Chapter 2
Country Fertility Transition Patterns

2.1 Introduction

Unlike Chap. 1 where we described the fertility transition of the entire developing world, throughout this and the following chapters the focus is on the transition experience of individual countries. Policy decisions and program implementation strategies are country-specific. Each country has a special set of economic, political, social and cultural conditions that influence fertility and related policies. A country focus is also necessary to answer some of the most debated questions such as which socio-economic variable is the most important driver of the fertility transition? And what is the fertility impact of family planning programs? (These questions will be taken up in later chapters.)

A quick glance at Fig. 2.1 shows that from the country perspective, there has been a great variety of fertility transition patterns over the past seven decades: many countries have completed their transitions whether fast or slow, the majority have yet to complete their transitions, and a few have hardly begun their transitions. In addition, several countries have experienced a "stall" in their transitions, and it is still unclear whether completion is in their near-term futures. Each country's fertility transition is the result of a different mix of fertility decline drivers (Fig. 1.4), and each hold particular policy lessons.

When summarizing the fertility transition experiences in major world regions, we rely on unweighted averages for various indicators of the fertility transition. Using this measure gives each country's fertility experience equal importance, and allows us to better understand how differing experiences, policies and programs affect the course of fertility declines. With this focus, Niger's fertility decline story is as important as that of India, even though Niger's 2020 population is 24 million while India's is 1.4 billion. In Chap. 1 our focus was on understanding how individuals in the developing world, not countries, experienced the fertility transition. This is why some of the findings in this chapter seem to tell a somewhat different story than those presented in Chap. 1. For example, in Chap. 1 we reported that the developing world's
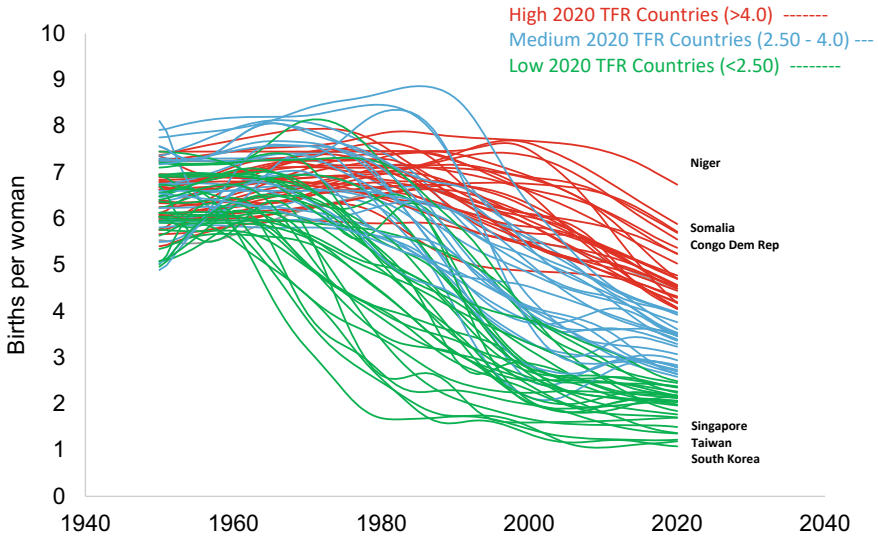
Fig. 2.1 Country fertility trends 1950–2020 (UN Population Division, 2019)

recent TFR was 2.6 (Fig. 1.1), meaning that the average woman in the developing world is having 2.6 live births. In this chapter we report that the average TFR for the developing countries examined is 3.2 in 2020 (Table 2.1), meaning that the average country in the developing world had a TFR of 3.2. The fact that the largest countries in the developing world (e.g., China, India, Indonesia and Brazil) have reached replacement pulls the weighted average below the unweighted average. Each country's fertility transition is an equal source of insight about the drivers of fertility trends, but the number of people being affected by each transition varies greatly. The terms "developing world", "Sub-Saharan Africa" (or "SS Africa"), "Asia/N.Africa" and "Latin America" are used below to refer to "countries in the developing world", "countries in sub-Saharan Africa, "countries in Asia/N.Africa" and "countries in Latin America and Caribbean."[1]

After a summary of the data, the remainder of this chapter consists of three parts: a description of levels and trends in fertility in countries in the developing world between 1950 and 2020; an examination of each of the transition phases, including pre-transitional fertility, the timing of the onset, the pace of fertility decline, the timing of the transition end and post-transitional fertility; and a discussion of countries experiencing a "stall" in their fertility transition.

---

[1] Asia and North Africa are combined in this chapter's country analyses because North African countries' transitions are similar to those of Asian countries, and very different from those in sub-Saharan African countries. In addition, the number of North African countries (5) is too small to constitute a separate region.

2.2 Data

The main source of country level fertility estimates is a databank maintained by the United Nations Population Division (2019). This source provides both 5-year and 1-year estimates of the total fertility rates (TFR) for each country from 1950 to 2020. In Chap. 1 we used the 5-year data. In this chapter we are using the 1-year estimates that are derived by smoothing the 5-year averages. This smoothing sometimes obscures sudden changes in trends and makes the UN data less suitable for the examination of anomalous fertility trends. We therefore rely on TFR estimates from Demographic and Health Surveys (DHS) conducted in many developing countries since the late 1980s to discuss stalls in fertility transitions (ICP, 2021).

Our analysis of fertility transitions in the developing world over the past seventy years focuses on the following 97 countries:

Sub-Saharan Africa: Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Central African Republic, Chad, Congo, Cote d'Ivoire, Congo Democratic Republic, Eritrea, Ethiopia, Ghana, Guinea, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mozambique, Namibia, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, Somalia, South Africa, South Sudan, Sudan, Togo, Uganda, Tanzania, Zambia, Zimbabwe.

Asia/North Africa: Afghanistan, Algeria, Azerbaijan, Bangladesh, Cambodia, China, Taiwan, Egypt, India, Indonesia, Iran, Iraq, Jordan, Kuwait, Laos, Lebanon, Libya, Malaysia, Mauritius, Mongolia, Morocco, Myanmar, Nepal, Oman, Pakistan, Papua New Guinea, Philippines, Republic of Korea, Saudi Arabia, Singapore, Sri Lanka, Palestine, Syria, Tajikistan, Thailand, Tunisia, Turkey, Turkmenistan, United Arab Emirates, Uzbekistan, Viet-Nam, Yemen.

Latin America: Bolivia, Brazil, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Haiti, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Trinidad and Tobago, Venezuela.

These 97 countries are selected from the larger set of all developing countries based on the following criteria:

– Population size is above 1 million in 1990. The smallest countries are excluded for several reasons. The quality of demographic statistics tends to be better in larger countries. Smaller countries also often have high migration rates which affect fertility behavior. This criterion means that unweighted regional averages of variables are somewhat more representative of regions.
– Country is pre-transitional in the mid-1950s. This condition is used because we are interested in examining the onsets of transitions. For present purposes a developing country is considered to have entered the transition before the mid-1950s if the total fertility rate in 1955 had dropped below 5.0 births per woman. (The year 1955 is selected rather than 1950 because the early 1950s showed significant fluctuations in fertility, presumably due to the aftermath of World War II).

2.3   Fertility Trends

Figure 2.1 plots UN estimates of the total fertility rates from 1950 to 2020 for the 97 developing countries. Substantial variation in trajectories is evident with Singapore being the first country to enter the transition and Niger the last. The countries have been grouped by the TFR in 2020: High (above 4, red lines), Medium (between 2.5 and 4, blue lines) and Low (below 2.5, green lines). See Appendix Table for 2020 fertility estimates of all countries.

Despite the large country differences there are also common patterns. Fertility is high in the 1950s, as countries continue in their pre-transitional phase which prevailed for most of human history. This phase ends with the onset of the transition, the timing of which varies widely among countries. Once under way, the transition generally continues, and fertility keeps declining. In about two-fifths of countries a new and much lower equilibrium is attained around replacement level before 2020, indicating the arrival in the post-transitional phase. However, in a majority of countries the transition did not end before 2020 and their future fertility trajectories are uncertain. Differences between transition patterns of countries therefore result from variations in the pre-transitional level of fertility, the timing of the onset, the pace of decline, the timing of the transition end and the level of post-transitional fertility.

2.4   Transition Phases

To obtain a better understanding of transition patterns we will examine each element of the transition in more detail.

2.4.1   Pre-transition Fertility

For present purposes we take the highest TFR observed before the transition onset to be the pre-transitional total fertility rate (TFR_p).[2] The second column of Table 2.1 presents the average values of TFR_p for all countries as well as for the countries in each region. The average TFR_p equaled 6.9 births per woman with little variation by region: SS Africa 7.1, Asia/N.Africa 6.8 and Latin America 6.7. However, at the country level TFR_p varies substantially from 8.9 in Yemen to 5.3 in Trinidad and Tobago.

---

[2] The peak TFR is easily calculated in almost all countries because there is only one peak. However, in a few countries pre-transitional fertility fluctuated, and more than one peak may occur before the transition onset. The highest peak is selected unless a secondary peak occurs less than 10% below the earlier peak.

Table 2.1 Estimates of unweighted transition indicators by region

	Pre-transition TFR$_p$	Onset year	Onset TFR	Pace of decline (%)	TFR 2020	Post-transition TFR[1]
All countries	6.9	1979	6.6	19	3.2	2.0
SS Africa	7.1	1990	6.7	13	4.4	2.4[2]
Asia/N.Africa	6.8	1974	6.5	24	2.4	1.9
Latin America	6.7	1968	6.3	20	2.2	2.1
Asia/NA + L.America	6.8	1972	6.5	23	2.3	2.0
Africa effect[3]	0.3*	17****	0.3*	−10****	2.1***	

(1) Estimates are based only on the 41 countries that have reached the end of the transition; (2) Only one country, South Africa; (3) The Africa effect equals the difference between estimates for SS.Africa and Asia/NA + L.America

2.4.2 Onset of Transition

The conventional method for estimating the onset of fertility transitions was developed by Coale and Treadway (1986). They identified the onset as the year in which fertility has dropped 10% below its pre-transitional level. This method is still widely used, but Bryant (2007) and Casterline (2001) point out that the year of onset as measured by this approach occurs sometimes several years after fertility has begun declining. To address this issue at least in part, we rely on a revised procedure proposed by Bongaarts (2002), who changed the threshold from 10 to 5%. That is, the onset of the transition is estimated to occur in the year in which the TFR drops 5% below the pre-transitional fertility.[3]

This method yields years of onset for all 97 countries. Figure 2.2 plots the fertility at the onset of the transition (TFR$_o$) by the year of the transition onset (Y$_o$).

The average onset year for all 97 countries is 1979 and the average TFR$_o$ is 6.6 births per woman. Regional estimates are presented in the third and fourth columns of Table 2.1. On average, Latin American countries had the earliest onset year (Y$_o$ = 1968) and lowest fertility at onset (TFR$_o$ = 6.3). Asian/N.African countries are next with Y$_o$ = 1974 and TFR$_o$ = 6.5, and SS African countries had the latest and highest onset with Y$_o$ = 1990 and TFR$_o$ = 6.7.

Transition patterns in Latin America and Asia/N.Africa are quite similar as is evident from the small differences between the values of Y$_o$ and TFR$_o$ in these two regions. This similarity is also observed in Fig. 1.2 in Chap. 1. To assess the difference between SS African countries and the rest of the developing world we estimate the averages for Asian/N.African countries and Latin American countries combined (see next to last row in Table 2.1). The difference between these pooled estimates and the ones for SS African countries will be called the "Africa effect". The Africa effect equals 17 years for the year of onset and 0.3 births per woman for the TFR$_o$.

---

[3] On condition that the fertility decline continues subsequently to reach at least 10% below the peak.
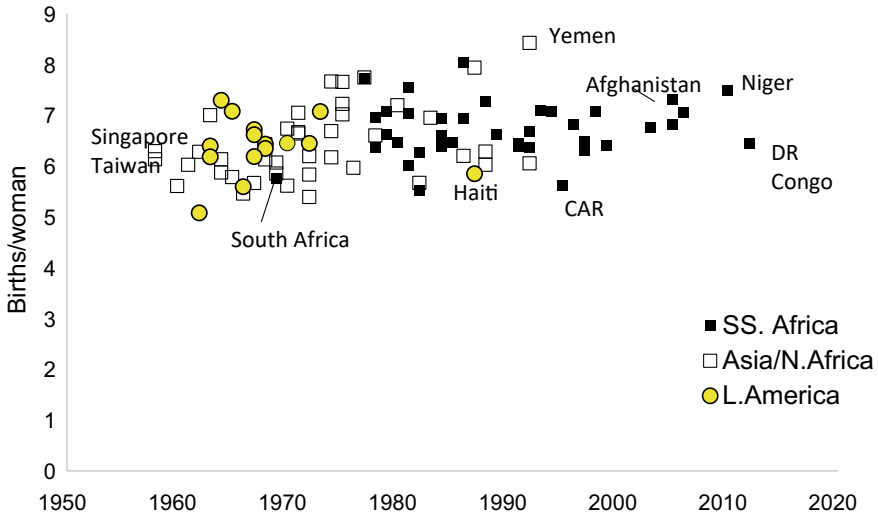
Fig. 2.2 TFR$_o$ by year at transition onset (authors' estimates from UN Population Division, 2019)

In sum, the transition onset in sub-Saharan African counties occurs on average nearly two decades later than in Asian/N.African countries and Latin American countries, and the sub-Saharan fertility level at onset is slightly higher (0.3 births per woman) than it was in other regions.

2.4.3   Pace of Decline

Once a transition has begun, fertility declines continue in most countries. Figure 2.3 presents fertility trends around the year of the onset. The y-axis plots relative fertility (i.e., fertility as a percentage of the pre-transitional maximum level) and the x-axis plots years from the onset of the transition for the 97 countries in our sample. By definition, relative fertility equals 95% in the year of onset for all countries. A decade after the onset, fertility had declined to 76% of the maximum. We measure the pace of fertility decline in each country as the change in relative fertility during the first decade after the onset; it averaged 19% (i.e., from 95% in year 0 to 76% in year 10).

As is evident from Fig. 2.3, there is substantial variation in the pace of decline among countries: in two countries fertility declined by less than 5% in the first ten years of the transition (Central African Republic and Guatemala), while in other populations the pace was more than 40% in the first 10 years (China, Iran, Mauritius and Singapore). Regional differences are also substantial, with the fastest pace in Asian/N.African countries (24%) and Latin American countries (20%) and the slowest pace in SS.African countries (13%) (see Table 2.1).
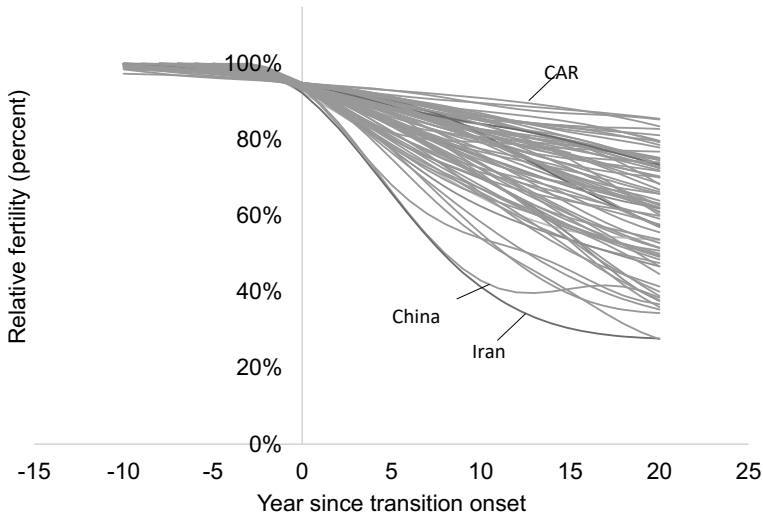
Fig. 2.3 Relative fertility trends around the time of the onset of the transition (authors estimates from UN Population Division, 2019)

A key feature of these transitions is the suddenness with which the fertility levels changed in many countries and the apparent irreversibility of the decline. The onset of a transition usually marks a clear departure from the reproductive behavior of the past.

2.4.4 The End of the Transition

Despite large fertility declines in much of the developing world, the majority of countries (55 out of 97) have not yet reached the end of the transition. We consider a country to have completed the transition if its fertility in 2020 has declined below 2.5 births per woman. By this measure 42 countries had reached the end of their transition.

We estimate the year in which the transition ends for these post-transitional countries as the first year in which the TFR dropped below 2.5. Based on estimates of both the onset and end of transitions, we then calculate the duration of the transition. This in turn allows us to divide the period 1950–2020 into three sub-periods: pretransition, transition and post-transition. Figure 2.4 presents this decomposition for all 42 post-transitional countries. The transition period is depicted in red and countries have been ordered from shortest to longest transition duration. Nine of these countries completed their transitions in 25 years or less, which is very rapid by historical standards: Iran (11), Singapore (16), Thailand (17), Mauritius (18), Korea (20), China (20), Taiwan (22), Viet Nam (23) and Tunisia (25). At the other end

of the spectrum are the slowest transitions, with twelve countries that took more than 40 years between onset and end: Philippines (57), Panama (51), Nicaragua (50), Paraguay (49), Dominican Republic (47), Ecuador (47), Venezuela (47), South Africa (46), Morocco (46), Honduras (44), Peru (44), India (42).

This overview of transition durations is limited to countries that ended their transitions before 2020. This is a selected set of countries; the transitions of most countries
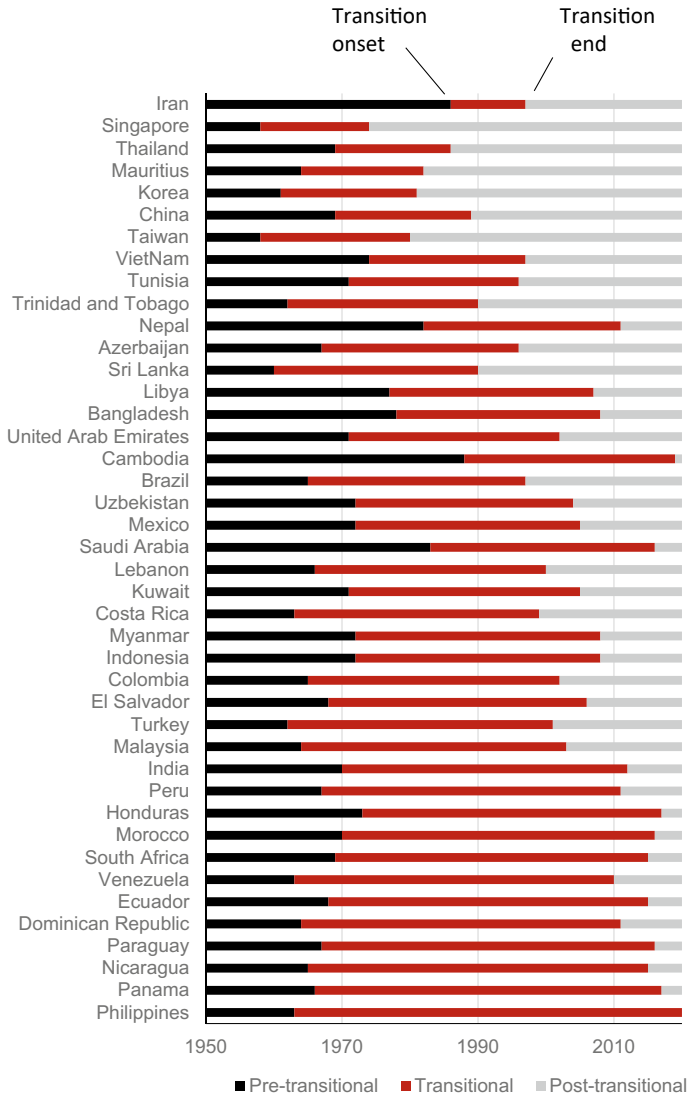

Fig. 2.4 Pre-transition, transitional and post-transition periods for 42 countries with completed transitions (authors' estimates from UN Population Division, 2019)

were unfinished in 2020. As a result, their transition durations cannot be estimated. However, these remaining countries are predominantly in SS Africa, and they have had a slow pace of decline in the first ten years of their transitions as shown earlier. It is therefore likely that most of these countries will have relatively long transition periods.

2.4.5   Fertility in 2020

The record of UN fertility estimates available for this study ends in 2020. All 97 countries had experienced the onset of the transition before 2020 with fertility declining rapidly in many countries. The country average TFR declined by half from 6.9 to 3.2 between the pretransition level and 2020. As shown in Table 2.1, declines over this period were substantially larger in Asian/N.African countries (from 6.8 to 2.4) and Latin American countries (from 6.7 to 2.2) than in SS African countries (from 7.1 to 4.4).

2.4.6   Post-Transitional Fertility

The average post-transitional TFR in 2020 was 2.0 for all 42 countries; 2.4 for 1 country in SS Africa (South Africa); 1.9 for 27 countries in Asia/N.Africa; and 2.1 for 14 countries in Latin America. (All post-transitional TFRs are presented in the "Low" column in a table in the Appendix.) These averages for Asian/N.African countries and Latin American countries are not far from the levels observed in the developed world.

2.5   Stalled Transitions

The preceding summary of fertility trends assumed that transitions generally proceed smoothly over time and more or less follow a predictable pattern. That is, fertility is assumed to be nearly stable before the onset of the transition; the subsequent fertility decline occurs at a fairly steady pace; and the transition eventually ends near replacement level. This standard pattern captures many observed transitions, although, as shown above, levels of pre-transitional fertility, the pace of decline and the level of post-transitional fertility can vary substantially among countries. And for many countries the end of the transition has not been observed.

However, as seen in Fig. 2.1, not all countries follow this standard fertility transition pattern. The most important exceptions from a demographic perspective are several countries where the fertility transition stalled after its onset and before reaching its end. This raises the question of whether some countries may continue to

have fertility above replacement for many decades into the future. Stalls can occur at any time after the onset, but stalls shortly after the onset year might be considered fluctuations near pre-transitional fertility and stalls after fertility has dropped below 3 birth per woman may be considered a transition end near replacement. For present purposes, we will focus here on mid-transition stalls which are defined as a leveling-off or reversal in the TFR between 3 and 5 births per woman, a point in the transition when fertility declines usually are most rapid.

In a detailed study of stalls in SS Africa, using data from multiple Demographic and Health Surveys, Schoumaker (2019) identified seven countries in which fertility stopped declining or rose in mid-transition (years refer to start and end of stalls): Cameroon (2004–2011), Congo (2005–2011), Ghana (1998–2003, 2008–2014), Kenya (1998–2003), Namibia (2007–2013), Senegal (2011–2013), Zimbabwe (2005–2011). Fertility trends in these countries are plotted in Fig. 2.5. Note that Ghana experienced two stalls, the first from 1999 to 2003 at a TFR of 4.4 and the second from 2008 to 2014, with a rise of the TFR from 4.0 to 4.2. These estimates are based on the strictest definition of stalling, namely no decline in the TFR. Schoumaker (2019) also examines the record of fertility transitions in which fertility declines between two successive surveys are not statistically significant; this is the case in Ethiopia (2011–2016), Gabon (2000–2012), Lesotho (2009–2014), and Zimbabwe (1999–2005, 2011–2015). The longest stalls are observed in Zimbabwe at 4 births per woman from 1999 to 2015, in Cameroon at 4.8 births per woman from 1998 to 2018 and in Ghana ca. 4.3 from 1998 and 2014.
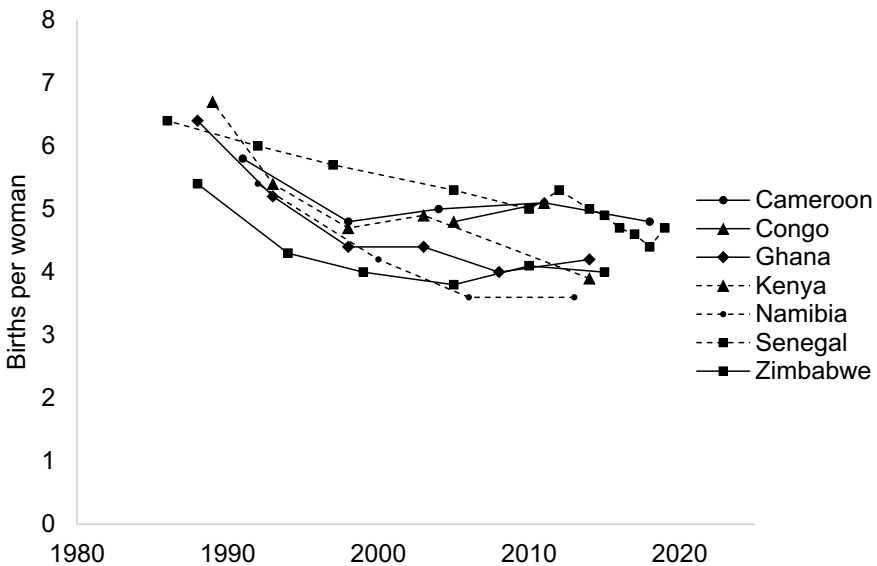

Fig. 2.5 TFR trends in mid transition countries with stalling fertility (ICF, 2021)

A stall is an interesting and unexpected phenomenon, that has been observed mostly in sub-Saharan Africa. But even in this region only seven out of thirty-five countries have experienced a stall before 2020. The dominant pattern of transition remains one with continuous declines.

2.6 Conclusion

This chapter described a variety of transition patterns in developing countries over the past seven decades. Countries such as Singapore, Mauritius, Korea, Taiwan, and China experienced early, rapid and complete transitions. In contrast, transitions in all but one country in sub-Saharan Africa (South Africa) have been late and slow, and fertility is today still well above replacement. An astute reader will note that the first group consists largely of "Asian Tigers" which have experienced very rapid development from the 1960s onward. These countries also benefited from strong government commitment to voluntary family planning programs, with the obvious exception of China's coercive approach. On the other hand, most countries in SS Africa still score low on indicators of socio-economic development, and family planning programs in the region lack government support and remain weak and underfunded. The next few chapters will explore in greater detail the determinants of fertility levels and trends and aim to quantify the roles of development versus programs, that is, the importance of Path 1 relative to Path 2 in Fig. 1.4.

Appendix: Country TFRs in 2020 (UN Population Division, 2019)

High (above 4.0)		Medium (2.5−4.0)		Low (below 2.5)	
Niger	6.74	Madagascar	3.98	Philippines	2.49
Somalia	5.89	Eritrea	3.93	Cambodia	2.45
Congo Dem Rep	5.72	Rwanda	3.93	Panama	2.42
Mali	5.69	Ghana	3.77	Honduras	2.39
Chad	5.55	Yemen	3.61	Paraguay	2.38
Angola	5.37	Iraq	3.54	Ecuador	2.38
Nigeria	5.25	Tajikistan	3.52	Uzbekistan	2.38
Burundi	5.24	Palestine	3.49	South Africa	2.36
Burkina Faso	5.03	Papua N Guinea	3.48	Morocco	2.35
Tanzania	4.77	Zimbabwe	3.46	Nicaragua	2.35
Mozambique	4.71	Pakistan	3.39	Dominican Rep	2.30

(continued)

High (above 4.0)		Medium (2.5−4.0)		Low (below 2.5)	
Uganda	4.70	Kenya	3.37	Indonesia	2.27
Benin	4.70	Namibia	3.29	Saudi Arabia	2.24
Cen African Rep	4.57	Egypt	3.24	Venezuela	2.23
Guinea	4.55	Lesotho	3.07	Peru	2.21
South Sudan	4.54	Algeria	2.94	India	2.18
Cote d'Ivoire	4.54	Haiti	2.84	Libya	2.18
Zambia	4.50	Mongolia	2.83	Sri Lanka	2.17
Senegal	4.49	Botswana	2.80	Tunisia	2.15
Mauritania	4.45	Oman	2.78	Iran	2.14
Cameroon	4.44	Guatemala	2.78	Myanmar	2.12
Congo (Braz)	4.32	Syria	2.73	Mexico	2.08
Sudan	4.29	Turkmenistan	2.70	Kuwait	2.07
Togo	4.20	Bolivia	2.65	Lebanon	2.06
Liberia	4.18	Jordan	2.64	Viet Nam	2.05
Afghanistan	4.18	Laos	2.58	Azerbaijan	2.04
Sierra Leone	4.08			Turkey	2.04
Malawi	4.06			El Salvador	2.00
Ethiopia	4.05			Bangladesh	1.99
				Malaysia	1.97
				Nepal	1.85
				Colombia	1.77
				Costa Rica	1.72
				Brazil	1.71
				China	1.70
				Trini & Tobago	1.70
				Thailand	1.50
				U Arab Emirates	1.37
				Mauritius	1.36
				Singapore	1.22
				Taiwan	1.19
				Korea	1.08

References

Bongaarts, J. (2002). The end of the fertility transition in the developing world. In: Completing the fertility transition (pp. 288–307). Department of Economic and Social Affairs, Population Division, ESA/P/WP.172/Rev.1. United Nations.

Bryant, J. (2007). Theories of fertility decline and the evidence from development indicators. *Population and Development Review, 33*(1), 101–127.

Casterline, J. B. (2001). The pace of fertility transition: national patterns in the second half of the twentieth century. *Population and Development Review 27*(Supp.), 17–52.

Coale, A. J., & Treadway, R. (1986). A summary of the changing distribution of overall fertility, marital fertility, and the proportion married in the provinces of Europe. In: A. Coale & S. Watkins S (Eds.), *The decline of fertility in Europe* (pp. 31–181). Princeton University Press.

Schoumaker, B. (2019). Stalls in fertility transitions in sub-Saharan Africa: Revisiting the evidence. *Studies in Family Planning, 50*(3), 257–278.

ICF. (2021). The DHS program STATcompiler. Retrieved September 29, 2021, from http://www.statcompiler.com.

United Nations Population Division. (2019). World population prospects 2019, Online Edition. Rev.1. Department of Economic and Social Affairs, United Nations.