Chapter 3
Transitions in Individual Reproductive Behavior and Preferences

3.1 Introduction

Chaps. 1 and 2 described fertility transitions from the global and country perspectives. We turn now to an examination of fertility transitions from the perspective of individual women and to the behaviors that bring about declines in fertility. We document what women do to achieve a smaller family size and the extent to which these efforts are successful.

In pre-transitional societies women and couples do little or no planning about childbearing and essentially let nature take its course while observing social norms regarding behaviors that can affect fertility (e.g., age at marriage). This situation changes fundamentally once desired family size declines. To achieve a smaller family size, women must start using contraception (or abortion), a behavior that is new and unfamiliar to most women in pre-transitional societies. As desired fertility declines contraceptive use rises and by the end of the transition women rely on contraception for most of their reproductive lives to achieve a small family size and to avoid unplanned pregnancies. Induced abortion also reduces fertility, but a rise in contraceptive use is the dominant cause of low fertility in most populations.

The first part of this chapter describes levels and trends in contraceptive use and abortion, as well as their impact on fertility. The second part reviews trends in fertility preferences that bring about the rise in contraceptive use. It also discusses the universal finding that some women who don't want to get pregnant are not using contraception. These women are considered to have an "unmet need" for contraception which is caused by a number of obstacles women face in trying to implement their reproductive intentions and results in unplanned pregnancies. The chapter concludes with an examination of levels and trends in unplanned pregnancy rates and their reproductive outcomes over the course of the fertility transition.

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3.2 Data

- ***Contraception***. The United Nations Population Division maintains two data banks related to contraceptive behavior. The first compiles estimates of contraceptive prevalence (by method), unmet need, and the demand for contraception from surveys that provide data in a consistent format. These estimates are only available for selected years and come from different sources. As a result, time series of these data are not smooth and there are inconsistencies among sources. To address this issue and to obtain annual estimates the UN also fits models to the observed data. This yields smooth annual estimates of contraceptive prevalence from 1970 to 2015 which we rely on below (United Nations Population Division, 2021)[1]
- ***Abortion***. Estimates of abortion rates for individual developing countries are difficult to obtain. Because abortion is heavily restricted by law or even prohibited, women are often reluctant to report having had an abortion. Nevertheless, the Guttmacher Institute, using sophisticated estimation techniques, has estimated abortion rates by region for the developing world (Bearack et al., 2020).
- ***Desired family size***. Demographic and Health Surveys (DHS) routinely ask women about their ideal family size. These estimates are available from the DHS STATcompiler data bank (ICF, 2021).

3.3 Contraception and Its Impact on Fertility

3.3.1 Contraceptive Prevalence Trends

Figure 3.1 plots trends in contraceptive prevalence rates among married/in union women (CPR) from 1970 to 2015 for 97 developing countries. The thick lines represent regional averages.

The CPR rises in all countries between 1970 and 2015. This is as expected from the fertility declines presented earlier in Fig. 2.1. A few countries experience brief periods of decline, typically associated with wars or major disasters, but these pauses are temporary, and the CPR continues its rise afterwards.

In 1970 the average CPR for all countries stood at 16%, with regional averages ranging from a low of 5% in SS.Africa to 21% in Asia/N.Africa and 27% in L. America. Nearly half of all countries—mostly in SS Africa—still had CPR levels in the single digits. At the other extreme two countries—Singapore and Brazil—had CPRs above 60%.

By 2015 contraception was much more prevalent everywhere. The average for all countries more than tripled since 1970, reaching 48% in 2015. The largest increase

[1] Since estimates of the prevalence of and the demand for contraception require special surveys which are relatively infrequent, we only use data up to 2015 which are more reliable than those for years between 2015 and 2020.

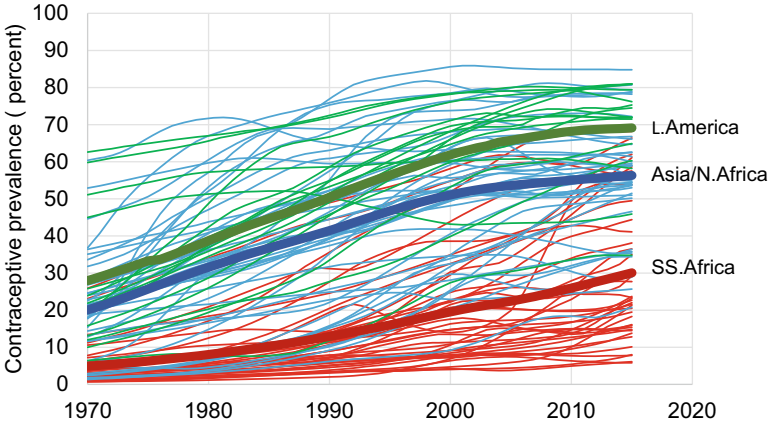

Fig. 3.1 Contraceptive prevalence by country, 1970–2015 (United Nations, 2021)

occurred in Latin America (from 28 to 69%), next is Asia/N.Africa (from 21 to 56%) and the smallest rise is observed in SS Africa (from 5 to 30%).

At the country level CPR increases between 1970 and 2015 varied widely in all regions. At one end of the spectrum are countries such as Chad, Eritrea and Sudan with increases of less than 10% points. In contrast, a third of countries in Asia/N.Africa and L.America experienced surges in CPR of 50% points or more. Such large increases were rarer in SS.Africa, but Botswana, Kenya, Malawi and Rwanda also saw jumps in their CPR in excess of 50% points.

3.3.2 Contraceptive Use and Fertility: Cross-Sectional Evidence

Women (or their husbands) who practice contraception intend to avoid pregnancy. It is therefore not surprising that the contraceptive prevalence rate (CPR) among women in union in a population is negatively and causally related to its level of fertility. This relationship is one of the most widely documented in the population literature. Typically, the total fertility rate (TFR) is around six to seven births per woman in countries with no contraceptive use, while fertility is near two births per woman in countries in which the CPR is about 75% (lower in populations with significant resort to abortion). This inverse relationship has been repeatedly documented using cross-sectional data from large numbers of countries (Bongaarts, 1984; Jain et al., 2014; Mauldin & Segal, 1988; Tsui, 2001; United Nations Population Division, 2000; Westoff & Bankole, 1991).

Figure 3.2 repeats this exercise for the 97 countries in our sample. The regression line fitted to the data turns out as expected on theoretical grounds. Countries with the

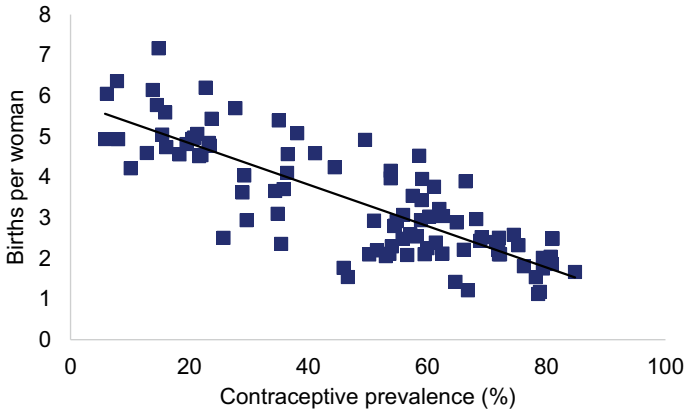

Fig. 3.2 Total fertility rate by contraceptive prevalence in 97 countries, 2015 (United Nations, 2019, 2021)

lowest levels of CPR have the highest fertility levels and countries with the highest CPRs have fertility near 2 births per woman.

Individual countries have CPRs ranging from 6 to 84%, with the corresponding TFRs generally lower the higher the CPR. The slope of the regression line is a simple indicator of the average effect of the CPR on the TFR; it equals a 0.051 births per woman decline in the TFR for each 1% increase in CPR. This is equivalent to a 19.5% increase in the CPR for a decline of 1 birth per woman in the TFR.

As shown in Fig. 3.2, there is a clear and highly significant inverse correlation between countries' TFRs and CPRs. However, many individual countries deviate substantially from the expected level predicted by the regression line, falling either above or below it. For example, countries with a CPR near 50% have TFRs ranging from less than 2 to 5 births per woman. There are several reasons for this finding:

(1) *Variation in pre-transitional fertility*. The nature of pre-transitional fertility has been the subject of numerous studies in historical populations (Coale & Watkins, 1986; Henry, 1961; Knodel & van de Walle, 1979; van de Walle, 1992). A key conclusion from this research is that pre-transitional fertility is largely "natural," that is, the large majority of couples do not consciously practice birth control to limit the number of children they have. This conclusion is confirmed in contemporary fertility surveys, in which couples have been asked directly about their birth control practices. For example, in DHS surveys in pre-transitional societies only a very small percentage of women report practicing contraception (see SS. African countries in 1970 in Fig. 3.1).

The term "natural" is not an ideal one because it can be misinterpreted as being the biological limit to childbearing. This is not the case because natural fertility is affected by non-biological factors (Bongaarts & Potter, 1983). Practices such as prolonged breastfeeding or post-partum abstinence lower fertility well below its biological maximum, yet they are considered natural if they are

not deliberately modified as the number of children already born rises. Late marriage and low frequency of intercourse also reduce natural fertility. Natural fertility is highest in populations with low ages at marriage, short durations of breastfeeding, and high frequency of intercourse, and it is lowest when marriage is late, breastfeeding long and frequency of intercourse low. These behaviors are in turn, largely determined by community norms and customs and are thus under social control (Watkins, 1991). As a result, the level of natural fertility varies among societies and over time within a society. As Fig. 2.1 showed, pre-transitional TFR in the 1950s ranged widely from 5.3 in Trinidad and Tobago to 8.9 in Yemen.

The behaviors associated with high or low natural fertility are at least to some extent retained as countries enter the fertility transition. As a result, countries with high or low natural fertility tend to remain above or below the expected level (i.e., the regression line in Fig. 3.1) as contraceptive prevalence rises.

(2) *Contraceptive failure*. Except for sterilization, all contraceptive methods have a risk of failure. This risk is small for long-acting methods such as the IUD and implants but is substantial for the pill and especially for condoms and traditional methods. Average contraceptive effectiveness is less than 100% in all populations, with the actual level depending on the mix of methods used. Failure rates in countries where most women use contraception to space their births are on average higher than failure rates in countries where limiters predominate. Countries with high failure rates, tend to lie above the regression line in Fig. 3.2.

(3) *Overlap between contraception and postpartum infecundability.* Women who wish to delay or avoid pregnancy sometimes start using contraception before the post-partum infecundability[2] period has ended. This means that some of the contraceptive use is not effective, thus leading to a lower-than-expected impact on fertility.

(4) *Abortion*. The higher the level of abortion, the lower the TFR for a given level of CPR.

(5) *Nonmarital fertility*. The conventional contraceptive prevalence rate used here is measured among women in union (married or living together) while the TFR measures all births regardless of whether they occur in or out of union. This approach is becoming increasingly problematic, as nonmarital fertility has risen over time in many populations. This mismatch raises the TFR for a given level of the CPR.

(6) *Migration of spouses*. In many countries spousal migration both internally and internationally is common. This practice lowers the fertility and contraceptive use in both the sending and receiving areas, because spouses are often separated for prolonged periods.

(7) *War, famine, natural disaster.* These events cause massive disruptions of societies with potentially large effects on reproductive behavior. In particular, fertility declines as couples avoid pregnancies.

[2] Postpartum infecundability refers to a temporary inability to conceive due to breastfeeding or postpartum abstinence from sexual relations.

Table 3.1 Factors causing deviation from expected TFR for given CPR level

Factors causing positive or negative deviation
Positive deviation
High natural fertility
Nonmarital fertility
Contraception failure
Overlap with postpartum infecundability
Negative deviation
Low natural fertility
Abortion
Spousal separation
War, famine, natural disaster

Table 3.1 summarizes the positive and negative fertility effects of these factors causing the observed TFR of a country to deviate from the regression line in Fig. 3.2. We will not attempt to quantify these effects due to a lack of data. However, in the countries that fall below the regression line the negative factors outweigh the positive ones, and the reverse is the case in countries that fall above the regression line.

Figure 3.2 includes data for all 97 countries. A closer look at the regional relationship between the CPR and the TFR in Fig. 3.3 yields some unexpected results. In particular, the regression line fitted to the countries in SS Africa lies above the regression line for Asia/N.Africa and L.America. The difference is substantial; for example, in a country with a CPR of 50% the expected TFR of SS Africa is 1.4 births per woman higher than in the rest of the developing world. This phenomenon was discovered by Westoff and Bankole (2001). Bongaarts (2017) examined this puzzle and identified several reasons for this difference including nonmarital fertility, substantial overlap between contraceptive use and postpartum infecundablity, and a predominance of contraception for spacing, all of which tend to be higher in SS Africa than elsewhere.

Another puzzle in Fig. 3.3 is that extrapolation of the regression line to CPR = 100% results in an estimated TFR of about 2.5 for SS Africa. This finding is implausible and strongly suggests that these cross-sectional analyses are biased. This conclusion is confirmed by longitudinal analyses in the next section.

3.3.3 Contraceptive Use and Fertility: Longitudinal Evidence

The data presented in Figs. 3.2 and 3.3 are informative and provide a general overview of the association between contraceptive use and fertility. However, such cross-sectional data can provide potentially biased estimates of the true causal effect of the CPR on the TFR because they give information only about differences between

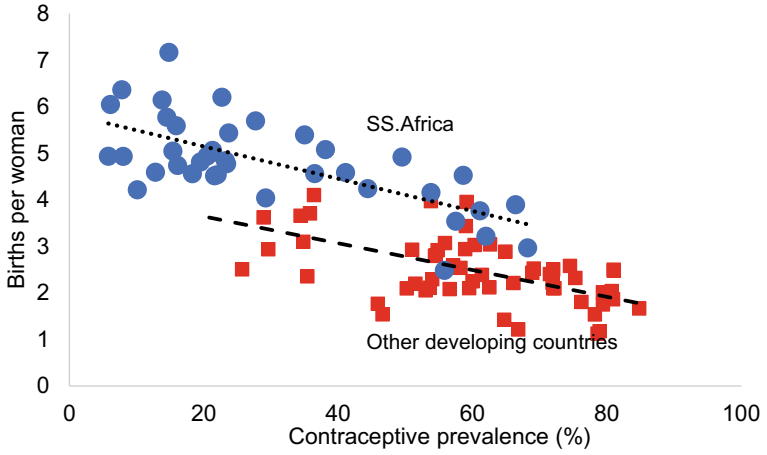

Fig. 3.3 Total fertility rate by contraceptive prevalence in countries in SS. Africa and in other developing countries, 2015 (United Nations, 2019, 2021)

countries at one point in time and not about changes over time. A better approach is to rely on longitudinal data, which we now examine.

Figure 3.4 presents trends over time in the country level TFR as a function of the CPR, thus summarizing the longitudinal association between fertility and contraceptive prevalence. Each line represents one country connecting two observations. The first point on the line represents the pre-transitional stage, with the TFR set at its pre-transitional level and the CPR is assumed to be zero. The second point on the line represents the situation in 2015 with the observed TFR and CPR for that year. (This point is also plotted in Figs. 3.2 and 3.3.) The length of each line indicates the progress the country has made through the transition in term of declines in fertility and increases in contraceptive prevalence, but they are independent of the number of years between the first (pre-transitional) observation and second observation (2015). The lines are shorter for most SS African countries than for countries in the other regions because the former have, on average, made less progress through their fertility transitions than the latter.

As before, the key indicator of the effect of contraceptive use on TFR is the slope of each line which is estimated as the absolute decline in the TFR resulting from a 1% increase in the CPR.

Four findings are notable:

(1) As contraceptive prevalence rises over time, the TFR declines in all countries. The TFR observed for a given CPR varies substantially among countries, but within each region the majority of countries have similar slopes (i.e., the solid lines are parallel to one another). This result indicates that countries start off at substantially differing pretransition levels, but the subsequent declines in TFR with rising CPR are similar.

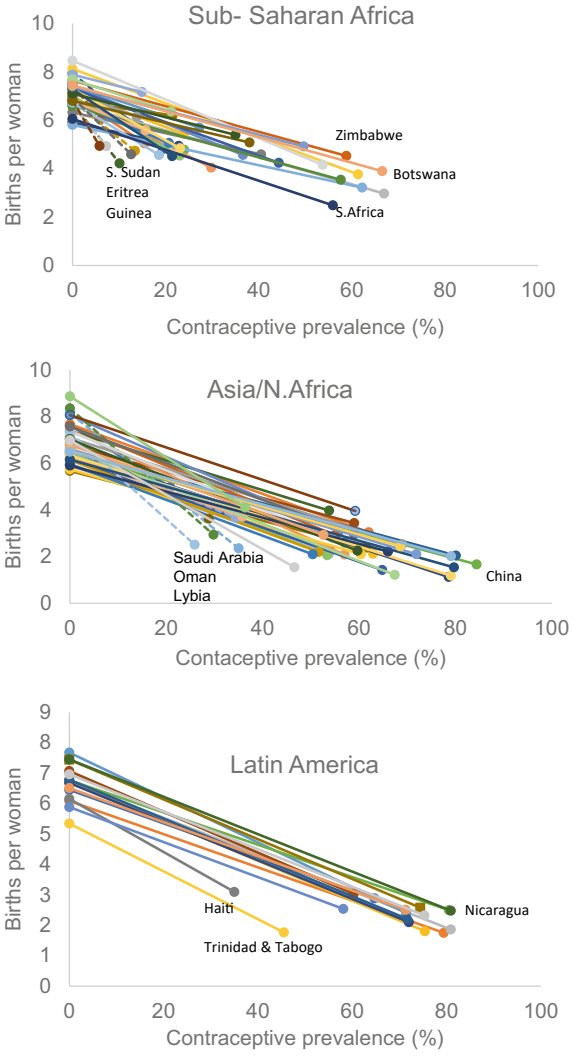

Fig. 3.4 Trends in total fertility rate by contraceptive prevalence, pre-transition to 2015. *Source* Authors' calculations from (UN Population Division, 2019, 2021)

(2) A number of countries have much steeper slopes than is typical for their region (dashed lines). These include Chad, Cote d'Ivoire, Eritrea, Guinea, South Sudan and Sudan in SS Africa, and Libya, Oman and Saudi Arabia in Asia/N.Africa. These countries will be considered outliers.[3] A full discussion of the causes of these anomalous trends is beyond the scope of this chapter, but a few observations are worth making. First, most of these outliers have typical levels of pre-transitional fertility, so the high slopes are due to depressed levels of the

[3] Following the standard definition of outlier, a country is considered an outlier if its slope is greater than the third quartile of the slope distribution plus 1.5 times its inter-quartile range.

Table 3.2 Regional estimates of the effects of CPR increase on TFR

	Average slope (standard deviation) Births per 1% increase in CPR	Percent CPR increase for one birth decline in the TFR (%)
SS Africa	−0.075 (0.029)	13.4
Asia/N.Africa[a]	−0.076 (0.019)	13.1
Latin America	−0.064 (0.010)	15.6
All	−0.070 (0.027)	14.3

[a]Estimates exclude outliers
Source Authors' calculations

CPR and/or TFR in 2015. For several of these outliers, crises of one sort or another, occurred in the mid-2010s which provide plausible explanations for the deviant slopes in these countries. For example, South Sudan and Libya had civil wars, Chad and Eritrea suffered from droughts, Guinea had a large outbreak of Ebola, Cote d'Ivoire has the highest foreign-born population in West Africa consisting of migrants from neighboring countries. For Saudi Arabia and Oman the depressed TFRs and CPRs are likely due to high proportions of the population (over one third) that are foreign-born migrants, mostly from Asia and Africa, men who work in industries such as construction and women who work in domestic service, health care, restaurants, etc. Most of these temporary workers do not have their families with them. These migrants have low levels of fertility and contraceptive use, thus depressing the corresponding national statistics and causing the countries to be outliers in Fig. 3.4.

(3) Averages of slopes (excluding outliers) differ little by region. As shown in Table 3.2 the average slopes range from a low of −0.064 in L. America to a high of −0.076 in Asia/N.Africa. The average slope for all countries is −0.070. Within each region the country specific slopes cluster tightly around their average as is confirmed by the small standard deviations. The last column in Table 3.2 presents the increase in the CPR required to yield a decline in TFR of 1 birth per woman. For all countries this average increase equals 14.3%.

(4) The slopes derived from the longitudinal analysis are substantially steeper than the corresponding slopes implied by the cross-sectional data discussed in the previous section. For all countries the cross-sectional slope was −0.051 (see Fig. 3.2) and the longitudinal slope equals −0.070. The difference between the cross-sectional and longitudinal slopes (−0.035 versus −0.075) is even larger in sub-Saharan Africa. Clearly the cross-sectional analysis gives a misleading picture of the effect of contraceptive use on fertility.

In sum, an increase in contraceptive use is the key driver of countries' fertility transitions. Over the course of the transition from pre-transitional to replacement fertility, the CPR rises on average from near zero to about 75%. This large increase in the CPR is mainly responsible for the decline in the TFR from 6–7 to 2 births. Other behavioral factors also affect the relationship between fertility and contraceptive use,

but these typically have a smaller magnitude. One such factor is abortion which will be discussed next.

3.4 Abortion and Its Impact in Fertility

Abortion (i.e., induced abortion) is practiced at least to some extent in all contemporary societies. The total number of abortions in low- and middle-income countries is estimated to be 69.4 million per year for 2015–2020 (Bearak et al., 2020). Regional estimates summarized in Table 3.3 range from 5.4 million in Latin America to 24.6 million in Eastern and Southeast Asia which includes China.

A widely used indicator of the degree to which women resort to abortion is the number of abortions per 1000 women aged 15–49. As shown in Table 3.3 this measure is lowest in sub-Saharan Africa (33) and Latin America (32) and highest in Western Asia and North Africa (53) and Central and Southern Asia (46).

Interestingly, global abortions rates have changed little over the past quarter century: 40 in 1990–1994 and 39 in 2015–2019. Bearak et al. (2020). This global average could, of course, hide regional and country trends.

Abortion rates are the most widely reported metric in the abortion literature. For our purposes a different indicator called the Total Abortion Rate (TAR) is also useful. It is similar to the TFR but measures abortions rather than births per woman over a reproductive lifetime. In the absence of age specific abortion data, the TAR in a given year can be estimated as 30 times the abortion rate in that year. That is, an average woman is assumed to experience the observed abortion rate in each year during the three decades between ages 15 and 45. Estimates of the TAR by region are provided in the last column of Table 3.3. The TAR ranges from 1.0 in SS.Africa and L.America to 1.6 in W.Asia and N.Africa. These estimates imply that women in the developing world on average have one or more abortion in their lifetime.

Table 3.3 Average abortion and total abortion rate by region

Region[a]	Number of abortions (millions)	Abortion rate (per 1000 women)	Total abortion rate[b]
Sub-Saharan Africa	8.0	33	1.0
Western Asia and Northern Africa	6.7	53	1.6
Central and Southern Asia	23.4	46	1.4
Eastern and Southeast Asia	24.6	43	1.3
Latin America and the Caribbean	5.4	32	1.0

Source Bearak et al. (2020). [a]Regions as defined in source, [b]Calculated by authors

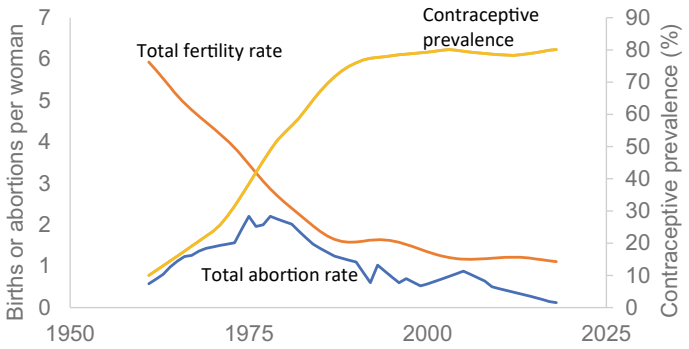

Fig. 3.5 Trends in the TFR, TAR and CPR during the fertility transition in the Republic of Korea (United Nations, 2019, 2020; Johnston, 2021)

These regional estimates provide little insight into levels and trends in abortion rates in individual countries. Reliable country data on abortion are rare, but Korea has one of the best records available in the developing world. As shown in Fig. 3.5, Korea has estimates of the total abortion rate (number abortions over a woman's reproductive years) from 1961 onward, covering nearly all of the fertility transition to replacement. The TFR declined from 6.1 in 1960 to 1.6 in 1990. During this period the CPR rose steadily, leveling off after 1990 at between 75 and 80%. The total abortion rate rose from low levels in the 1950s to 2.2 abortions per woman in the late 1970s. The sharp rise in both the CPR and the TAR reflects the rapidly rising demand for birth control during this period. After 1980 abortion rates dropped, presumably because women became more reliant on contraception to implement their reproductive preferences and the government's family planning program continued to provide ready access to contraceptive options.

Unfortunately, the available evidence is too limited to confirm whether abortion rates in other countries follow Korea's inverted U-shaped pattern over the course of the transition. It would not be surprising if this were the case. One relevant finding from Bearack et al. (2020) concerns the pattern of abortion rates of countries classified by development status. The average abortion rate is 38 in low-income countries, rising to 44 in middle income countries and dropping to just 15 in high income countries, indicating an inverted U-shaped pattern in this cross-section by development status.

Women resort to abortions to end unwanted pregnancies but estimating the fertility impact of these abortions is not straightforward. Past research has shown that an abortion averts less than one birth. There are a number of reasons for this perhaps unexpected fact (e.g., an induced abortion might have been unnecessary if the pregnancy would have ended in a spontaneous abortion or still birth.) For more details see Bongaarts and Potter (1983). Given the estimated TARs a typical value for births averted per abortion is 0.4 in SS. Africa and 0.5 for the rest of the developing world. The reduction in fertility resulting from abortions (estimated as the product of births averted per abortion and the total abortion rate) ranges from 0.4 in SS. Africa to 0.8 in W.Asia and N.Africa.

Levels of abortion are substantial throughout the developing world, but in most regions the reduction in the TFR achieved by abortion averages substantially less than one birth per woman. This effect is much smaller than the TFR decline due to contraception. In general abortion is therefore a less important driver of the fertility transition than contraception.

3.5 Why Contraceptive Use Rises: The Roles of Demand and Satisfaction

As the fertility transition proceeds and desired family size declines women face two key decisions. The first is how many births to have. If desired family size is less than natural fertility, then women will only need a fraction of their reproductive lives for bearing wanted children and will need to use birth control to avoid unplanned pregnancies during the remainder of their reproductive lives. Women who have reached their desired family size ("limiters") as well as women who want to delay the next wanted pregnancy ("spacers") are assumed to have a "demand" for contraception. This demand rises over time as the desired family size declines during the transition.

The second decision women face is whether to use contraception when they don't want to get pregnant. In an ideal world all women who have a demand for contraception would be practicing contraception, but in reality, this is not the case. That is, despite wanting to avoid pregnancy some women currently in relationships are not taking action to protect themselves from the risk of pregnancy. These women are considered to have an *unmet need* for contraception.

The reasons for the nonuse of contraception among women who are motivated not to become pregnant are varied and include: a lack of knowledge about and access to contraceptives and related services, the cost of contraception, fear of side effects, infrequent sexual activity, personal opposition or opposition from spouses and other family members, and from religious or political leaders (Bongaarts & Bruce, 1995; Casterline & Sinding, 2000; Casterline et al., 1997, 2001; Cleland et al., 2006; El-Zanaty et al., 1999). These obstacles tend to be larger in the early years of the transition when women need time to learn how to reliably acquire and use contraceptives and when they may lack accurate information about modern contraceptives and their sources. Having just begun the practice, they also might have less concern about the consequences of an unwanted pregnancy, and therefore might be less vigilant about birth control practices. Offsetting these obstacles are the opportunity costs of having an unplanned pregnancy which motivates women to use effective contraception. These costs tend to rise over time as women become more educated and desire to join the labor market.

From an analytic point of view demand and its satisfaction can be considered separate factors. But from the point of view of an individual woman these factors are linked. That is, a rising demand requires a rising level of satisfaction if women are to accomplish their goal of having a small family and avoiding an increasing number

of unplanned pregnancies during their 30+ reproductive years. An increase in the satisfaction of demand over the course of the transition is essential for achieving a small family size.

An analysis of these processes at the population level requires the introduction of two new indictors:

– *Demand for contraception* (D) refers to the proportion of women in union who do not want to get pregnant. This indicator estimates the level of contraceptive use that would be observed if all women fully implemented their fertility preferences by using effective birth control.
– *Proportion of demand satisfied* (DS). This indicator equals the ratio of use to demand, i.e., DS = CPR/D. As noted, the CPR falls short of the level demanded (D) in all contemporary societies and observed values of DS are therefore less than 1.0. DS is a measure of the degree to which women are able to avoid unplanned pregnancies and, by implication, a measure of the obstacles to contraceptive use.

Figure 3.6 presents trends in the demand for contraception (D) and the proportion implemented (DS) among married women of reproductive age (MWRA) for each of the three regions from 1970 to 2015. (These regional estimates are the unweighted averages of the country estimates). Also plotted is the observed CPR which equals the product of D and DS: CPR = DxDS (when CPR, D and DS are expressed as proportions). In all three regions these indicators of reproductive behavior rose between 1970 and 2015, but, as expected, their values are lower in SS.Africa than in Asia and Latin America. For example, in 2015 demand reached 71% in Asia/N.Africa and 81% in L.America, while in SS Africa demand, although rising, only was 54%. Similarly, the percent satisfied stood at 80% in Asia and 84% in L.America compared to 56% in SS Africa. Throughout the period 1970–2015 the regional differences in D and DS are directly responsible for the still large differences in the CPR.

At any point in time the relative levels of D and DS indicate which of these factors is the most important direct determinant of CPR. As can be seen in Fig. 3.6 in Asia/N. Africa and L.America values of D and DS closely track each other throughout the period 1970–2015. However, before 2000 the DS in SS.Africa is substantially lower then D, indicating that DS was largely responsible for the very low CPR level before 2000.

It may seem surprising that the demand for contraception was as high as 34% in 1970 in SS. Africa when most of the continent was still pre-transitional and desired family size was high. One reason for this finding is that several early transition countries (e.g., South Africa, Kenya, and Zimbabwe) were already experiencing increases in demand. In the true pre-transitional countries (such as Chad, Mali and Niger) demand was around 25%. This may still seem rather high, but it should be emphasized that nearly all this demand was for spacing of births. Given the high desired family size the proportion of women wanting to stop childbearing was typically less than 5%.

Observed CPR increases are driven by rising levels of D and DS. The more rapid rise in DS than in D evident in Fig. 3.6 in all three regions suggests that the former is more important as a determinant of trends in CPR than the latter. To confirm

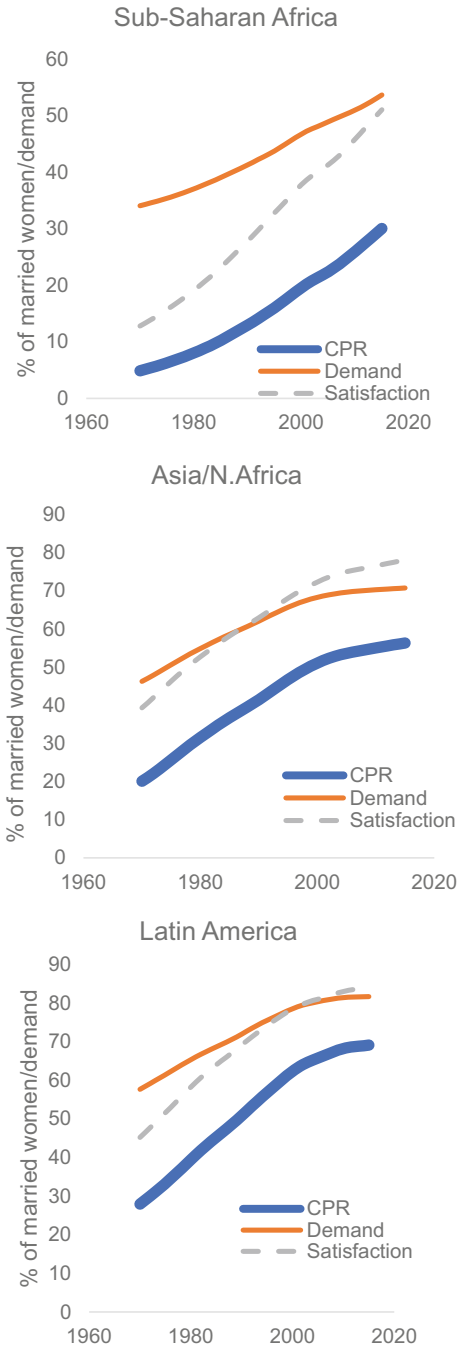

Fig. 3.6 Trends in unweighted average demand, demand satisfaction and contraceptive prevalence 1970–2015, by region (United Nations, 2021)

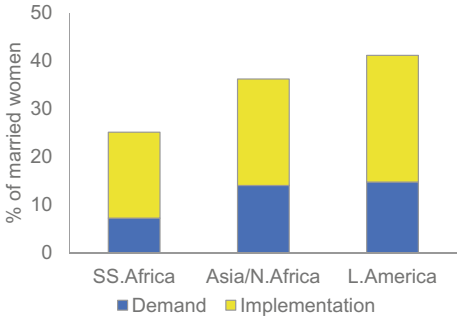

Fig. 3.7 Rise in CPR 1970–2015 and its demand and satisfaction components

this finding, we undertake a simple decomposition exercise which divides the total increase in CPR between 1970 and 2015 into two components, one measuring the impact of the change in demand, and the other the change in satisfaction. (Details of the decomposition procedure are provided in Appendix 1.)

Figure 3.7 presents the results of the decompositions for each region in the developing world. The overall size of the bars in the figure equals the size of the rise in the CPR between 1970 and 2015. This overall increase is divided into a component attributable to the rise in demand (the blue part) and a component attributable to the rise in satisfaction (the yellow part). These estimates show that the increases in satisfaction are more important than the increases in demand in accounting for the rises in CPR. The average proportion of the change in CPR accounted for by rising satisfaction ranges from 69% in SS Africa to 62% in Asia/N.Africa and 61% in L.America. These decomposition estimates of the dominant role of demand satisfaction are broadly consistent with those of Ibitoye et al. (2022) and Feyisetan et al. (2000) although our estimates are somewhat smaller than theirs.

These findings provide clear evidence for the importance of demand satisfaction as the primary driver of increases in contraceptive prevalence over the course of the fertility transition.

3.6 The Reproductive Consequences of Imperfect Birth Control

In all countries there are some women who do not want to get pregnant and are not using contraception. In addition, contraceptive failures occur among women who practice non-permanent methods of contraception. The inevitable result is that at least some of these women have unplanned pregnancies. This is true even in more recent decades when new contraceptive technologies have become available, and the choice of methods and their effectiveness have risen (United Nations Population Division, 2021). World-wide, 121 million unintended pregnancies occur each year

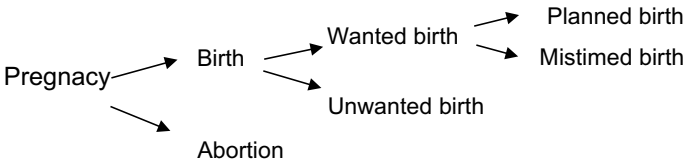

Fig. 3.8 Multiple pregnancy outcomes

of which more than half (73.3 million) end in abortions (Bearak et al., 2020). Clearly contraception is far from perfect.

We will now examine levels and trends of unplanned pregnancies rates and their reproductive outcomes over the course of the fertility transition in the developing world. Figure 3.8 summarizes the various pregnancy outcomes of interest. (For simplicity, spontaneous abortions are ignored.) Any pregnancy therefore ends either in a birth or in an abortion. Births can be further divided into wanted and unwanted types (depending on whether they occur before or after the woman has reached her desired family size). Wanted births can be planned or mistimed (depending on whether the timing of the wanted birth was in accordance with plans).

To quantify the population-level incidence of these different outcomes, we calculate various "total" rates. These rates measure the average number of pregnancy outcomes women would experience over a lifetime if they experienced the current age-specific rates of their population. The most familiar and widely used of such rates is the total fertility rate (TFR) which measures the lifetime number of births given current age-specific fertility rates. Other total event rates presented here are the total pregnancy rate (TPR) and the total abortion rate (TAR). The total pregnancy rate equals the sum of the total abortion rate and the total fertility rate: TPR = TAR + TFR.

The data for this exercise are taken from Bongaarts and Casterline (2018) who estimated the various non-abortion outcomes from the latest available DHS survey conducted after 2000 in 53 developing countries. Abortion rates are based on regional and sub-regional estimates from Sedgh et al. (2016).

Figure 3.9 plots average country-level rates of the various outcomes observed at the time of the most recent DHS survey as a function desired family size (DFS). The DFS is used as a proxy for stage of fertility transition. The horizontal axis is reversed so that early transition countries with high desired family size are on the left and late transition countries with low desired family size are on the right, to correspond to a transition that moves from left to right with time. Countries are grouped by level of desired family size (i.e., 7+, 7–6, 6–5, 5–4, 4–3, 3–2). For simplicity the countries in the group with desired family size of 7 and above will be called pre-transitional and the countries with a desired family size below 3 will be considered to have reached the end of the transition.

The overall size of each bar equals the total pregnancy rate which declines from 7.6 pregnancies per woman in pre-transitional countries to 3.8 pregnancies per woman in countries at the end of the transition. The corresponding change in the TFR is from

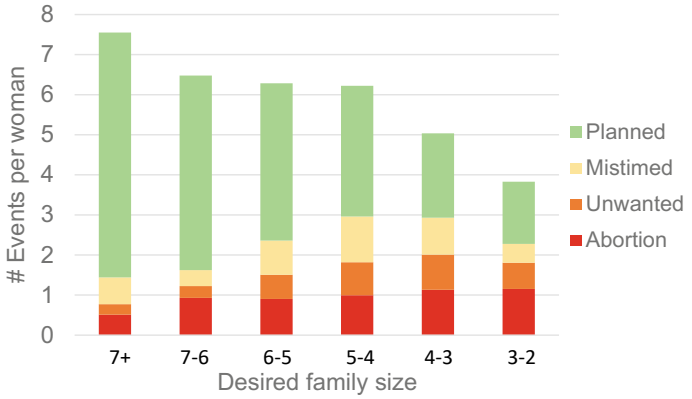

Fig. 3.9 Total pregnancy rate components (planned, mistimed, unwanted and abortion, by level of desired family size, at the time of the most recent DHS survey (Bongaarts & Casterline, 2018)

7.0 to 2.7 births per woman. As noted earlier, the unweighted country average TFR for the developing world equals 3.3 births per woman and the average women's TFR equals 2.6. As a result, most women in the developing world live today in situations represented by the two columns on the right in Fig. 3.9.

The main driver of the downward trends in the TPR and TFR is a large decline in planned births (green bars) from 6.1 to 1.6 per woman with an approximately linear transition from high to low fertility. The trends in the other pregnancy outcomes (mistimed in yellow, unwanted in orange and abortion in red) are not linear. All these unintended outcomes *rise* in the first half of the transition, peaking in mid transition and then decline by the end of the transition, except for the abortion rate which rises and then remains flat. In the pre-transitional group a relatively small proportion of pregnancies (19%) is unplanned and only 10% is unwanted. (Note that this finding is consistent with an average unmet need of 19% in this group of countries).[4] In contrast, at the end of the transition, more than half of all pregnancies (59%) are unplanned. In this group of countries women average 2.3 unplanned pregnancies over their lifetimes, which equals the sum of 1.1 abortions, 0.6 unwanted births, and 0.5 mistimed births.

The main findings from the preceding analysis are that unplanned pregnancy rates are substantial in all countries but are typically highest in mid-transition countries. Furthermore, the *fraction* of all pregnancies that is unplanned is highest in the developing countries with the lowest desired family size. In these societies at the end of the transition almost one-third (1.2/3.8) of pregnancies yield an unwanted or mistimed birth, the unplanned *pregnancy rate* exceeds two per woman, and the unplanned *birth rate* exceeds one per woman.

It may seem surprising that in the first stages of the transition when contraceptive use (intended to avoid unplanned pregnancies) rises rapidly, unplanned pregnancies

[4] This comparison ignores a small number of contraceptive failures.

are also rising. These trends are explained by the increasing difficulty women face in avoiding unplanned pregnancies as desired family size declines and countries move through the fertility transition. In pre- and early transitional countries most of women's reproductive years are required to bear wanted and planned children because desired family size is high. There are few unplanned pregnancies because there is little time at risk of such pregnancies. High rates of wanted fertility remove most reproductive years from the risk of unintended pregnancy.

In contrast, in countries at the end of the transition, with a desired family size near two, only a small proportion of the reproductive years is needed to bear two wanted children. Women then face the challenging task of avoiding unplanned pregnancies during the remaining reproductive years. When women desire just a few births during their childbearing years, the risk of unintended pregnancy is high, because of the many years during which pregnancy is not wanted. If women are sexually active both before and after the period of having wanted births, as most women are, they could face 20 or more years at risk of unplanned pregnancy. The rise in the number of years at risk of unplanned pregnancies over the course of the transition means that the period during which women must practice consistent and effective contraception lengthens considerably. In a hypothetical population with no practice of contraception or abortion and a desired family size of two, women can experience as many as 6 or 7 unplanned births in addition to the two wanted children.

An increase in contraceptive use and abortion offsets the upward pressure on unplanned pregnancies due to an increase in exposure over the course of the transition. Ideally there would be no unplanned pregnancies if all women who wish to avoid pregnancy use 100% effective contraception. In reality, few women are able to achieve this outcome. As discussed above, actual use falls short of demand even though both rise as the transition proceeds. The size of the gap between use and demand depends on the obstacles to contraceptive use identified above. As countries proceed through the transition, the obstacles typically decline, often aided by family planning programs. In addition, the opportunity costs of unintended births rise as women become more educated and have more flexible time because of fewer children, and able to earn an income in the market economy, thus leading to more careful and effective use of contraception. (Of course, the causal arrow also runs in the opposite direction: careful and effective use of contraception is a liberating force allowing women to more easily attain higher levels of education and higher rates of employment in the economy).

An additional factor contributing to substantial unplanned pregnancy rates especially in the later phases of the transition is the occasional failure of all contraceptive methods except sterilization.[5] A typical annual failure rate for pill users is 10% which implies a fifty percent failure rate in about seven years of use. Methods such as the IUD and implants have higher effectiveness, but the cumulative risk of an unplanned pregnancy over a decade or more is still substantial. The high level of unwanted births flowing from this substantial risk is reduced significantly by the use of abortion.

[5] Although, tubal sterilization is considered a permanent method of fertility control, pregnancy can occur in very rare cases.

In sum, any women who is sexually active and wants a small family has the difficult task of avoiding unplanned pregnancies during the many years she is at risk of conceiving. The transition in individual reproductive behavior entailed in moving to a small family norm requires a large increase in the level of birth control throughout the fecund years.

As countries move through their fertility transitions, the obstacles to consistent and effective birth control continue to be substantial for many women. As a result, the justification for public investment in low-cost access to high quality birth control extends into the later stages of fertility transition and persists even in post-transition societies. The key role of family planning programs in assisting women in implementing their reproductive preferences will be discussed in more detail in Chap. 7.

Appendix 1

Standard demographic methods are used to decompose the change in CPR into contributions made by changes in the demand for contraception and changes in the satisfaction of this demand (Das Gupta, 1993).

The following variables are used:

CPR	contraceptive prevalence among married/in union women.
D	Demand for contraception.
DS	Proportion of demand that is implemented.
ΔCPR	Change in CPR between first and last survey.
ΔCPRA	Component of ΔCPR attributable to change in demand between first and last survey.
ΔCPRB	Component of ΔCPR attributable to change in satisfaction between first and last survey.

By definition, CPR = Dx DS.

Let the subscripts 1 and 2 refer, respectively, to the first and last available survey then the change in the CPR between the surveys is decomposed into its components by

$$\Delta CPR = \Delta CPRA + \Delta CPRB = \Delta D \times (DS1 + DS2)/2 + \Delta DS \times (D1 + D2)/2$$

$$\Delta CPRA = \Delta D \times (DS1 + DS2)/2$$

$$\Delta CPRB = \Delta DS \times (D1 + D2)/2$$

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