C., & Sinha, M. (2013). *Ralentissements, résistances et ruptures dans les transitions démographiques* (D. Tabutin & B. Masquelier, Eds.; pp. 47–64). Chaire

Quetelet 2010, Université Catholique de Louvain. https://pdfs.semanticscholar.org/2529/db4af2c4385d493f1a7bc93238c9402a93bc.pdf

Shapiro, D., & Tambashe, B. O. (2002). Fertility transition in urban and rural areas of sub-Saharan Africa: Preliminary evidence of a three-stage process. *Journal of Africa Policy Studies*, *8*(2), 103–127.

Shapiro, D., & Tenikue, M. (2017). Women's education, infant and child mortality, and fertility decline in rural and urban sub-Saharan Africa. *Demographic Research*, *37*(21), 669–708. https://doi.org/10.4054/DemRes.2017.37.21

Shemeikka, R., Notkola, V., & Siiskonen, H. (2005). Fertility decline in North-Central Namibia: An assessment of fertility in the period 1960-2000 based on parish registers. *Demographic Research*, *13*(4), 83–116. https://doi.org/10.4054/DemRes.2005.13.4

Shreffler, K. M., & Dodoo, N.-A. F. (2009). The role of intergenerational transfers, land, and education in fertility transition in rural Kenya: The case of Nyeri district. *Population and Environment*, *30*(3), 75–92. https://doi.org/10.1007/s11111-009-0077-1

Singh, S., Remez, L., Sedgh, G., Kwok, L., & Onda, T. (2018). *Abortion worldwide 2017: Uneven progress and unequal access*. Guttmacher Institute. https://www.guttmacher.org/sites/default/files/report_pdf/abortion-worldwide-2017.pdf

Sneeringer, S. E. (2009). *Fertility transition in sub-Saharan Africa: A comparative analysis of cohort trends in 30 countries. DHS Comparative Reports No. 23.* ICF Macro. https://dhsprogram.com/pubs/pdf/CR23/CR23.pdf

Spoorenberg, T., & Issaka Maga, H. (2018). Fertility compression in Niger: A study of fertility change by parity (1977–2011). *Demographic Research*, *39*(24), 685–700. https://doi.org/10.4054/DemRes.2018.39.24

Tabutin, D., & Schoumaker, B. (2004). The demography of sub-Saharan Africa from the 1950s to the 2000s. A survey of changes and a statistical assessment. *Population*, *59*(3/4), 457–519. https://doi.org/10.2307/3654914

Tabutin, D., & Schoumaker, B. (2020). The demography of sub-Saharan Africa in the 21st Century: Transformations since 2000, outlook to 2050. *Population*, *75*(2-3), 163–286. https://doi.org/10.3917/popu.2002.0167

Timaeus, I. M., & Moultrie, T. A. (2008). On postponement and birth intervals. *Population and Development Review*, *34*(3), 483–510. https://doi.org/10.1111/j.1728-4457.2008.00233.x

Timaeus, I. M., & Moultrie, T. A. (2013). Distinguishing the impact of postponement, spacing and stopping on birth intervals: Evidence from a model with heterogeneous fecundity. *Journal of Biosocial Science*, *45*(3), 311–330. https://doi.org/10.1017/S0021932012000648

Uchudi, J. M. (2001). Spouses' socioeconomic characteristics and fertility differences in sub-Saharan Africa: Does spouse's education matter? *Journal of Biosocial Sciences*, *33*(4), 481–502. https://doi.org/10.1017/s0021932001004813

United Nations. (2002). *Fertility levels and trends in countries with intermediate levels of fertility*. United Nations.

United Nations. (2020). *World Population Prospects*. United Nations, Department of Economic and Social Affairs. https://population.un.org/wpp/

Walle, E. van de, & Foster, A. D. (1990). *Fertility decline in Africa: Assessments and prospects. Technical paper No. WTP 125*. World Bank.

Westoff, C. F. (2013). The recent fertility transition in Rwanda. *Population and Development Review*, *38*(Suppl. 1), 169–178. https://doi.org/10.1111/j.1728-4457.2013.00558.x

Westoff, C. F., & Cross, A. R. (2006). *The stall in the fertility transition in Kenya. DHS Analytical Studies No. 9*. ORC Macro. http://dhsprogram.com/pubs/pdf/AS9/AS9.pdf

World Bank. (2020). *World Bank Open Data*. https://data.worldbank.org/

Annex table 1: Total fertility rate by country.

Country	1950-1955	1955-1960	1960-1965	1965-1970	1970-1975	1975-1980	1980-1985	1985-1990	1990-1995	1995-2000	2000-2005	2005-2010	2010-2015	2015-2020
Northern Africa														
Algeria	7.28	7.38	7.65	7.65	7.57	7.17	6.32	5.30	4.12	2.88	2.38	2.72	2.96	3.05
Egypt	6.75	6.75	6.65	6.45	6.00	5.70	5.49	5.00	4.15	3.60	3.15	3.02	3.45	3.33
Libya	7.14	7.20	7.30	7.99	8.10	7.67	6.68	5.71	4.21	3.20	2.64	2.50	2.45	2.25
Morocco	6.61	6.90	7.10	6.85	6.40	5.90	5.40	4.43	3.70	2.96	2.67	2.53	2.60	2.42
Sudan	6.65	6.65	6.75	6.86	6.90	6.92	6.63	6.30	6.00	5.65	5.30	5.00	4.75	4.43
Tunisia	6.65	6.85	6.99	6.92	6.38	5.65	4.82	4.00	2.98	2.34	2.04	2.02	2.25	2.20
Western Sahara	6.34	6.42	6.53	6.60	6.57	6.23	5.33	4.60	4.00	3.40	2.85	2.55	2.60	2.41
Eastern Africa														
Burundi	6.80	6.86	7.05	7.23	7.26	7.40	7.38	7.46	7.30	7.05	6.77	6.39	5.95	5.45
Comoros	6.00	6.60	6.91	7.05	7.05	7.05	7.05	6.70	6.10	5.60	5.20	4.90	4.60	4.24
Djibouti	6.31	6.39	6.55	6.71	6.84	6.64	6.45	6.18	5.85	4.81	4.21	3.55	3.10	2.76
Eritrea	6.96	6.96	6.82	6.70	6.62	6.62	6.70	6.60	6.30	5.60	5.10	4.80	4.35	4.10
Ethiopia	7.17	6.90	6.90	6.87	7.10	7.18	7.42	7.37	7.09	6.83	6.18	5.45	4.85	4.30
Kenya	7.48	7.79	8.06	8.11	7.99	7.64	7.22	6.54	5.65	5.35	5.00	4.65	4.06	3.52
Madagascar	7.30	7.30	7.30	7.30	7.20	6.95	6.50	6.25	6.10	5.80	5.28	4.83	4.40	4.11
Malawi	6.85	6.90	7.00	7.20	7.40	7.60	7.60	7.25	6.50	6.20	6.00	5.73	4.88	4.25
Mauritius	5.89	5.89	6.20	4.61	3.47	3.10	2.30	2.31	2.25	2.03	1.93	1.70	1.49	1.39
Mayotte	7.91	7.91	7.91	7.91	7.91	7.91	7.35	6.73	5.25	5.08	4.80	4.60	4.10	3.73
Mozambique	6.34	6.34	6.55	6.71	6.68	6.55	6.40	6.30	6.10	5.85	5.80	5.54	5.23	4.89
Réunion	6.93	6.57	6.56	5.67	3.88	3.12	2.78	2.71	2.40	2.33	2.44	2.40	2.40	2.27
Rwanda	8.00	8.15	8.20	8.20	8.28	8.43	8.38	7.80	6.55	5.90	5.40	4.85	4.25	4.10
Seychelles	5.00	5.00	5.59	5.92	5.38	4.27	3.51	2.94	2.57	2.18	2.20	2.30	2.38	2.46
Somalia	7.25	7.25	7.25	7.25	7.10	7.00	7.07	7.26	7.53	7.70	7.47	7.10	6.61	6.12
South Sudan	6.65	6.70	6.75	6.85	6.90	6.92	6.78	6.83	6.65	6.42	6.00	5.60	5.15	4.74
Tanzania	6.74	6.80	6.80	6.79	6.75	6.73	6.55	6.36	6.05	5.75	5.66	5.58	5.24	4.92
Uganda	6.90	6.95	7.05	7.12	7.10	7.10	7.10	7.10	7.06	6.95	6.75	6.38	5.78	5.01

Zambia	6.70	6.95	7.25	7.30	7.40	7.25	6.90	6.60	6.30	6.10	5.95	5.60	5.20	4.66
Zimbabwe	6.80	7.00	7.30	7.40	7.40	7.30	6.30	5.37	4.42	3.88	3.72	3.89	4.09	3.63
Middle Africa														
Angola	6.00	6.50	6.90	7.30	7.50	7.46	7.46	7.40	7.10	6.75	6.55	6.35	6.00	5.55
Cameroon	5.49	5.53	5.80	6.08	6.31	6.50	6.70	6.60	6.22	5.75	5.45	5.25	4.95	4.60
Central African Republic	5.52	5.75	5.90	5.95	5.95	5.90	5.90	5.90	5.70	5.55	5.45	5.30	5.10	4.75
Chad	6.10	6.20	6.30	6.40	6.67	6.87	7.04	7.21	7.39	7.41	7.24	6.85	6.31	5.80
Congo	5.68	5.79	5.99	6.19	6.30	6.25	5.80	5.30	5.00	4.90	4.85	4.80	4.70	4.45
DR Congo	5.98	5.98	6.04	6.15	6.29	6.46	6.60	6.71	6.77	6.77	6.72	6.63	6.40	5.96
Equatorial Guinea	5.67	5.65	5.67	5.79	5.80	5.79	5.89	5.98	5.97	5.94	5.69	5.40	4.99	4.55
Gabon	3.99	4.20	4.59	4.93	5.23	5.57	5.72	5.58	5.25	4.77	4.35	4.20	4.10	4.00
Sao Tome and Principe	6.20	6.20	6.30	6.40	6.52	6.50	6.24	5.96	5.68	5.30	5.08	4.85	4.60	4.35
Southern Africa														
Botswana	6.50	6.58	6.65	6.70	6.55	6.35	5.95	4.90	4.13	3.49	3.19	3.03	3.01	2.89
Eswatini	6.70	6.70	6.81	6.85	6.87	6.73	6.57	5.49	4.78	4.14	3.76	3.56	3.13	3.03
Lesotho	5.84	5.86	5.81	5.80	5.80	5.69	5.42	4.98	4.46	3.96	3.66	3.37	3.26	3.16
Namibia	6.00	6.10	6.20	6.30	6.60	6.46	6.20	5.55	4.89	4.26	3.60	3.61	3.62	3.42
South Africa	6.05	6.05	6.00	5.80	5.50	5.05	4.90	4.40	3.51	2.88	2.61	2.62	2.55	2.41
Western Africa														
Benin	5.86	6.13	6.42	6.65	6.83	7.00	7.01	6.88	6.56	6.16	5.78	5.49	5.22	4.87
Burkina Faso	6.10	6.24	6.35	6.56	6.70	7.02	7.17	7.07	6.93	6.73	6.43	6.08	5.65	5.23
Cabo Verde	6.57	6.76	6.97	6.97	6.86	6.62	6.10	5.63	5.05	3.94	3.23	2.71	2.50	2.29
Côte d'Ivoire	7.45	7.62	7.76	7.90	7.93	7.81	7.31	6.85	6.41	6.05	5.68	5.25	4.95	4.68
Gambia	6.35	6.30	6.20	6.20	6.20	6.40	6.30	6.15	6.05	5.95	5.80	5.65	5.50	5.25
Ghana	6.44	6.64	6.84	6.95	6.90	6.69	6.35	5.88	5.34	5.02	4.64	4.37	4.18	3.89
Guinea	6.00	6.07	6.15	6.21	6.29	6.45	6.59	6.63	6.51	6.24	5.91	5.54	5.13	4.74
Guinea-Bissau	5.90	5.90	5.95	6.00	6.10	6.25	6.70	6.68	6.50	6.05	5.60	5.20	4.90	4.51

Liberia	6.27	6.35	6.47	6.59	6.80	6.93	6.96	6.72	6.27	6.05	5.65	5.20	4.75	4.35
Mali	6.95	6.95	7.00	7.10	7.15	7.15	7.15	7.15	7.15	6.95	6.85	6.70	6.35	5.92
Mauritania	6.34	6.71	6.79	6.79	6.75	6.57	6.30	6.05	5.72	5.52	5.30	5.07	4.88	4.58
Niger	7.30	7.40	7.50	7.55	7.60	7.75	7.90	7.80	7.75	7.70	7.65	7.55	7.35	6.95
Nigeria	6.35	6.35	6.35	6.35	6.61	6.76	6.76	6.60	6.37	6.17	6.05	5.91	5.74	5.42
Senegal	6.80	6.90	7.10	7.25	7.25	7.25	7.25	6.70	6.20	5.70	5.25	5.10	5.00	4.65
Sierra Leone	6.03	6.03	6.25	6.41	6.57	6.65	6.72	6.72	6.69	6.48	6.11	5.57	4.84	4.32
Togo	6.33	6.42	6.65	6.94	7.20	7.28	7.06	6.50	5.90	5.54	5.31	5.04	4.69	4.35

Annex table 2: Literature review of studies on fertility transition 2000-2020.

Country	Stall period	Place of stall			No stall
		National	Urban	Rural	
Northern Africa					
Algeria	2000-2010	Ouadah-Bedidi, Vallin & Bouchoucha (2012)			United Nations (2002)
Egypt	1993-1998, 2006-2014	United Nations (2002), Eltigani (2003), Bongaarts (2008), El-Zeini (2008), Al Zalak & Goujon (2017)	Shapiro et al. (2013), Al Zalak & Goujon (2017)	Al Zalak & Goujon (2017)	Amin & Lloyd (2002), Bongaarts (2006)
Libya					United Nations (2002), Ouadah-Bedidi, Vallin & Bouchoucha (2012)
Morocco	1992-2004	Bongaarts (2008)			United Nations (2002), Bongaarts (2006), Ouadah-Bedidi, Vallin & Bouchoucha (2012), Shapiro et al. (2013)
Sudan					Garenne & Joseph (2002), United Nations (2002), Garenne (2008)
Tunisia	2000-2010	Ouadah-Bedidi, Vallin & Bouchoucha (2012)			United Nations (2002)
Western Africa					
Benin	2001-2006, 2012-2017				Capo-chichi & Juarez (2001), Garenne & Joseph (2002), Bongaarts (2006), Bongaarts (2008), Garenne (2008)
Burkina Faso	1993-1999, 2003-2010	Machiyama (2010), Johnson, Abderrahim & Rutstein (2011), Gebreselassie (2012), Shapiro et al. (2013),	Shapiro et al. (2013), Schoumaker & Sánchez-Páez (2020)[1]	Gebreselassie (2012)	Shapiro & Gebreselassie (2008), Schoumaker (2009), Sneeringer (2009), Shapiro (2010), Goujon, Lutz & KC (2015), Howse (2015), Shapiro

		Finlay, Mejía-Guevara & Akachi (2018)			& Tenikue (2017), Kebede, Goujon & Lutz (2019), Schoumaker (2019a)
Côte d'Ivoire	1994-2011	Howse (2015)		Shapiro & Tambashe (2002)	Garenne & Joseph (2002), Bongaarts (2006), Bongaarts (2008), Garenne (2008), Shapiro & Gebreselassie (2008), Schoumaker (2009), Sneeringer (2009), Shapiro (2010), Johnson, Abderrahim & Rutstein (2011), Gebreselassie (2012), Shapiro et al. (2013), Goujon, Lutz & KC (2015), Shapiro & Tenikue (2017), Finlay, Mejía-Guevara & Akachi (2018), Kebede, Goujon & Lutz (2019), Schoumaker (2019a), Schoumaker & Sánchez-Páez (2020)
Gambia	2004-2013	Bongaarts (2008), Howse (2015), Kebede, Goujon & Lutz (2019)		Shapiro et al. (2013), Shapiro & Tenikue (2017)	Garenne & Joseph (2002), Shapiro & Tambashe (2002), Guillaume (2003)[1], Bongaarts (2006), Garenne (2008), Shapiro & Gebreselassie (2008), Schoumaker (2009), Sneeringer (2009), Shapiro (2010), Gebreselassie (2012), Goujon, Lutz & KC (2015), Finlay, Mejía-Guevara & Akachi (2018), Schoumaker (2019a), Schoumaker & Sánchez-Páez (2020)
Ghana	1993-2004, 2008-2014	Goujon, Lutz & KC (2015)	Schoumaker & Sánchez-Páez (2020)[1]		
Guinea	1999-2012	Agyei-Mensah (2006), Bongaarts (2006), Bongaarts (2008), Garenne (2008), Shapiro & Gebreselassie (2008), Sneeringer (2009), Shapiro (2010), Garenne (2011),	Shapiro & Gebreselassie (2008), Shapiro et al. (2013), Schoumaker & Sánchez-Páez (2020)[2]	Shapiro & Gebreselassie (2008)	Garenne & Joseph (2002), Shapiro & Tambashe (2002), United Nations (2002), Derose & Ezeh (2005), Schoumaker (2009), Machiyama (2010), Johnson, Abderrahim & Rutstein (2011), Gebreselassie (2012), Goujon, Lutz & KC (2015), Howse (2015), Shapiro & Tenikue (2017), Finlay, Mejía-Guevara & Akachi

		Askew, Maggwa & Obare (2017)			(2018), Kebede, Goujon & Lutz (2019), Schoumaker (2019a)
Guinea-Bissau		Shapiro & Gebreselassie (2008), Gebreselassie (2012), Shapiro et al. (2013), Finlay, Mejía-Guevara & Akachi (2018)	Gebreselassie (2012), Shapiro et al. (2013), Schoumaker & Sánchez-Páez (2020)[1]	Shapiro & Gebreselassie (2008), Gebreselassie (2012), Shapiro et al. (2013)	Bongaarts (2008), Schoumaker (2009), Sneeringer (2009), Shapiro (2010), Goujon, Lutz & KC (2015), Howse (2015), Shapiro & Tenikue (2017), Kebede, Goujon & Lutz (2019), Schoumaker (2019a),
Liberia					Goujon, Lutz & KC (2015)
Mali	1987-2012	Shapiro et al. (2013), Goujon, Lutz & KC (2015)	Schoumaker & Sánchez-Páez (2020)[1]	Shapiro & Tambashe (2002)	Garenne & Joseph (2002), Bongaarts (2006), Bongaarts (2008), Garenne (2008), Shapiro & Gebreselassie (2008), Schoumaker (2009), Sneeringer (2009), Shapiro (2010), Gebreselassie (2012), Howse (2015), Shapiro & Tenikue (2017), Finlay, Mejía-Guevara & Akachi (2018), Schoumaker (2019a),
Niger	1992-2006	Shapiro & Tambashe (2002), Shapiro et al. (2013), Goujon, Lutz & KC (2015), Spoorenberg & Issaka Maga (2018), Kebede, Goujon & Lutz (2019)	Shapiro et al. (2013), Schoumaker & Sánchez-Páez (2020)[1]	Shapiro & Tambashe (2002), Shapiro & Tenikue (2017)	Garenne & Joseph (2002), Bongaarts (2006), Bongaarts (2008), Garenne (2008), Shapiro & Gebreselassie (2008), Schoumaker (2009), Sneeringer (2009), Shapiro (2010), Gebreselassie (2012), Howse (2015), Finlay, Mejía-Guevara & Akachi (2018), Schoumaker (2019a)
Nigeria	2003-2013	Bongaarts (2008), Garenne (2008), Garenne (2011), Gebreselassie (2012), Shapiro et al. (2013), Goujon, Lutz & KC (2015), Howse (2015), Kebede, Goujon & Lutz (2019)	Gebreselassie (2012), Schoumaker & Sánchez-Páez (2020)[1]	Shapiro et al. (2013)	Mbamaonyeukwu (2000), Garenne & Joseph (2002), Shapiro & Tambashe (2002), Bongaarts (2006), Shapiro & Gebreselassie (2008), Schoumaker (2009), Sneeringer (2009), Machiyama (2010), Shapiro (2010), Shapiro & Tenikue (2017), Finlay,

					Mejía-Guevara & Akachi (2018), Schoumaker (2019a)
Senegal	1997-2005, 2011-2016	Shapiro & Gebreselassie (2008), Shapiro (2010), Garenne (2011)	Shapiro & Gebreselassie (2008), Schoumaker & Sánchez-Páez (2020)[2]	Shapiro & Tambashe (2002), Shapiro & Gebreselassie (2008)	Garenne & Joseph (2002), Bongaarts (2006), Bongaarts (2008), Garenne (2008), Schoumaker (2009), Sneeringer (2009), Johnson, Abderrahim & Rutstein (2011), Gebreselassie (2012), Shapiro et al. (2013), Goujon, Lutz & KC (2015), Howse (2015), Shapiro & Tenikue (2017), Finlay, Mejía-Guevara & Akachi (2018), Schoumaker (2019a)
Sierra Leone					Goujon, Lutz & KC (2015), Schoumaker (2019a)
Togo	1998-2013		Schoumaker & Sánchez-Páez (2020)[2]		Garenne & Joseph (2002), Shapiro & Tambashe (2002), Bongaarts (2006), Garenne (2008), Shapiro & Gebreselassie (2008), Schoumaker (2009), Sneeringer (2009), Shapiro (2010), Gebreselassie (2012), Shapiro et al. (2013), Shapiro & Tenikue (2017), Schoumaker (2019a)
Middle Africa					
Cameroon	1998-2011	Bongaarts (2008), Shapiro & Gebreselassie (2008), Shapiro (2010), Johnson, Abderrahim & Rutstein (2011), Gebreselassie (2012), Shapiro et al. (2013), Howse (2015), Shapiro & Tenikue (2017), Finlay, Mejía-Guevara & Akachi (2018), Kebede, Goujon & Lutz (2019), Schoumaker (2019a)	Shapiro & Gebreselassie (2008), Gebreselassie (2012), Shapiro et al. (2013), Schoumaker & Sánchez-Páez (2020)[1]	Shapiro & Gebreselassie (2008), Gebreselassie (2012), Shapiro et al. (2013), Shapiro & Tenikue (2017),	Garenne & Joseph (2002), Shapiro & Tambashe (2002), Bongaarts (2006), Garenne (2008), Schoumaker (2009), Sneeringer (2009), Machiyama (2010), Goujon, Lutz & KC (2015)

Central African Republic					Garenne & Joseph (2002), Garenne (2008), Sneeringer (2009), Goujon, Lutz & KC (2015), Schoumaker & Sánchez-Páez (2020)
Chad	2004-2015			Shapiro et al. (2013), Shapiro & Tenikue (2017)	Garenne & Joseph (2002), Bongaarts (2008), Garenne (2008), Shapiro & Gebreselassie (2008), Schoumaker (2009), Sneeringer (2009), Shapiro (2010), Gebreselassie (2012), Goujon, Lutz & KC (2015), Howse (2015), Schoumaker (2019a), Schoumaker & Sánchez-Páez (2020)
Congo	2005-2011	Sneeringer (2009), Goujon, Lutz & KC (2015), Shapiro & Tenikue (2017), Kebede, Goujon & Lutz (2019), Schoumaker (2019a)	Shapiro & Tenikue (2017), Schoumaker & Sánchez-Páez (2020)[2]	Shapiro & Tenikue (2017)	
D.R. Congo	2007-2013	Romaniuk (2011), Shapiro & Tenikue (2017), Kebede, Goujon & Lutz (2019)	Shapiro & Tenikue (2017), Schoumaker & Sánchez-Páez (2020)[1]	Shapiro & Tenikue (2017)	Goujon, Lutz & KC (2015), Schoumaker (2019a)
Equatorial Guinea					Goujon, Lutz & KC (2015)
Gabon	2000-2012	Howse (2015), Shapiro & Tenikue (2017)	Shapiro & Tenikue (2017), Schoumaker & Sánchez-Páez (2020)[2]	Shapiro & Tenikue (2017)	Sneeringer (2009), Goujon, Lutz & KC (2015), Kebede, Goujon & Lutz (2019), Schoumaker (2019a)
Eastern Africa					

Burundi	1980-2010		Schoumaker & Sánchez-Páez (2020)[2]		Sneeringer (2009), Goujon, Lutz & KC (2015), Howse (2015), Shapiro & Tenikue (2017), Schoumaker (2019a)
Comoros					Garenne & Joseph (2002), Garenne (2008), Sneeringer (2009), Shapiro & Tenikue (2017), Schoumaker (2019a), Schoumaker & Sánchez-Páez (2020)
Eritrea					Shapiro & Gebreselassie (2008), Schoumaker (2009), Shapiro (2010), Gebreselassie (2012), Shapiro et al. (2013), Howse (2015)
Ethiopia	2000-2005, 2011-2016	Bongaarts (2008)	Schoumaker & Sánchez-Páez (2020)[1]	Shapiro et al. (2013)	Gurmu & Mace (2008)[1], Shapiro & Gebreselassie (2008), Schoumaker (2009), Shapiro (2010), Gebreselassie (2012), Goujon, Lutz & KC (2015), Howse (2015), Shapiro & Tenikue (2017), Finlay, Mejía-Guevara & Akachi (2018), Kebede, Goujon & Lutz (2019), Laelago, Habtu & Yohannes (2019), Schoumaker (2019a)
Kenya	1998-2003	Bongaarts (2006), Westoff & Cross (2006), Bongaarts (2008), Garenne (2008), Shapiro & Gebreselassie (2008), Ezeh, Mberu & Emina (2009), Schoumaker (2009), Sneeringer (2009), Machiyama (2010), Shapiro (2010), Garenne (2011), Johnson, Abderrahim & Rutstein (2011), Shapiro et al. (2013)Goujon, Lutz & KC (2015), Howse (2015), Odwe, Agwanda & Khasakhala (2015), Askew, Maggwa & Obare (2017),	Shapiro & Gebreselassie (2008), Odwe, Agwanda & Khasakhala (2015), Schoumaker & Sánchez-Páez (2020)[2]	Shapiro & Gebreselassie (2008), Odwe, Agwanda & Khasakhala (2015)	Garenne & Joseph (2002), Shapiro & Tambashe (2002), United Nations (2002), Blacker et al. (2005), Gebreselassie (2012)

		Shapiro & Tenikue (2017), Finlay, Mejía-Guevara & Akachi (2018), Kebede, Goujon & Lutz (2019), Schoumaker (2019a)			
Madagascar	1992-1997	Sneeringer (2009), Garenne (2011)	Garenne (2008)		Garenne & Joseph (2002), Bongaarts (2006), Bongaarts (2008), Shapiro & Gebreselassie (2008), Schoumaker (2009), Shapiro (2010), Johnson, Abderrahim & Rutstein (2011), Gebreselassie (2012), Shapiro et al. (2013), Howse (2015), Shapiro & Tenikue (2017), Finlay, Mejía-Guevara & Akachi (2018), Schoumaker (2019a), Schoumaker & Sánchez-Páez (2020)
Malawi	2004-2010	Finlay, Mejía-Guevara & Akachi (2018)			Garenne & Joseph (2002), Shapiro & Tambashe (2002), Bongaarts (2006), Bongaarts (2008), Garenne (2008), Shapiro & Gebreselassie (2008), Schoumaker (2009), Sneeringer (2009), Palamuleni (2010), Shapiro (2010), Johnson, Abderrahim & Rutstein (2011), Gebreselassie (2012), Shapiro et al. (2013), Goujon, Lutz & KC (2015), Howse (2015), Shapiro & Tenikue (2017), Kebede, Goujon & Lutz (2019), Schoumaker (2019a), Schoumaker & Sánchez-Páez (2020)
Mozambique	1997-2011	Bongaarts (2008), Shapiro & Gebreselassie (2008), Shapiro (2010), Gebreselassie (2012), Shapiro et al. (2013), Goujon, Lutz & KC (2015), Howse (2015), Finlay,	Gebreselassie (2012)	Shapiro & Gebreselassie (2008), Shapiro et al. (2013)	Garenne & Joseph (2002), Arnaldo (2004), Bongaarts (2006), Garenne (2008), Schoumaker (2009), Sneeringer (2009), Shapiro & Tenikue (2017), Schoumaker (2019a), Schoumaker & Sánchez-Páez (2020)

		Mejía-Guevara & Akachi (2018)			
Rwanda	2000-2005	Bongaarts (2008), Shapiro & Gebreselassie (2008), Schoumaker (2009), Sneeringer (2009), Machiyama (2010), Shapiro (2010), Garenne (2011), Johnson, Abderrahim & Rutstein (2011), Gebreselassie (2012), Westoff (2013)	Gebreselassie (2012), Shapiro et al. (2013)	Garenne (2008), Shapiro & Gebreselassie (2008)	Garenne & Joseph (2002), Bongaarts (2006), Ndahindwa et al. (2014), Goujon, Lutz & KC (2015), Howse (2015), Shapiro & Tenikue (2017), Finlay, Mejía-Guevara & Akachi (2018), Schoumaker (2019a), Schoumaker & Sánchez-Páez (2020)
Somalia					Goujon, Lutz & KC (2015)
Tanzania	1996-2010	Bongaarts (2008), Shapiro & Gebreselassie (2008), Ezeh, Mberu & Emina (2009), Sneeringer (2009), Shapiro (2010), Garenne (2011), Johnson, Abderrahim & Rutstein (2011), Shapiro et al. (2013), Goujon, Lutz & KC (2015), Howse (2015), Finlay, Mejía-Guevara & Akachi (2018), Kebede, Goujon & Lutz (2019)	Shapiro & Gebreselassie (2008), Shapiro et al. (2013), Schoumaker & Sánchez-Páez (2020)[1]	Shapiro & Tambashe (2002), Garenne (2008), Shapiro & Gebreselassie (2008), Shapiro et al. (2013)	Garenne & Joseph (2002), Bongaarts (2006), Schoumaker (2009), Machiyama (2010), Gebreselassie (2012), Shapiro & Tenikue (2017), Schoumaker (2019a)
Uganda	1995-2006	Bongaarts (2008), Finlay, Mejía-Guevara & Akachi (2018)	Shapiro et al. (2013), Schoumaker & Sánchez-Páez (2020)[1]		Garenne & Joseph (2002), Shapiro & Tambashe (2002), Blacker et al. (2005), Bongaarts (2006), Garenne (2008), Shapiro & Gebreselassie (2008), Ezeh, Mberu & Emina (2009), Schoumaker (2009), Sneeringer (2009), Machiyama (2010), Shapiro (2010), Gebreselassie (2012), Goujon, Lutz & KC (2015), Howse (2015), Kabagenyi et al. (2015), Shapiro &

					Tenikue (2017), Kebede, Goujon & Lutz (2019), Schoumaker (2019a)
Zambia	1996-2007	Bongaarts (2008), Machiyama (2010), Garenne (2011), Johnson, Abderrahim & Rutstein (2011), Gebreselassie (2012), Shapiro et al. (2013), Goujon, Lutz & KC (2015), Howse (2015), Finlay, Mejía-Guevara & Akachi (2018), Kebede, Goujon & Lutz (2019), Schoumaker (2019a)	Shapiro et al. (2013), Schoumaker & Sánchez-Páez (2020)[1]	Gebreselassie (2012), Shapiro et al. (2013), Shapiro & Tenikue (2017)	Garenne & Joseph (2002), Shapiro & Tambashe (2002), Bongaarts (2006), Garenne (2008), Shapiro & Gebreselassie (2008), Schoumaker (2009), Sneeringer (2009), Shapiro (2010),
Zimbabwe	1999-2015	Bongaarts (2008), Ezeh, Mberu & Emina (2009), Goujon, Lutz & KC (2015), Howse (2015), Sayi (2016), Nzimande & Mugwendere (2018), Kebede, Goujon & Lutz (2019), Muza (2019), Ndagurwa & Odimegwu (2019), Schoumaker (2019a)	Nzimande & Mugwendere (2018), Schoumaker & Sánchez-Páez (2020)[2]	Shapiro et al. (2013), Nzimande & Mugwendere (2018), Schoumaker & Sánchez-Páez (2020)	Garenne & Joseph (2002), Muhwava (2002), Shapiro & Tambashe (2002), Bongaarts (2006), Garenne (2008), Shapiro & Gebreselassie (2008), Schoumaker (2009), Sneeringer (2009), Shapiro (2010), Johnson, Abderrahim & Rutstein (2011), Mturi & Joshua (2011), Gebreselassie (2012), Shapiro & Tenikue (2017), Finlay, Mejía-Guevara & Akachi (2018)
Southern Africa					
Botswana					Garenne & Joseph (2002), United Nations (2002), Garenne (2008)
Eswatini					Goujon, Lutz & KC (2015), Chemhaka et al. (2016), Chemhaka & Odimegwu (2019)
Lesotho	2009-2014		Shapiro & Tenikue (2017), Schoumaker		Garenne & Joseph (2002), United Nations (2002), Garenne (2008), Sneeringer (2009), Howse (2015), Schoumaker (2019a)

			& Sánchez-Páez (2020)[2]		
Namibia	2007-2013	Palamuleni (2017), Schoumaker (2019a)	Schoumaker & Sánchez-Páez (2020)[2]	Schoumaker & Sánchez-Páez (2020)	Garenne & Joseph (2002), Bongaarts (2008), Garenne (2008), Shapiro & Gebreselassie (2008), Schoumaker (2009), Sneeringer (2009), Shapiro (2010), Johnson, Abderrahim & Rutstein (2011), Gebreselassie (2012), Indongo & Pazvakawambwa (2012), Shapiro et al. (2013), Howse (2015); Shapiro & Tenikue (2017); Finlay, Mejía-Guevara & Akachi (2018)
South Africa	1990-2013	Palamuleni (2013), Houle et al (2016)		Moultrie et al. (2008), Ibisomi et al. (2014)	Garenne & Joseph (2002), United Nations (2002), Moultrie & Timaeus (2003), Garenne et al. (2007), Garenne (2008), Sneeringer (2009), Burger, Burger & Rossouw (2012), Shapiro et al. (2013), Schoumaker (2019a), Schoumaker & Sánchez-Páez (2020)

Note:
[1] Only the capital city.
[2] In both, the capital city and other urban areas.

Annex table 3: Studies analyzing fertility dynamics in stall periods 2000-2020.

Country	Period	Marriage		Contraception		Postpartum insusceptibility		Abortion		Desired family size	
		Accounting for stalls	Not accounting for stalls	Accounting for stalls	Not accounting for stalls	Accounting for stalls	Not accounting for stalls	Accounting for stalls	Not accounting for stalls	Accounting for stalls	Not accounting for stalls
Algeria	2000-2010	Ouadah-Bedidi, Vallin & Bouchoucha (2012)			Ouadah-Bedidi, Vallin & Bouchoucha (2012)					Ouadah-Bedidi, Vallin & Bouchoucha (2012)	
Benin	2001-2006, 2012-2017		Finlay, Mejía-Guevara & Akachi (2018)		Johnson, Abderrahim & Rutstein (2011)						
Cameroon	1998-2011		Finlay, Mejía-Guevara & Akachi (2018)	Jadhav & Short Fabic (2019)	Johnson, Abderrahim & Rutstein (2011); Shapiro & Gebreselassie (2008)	Finlay, Mejía-Guevara & Akachi (2018)					
D.R. Congo	2007-2013			Romaniuk (2011); Jadhav & Short Fabic (2019)		Romaniuk (2011)					
Egypt	1993-1998, 2006-2014		Eltigani (2003)		Al Zalak & Goujon (2017); Eltigani (2003); United Nations (2002)	Al Zalak & Goujon (2017)				Eltigani (2003); El-Zeini (2008); Al Zalak & Goujon (2017)	

Ghana	1993-2004, 2008-2014		Bongaarts (2006); Garenne (2008)	Agyei-Mensah (2006); Bongaarts (2006); Askew, Maggwa & Obare (2017); Jadhav & Short Fabic (2019)	Askew, Maggwa & Obare (2017); Shapiro & Gebreselassie (2008); Garenne (2008)	Agyei-Mensah (2006); Agyei-Mensah & Owoo (2015)			Agyei-Mensah (2006); Bongaarts (2006); Askew, Maggwa & Obare (2017)
Guinea	1999-2012		Finlay, Mejía-Guevara & Akachi (2018)		Shapiro & Gebreselassie (2008)	Finlay, Mejía-Guevara & Akachi (2018)			
Kenya	1998-2003		Bongaarts (2006); Garenne (2008); Ezeh, Mberu & Emina (2009); Finlay, Mejía-Guevara & Akachi (2018)	Askew, Maggwa & Obare (2017); Bongaarts (2006); Ezeh, Mberu & Emina (2009); Garenne (2008); Westoff & Cross (2006)	Shapiro & Gebreselassie (2008)	Finlay, Mejía-Guevara & Akachi (2018)			Bongaarts (2006); Westoff & Cross (2006); Askew, Maggwa & Obare (2017)
Madagascar	1992-1997		Garenne (2008)		Garenne (2008)				
Malawi	2004-2010		Finlay, Mejía-Guevara & Akachi (2018)			Finlay, Mejía-Guevara & Akachi (2018)			

Mozambique	1997-2011		Finlay, Mejía-Guevara & Akachi (2018)	Jadhav & Short Fabic (2019)	Shapiro & Gebreselassie (2008)	Finlay, Mejía-Guevara & Akachi (2018)				
Namibia	2007-2013		Indongo & Pazvakawambwa (2012)	Jadhav & Short Fabic (2019); Palamuleni (2017)		Palamuleni (2017)				
Niger	1992-2006			Jadhav & Short Fabic (2019)						
Nigeria	2003-2013		Finlay, Mejía-Guevara & Akachi (2018)	Garenne (2008)		Finlay, Mejía-Guevara & Akachi (2018)				
Rwanda	2000-2005		Garenne (2008)	Garenne (2008)	Johnson, Abderrahim & Rutstein (2011); Shapiro & Gebreselassie (2008); Westoff (2013)			Westoff (2013)		Westoff (2013)
Senegal	1997-2005, 2011-2016				Shapiro & Gebreselassie (2008)					
South Africa	1990-2013				Moultrie et al. (2008)					
Tanzania	1996-2010		Garenne (2008); Ezeh, Mberu & Emina (2009); Finlay, Mejía-		Garenne (2008); Ezeh, Mberu & Emina (2009);					

			Guevara & Akachi (2018)		Johnson, Abderrahim & Rutstein (2011)				
Tunisia	2000-2010	Ouadah-Bedidi, Vallin & Bouchoucha (2012)		Ouadah-Bedidi, Vallin & Bouchoucha (2012)					Ouadah-Bedidi, Vallin & Bouchoucha (2012)
Uganda	1995-2006		Finlay, Mejía-Guevara & Akachi (2018)	Ezeh, Mberu & Emina (2009)		Finlay, Mejía-Guevara & Akachi (2018)			
Zambia	1996-2007	Chola & Michelo (2016)	Finlay, Mejía-Guevara & Akachi (2018)		Johnson, Abderrahim & Rutstein (2011)	Finlay, Mejía-Guevara & Akachi (2018)			
Zimbabwe	1999-2015		Ezeh, Mberu & Emina (2009); Nzimande & Mugwendere (2018); Sayi (2016)	Nzimande & Mugwendere (2018); Sayi (2016)	Ezeh, Mberu & Emina (2009); Muza (2019)	Muza (2019)			Sayi (2016); Nzimande & Mugwendere (2018); Ndagurwa & Odimegwu (2019)

Annex table 4: Studies analyzing the potential causes of fertility stalls 2000-2020.

Country	Period	Education		Employment		Under-5 mortality		HIV		FP programs		Wealth	
		Accounting for stalls	Not accounting for stalls	Accounting for stalls	Not accounting for stalls	Accounting for stalls	Not accounting for stalls	Accounting for stalls	Not accounting for stalls	Accounting for stalls	Not accounting for stalls	Accounting for stalls	Not accounting for stalls
Algeria	2000-2010		Al Zalak & Goujon (2017); Ouadah-Bedidi, Vallin & Bouchoucha (2012)										
Cameroon	1998-2011	Kebede, Goujon & Lutz (2019)					Shapiro & Tenikue (2017)						
Chad	2004-2015						Shapiro & Tenikue (2017)						
Congo	2005-2011	Kebede, Goujon & Lutz (2019); Goujon, Lutz & KC (2015)					Shapiro & Tenikue (2017)						
Côte d'Ivoire	1994-2011	Kebede, Goujon & Lutz (2019)					Shapiro & Tenikue (2017)						
D.R. Congo	2007-2013	Kebede, Goujon & Lutz (2019); Romaniuk (2011)					Shapiro & Tenikue (2017)			Romaniuk (2011)			

Egypt	1993-1998, 2006-2014		Al Zalak & Goujon (2017); Ouadah-Bedidi, Vallin & Bouchoucha (2012)	Al Zalak & Goujon (2017)								Eltigani (2003)	
Gabon	2000-2012						Shapiro & Tenikue (2017)						
Gambia	2004-2013	Goujon, Lutz & KC (2015)											
Ghana	1993-2004, 2008-2014	Agyei-Mensah (2006); Bongaarts (2006)	Askew, Maggwa & Obare (2017)		Garenne (2008)	Agyei-Mensah (2006); Bongaarts (2006); Garenne (2008)			Agyei-Mensah (2006)		Bongaarts (2006)		Askew, Maggwa & Obare (2017); Bongaarts (2006); Garenne (2008)
Kenya	1998-2003	Askew, Maggwa & Obare (2017); Bongaarts (2006); Ezeh, Mberu & Emina (2009); Goujon, Lutz & KC (2015); Kebede, Goujon & Lutz (2019); Odwe, Agwanda			Ezeh, Mberu & Emina (2009); Garenne (2008)	Bongaarts (2006); Garenne (2008); Gebreselassie (2012); Westoff & Cross (2006)		Magadi & Agwanda (2010); Westoff & Cross (2006)		Westoff & Cross (2006)		Askew, Maggwa & Obare (2017); Bongaarts (2006); Garenne (2008)	Ezeh, Mberu & Emina (2009)

		& Khasakhala (2015)							
Lesotho	2009-2014					Shapiro & Tenikue (2017)			
Madagascar	1992-1997			Garenne (2008)		Garenne (2008)		Garenne (2008)	
Mali	1987-2012	Goujon, Lutz & KC (2015)							
Mozambique	1997-2011	Goujon, Lutz & KC (2015)							
Niger	1992-2006	Kebede, Goujon & Lutz (2019); Goujon, Lutz & KC (2015)				Shapiro & Tenikue (2017)			
Nigeria	2003-2013	Kebede, Goujon & Lutz (2019); Goujon, Lutz & KC (2015)	Garenne (2008)			Garenne (2008)		Garenne (2008)	
Rwanda	2000-2005		Garenne (2008)		Garenne (2008); Westoff (2013)	Gebreselassie (2012)			Garenne (2008); Westoff (2013)
South Africa	1990-2013						Houle et al. (2016); Garenne et al. (2007); Moultrie et al. (2008)		

Tanzania	1996-2010	Ezeh, Mberu & Emina (2009); Goujon, Lutz & KC (2015); Kebede, Goujon & Lutz (2019)			Ezeh, Mberu & Emina (2009); Garenne (2008)		Garenne (2008)					Garenne (2008)	Ezeh, Mberu & Emina (2009)
Tunisia	2000-2010		Al Zalak & Goujon (2017); Ouadah-Bedidi, Vallin & Bouchoucha (2012)										
Uganda	1995-2006				Ezeh, Mberu & Emina (2009)								Ezeh, Mberu & Emina (2009)
Zambia	1996-2007	Kebede, Goujon & Lutz (2019); Goujon, Lutz & KC (2015)					Shapiro & Tenikue (2017)						
Zimbabwe	1999-2015	Ezeh, Mberu & Emina (2009); Goujon, Lutz & KC (2015); Kebede, Goujon & Lutz (2019)	Ndagurwa & Odimegwu (2019)		Ezeh, Mberu & Emina (2009); Muza (2019); Ndagurwa & Odimegwu (2019)	Gebreselassie (2012)							Ezeh, Mberu & Emina (2009); Muza (2019)