

Multiple Perspectives on Recent Trends in Unwanted Fertility in Low- and Middle-Income Countries

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ABSTRACT The last four decades have witnessed large declines in fertility globally. This study uses data from 78 low- and middle-income countries to examine concurrent trends in unwanted fertility. Three measures of unwanted fertility are contrasted: the conventional unwanted total fertility rate, a proposed conditional unwanted fertility rate, and the percentage of births unwanted. Incidence of unwanted births and prevalence of exposure to unwanted births are both derived from answers to questions on prospective fertility preference, recognized as the most valid and reliable survey measure of preferences. Country-level trends are modeled both historically and with the decline in total fertility, with a focus on regional differentials. Results show that unwanted fertility rates—especially the conditional unwanted fertility rate—have declined substantially in recent decades. By contrast, the percentage of births unwanted has declined less, remaining stable or even increasing: from a birth cohort perspective, declines in unwanted fertility have been far more modest than the increased parental success in avoiding unwanted births. The regional patterns suggest that sub-Saharan Africa has several similarities with other major regions but also some peculiar features, including a recent stall in the decline of unwanted fertility that persists after controlling for the stage of fertility transition.

KEYWORDS Unwanted fertility • Unwanted fertility trend • Fertility transition • Fertility preferences • Sub-Saharan Africa

Introduction

Demographic surveys have documented large declines in national fertility rates during the last four decades, with only a small fraction of countries—mostly located in sub-Saharan Africa—still having a total fertility rate (TFR) in excess of 3.0 children per woman (Bongaarts and Casterline 2013; United Nations 2019). Fertility transition is frequently portrayed as driven mainly by declines in desired fertility: women bear fewer children because they prefer to have smaller families as a response to changing balances of childbearing costs and benefits (Davis 1967; Galor 2012; Pritchett 1994). Documented declines in unwanted and unplanned births (Bearak et al. 2018; Sedgh et al. 2014; Singh et al. 2010), however, raise doubts about the sufficiency of this explanation, as these declines provide competing evidence that implementation of

fertility preferences is a further driver of fertility decline. This position is argued by Knodel and van de Walle (1979) for historical Europe and supported empirically by Günther and Harttgen (2016) for fertility declines in the period 1985–2011.

A distinction between wanted and unwanted fertility has long directed fertility research, reflecting not only theoretical but also policy concerns. We conform to a large and continuing literature in assuming that this distinction is meaningful, while also acknowledging that the assumption merits deeper investigation (e.g., via ethnography as in Kreager 1982). From a policy standpoint, a primary goal of investments in family planning services is to reduce the incidence of undesired births, guided by the assumption that such births have costs for the child, the mother, the household, and the community (Gipson et al. 2008).

This article provides an analysis of trends in unwanted fertility in low- and middle-income countries (LMICs) from the 1970s to the present, with a focus on how unwanted fertility changes with the decline in overall fertility. The analysis makes use of a broad set of fertility surveys that goes beyond Demographic and Health Surveys (DHS) to provide more historical depth and regional representation. It also avoids the dependence on retrospective reporting of birth wantedness—known to be of low validity—by measuring the incidence of unwanted births based on the more valid and reliable prospective preference item. Two further novel features in this study are the introduction of conditional fertility rates and the distinction between woman-centered and child-centered perspectives.

Measuring Unwanted Fertility

Unwanted fertility refers to births to women who—at the time of conception—did not want to have a (further) birth. The notion of unwanted fertility per se does not assume a fixed lifetime desired number of children, nor any other assumptions of unchanging fertility preferences, though some measures of unwanted fertility may require invoking such assumptions. Instead, in this analysis, unwanted fertility is treated as a period fertility outcome.

We construct three measures of unwanted fertility. Our nomenclature is as follows, with each element calculated for a specified reference period (in this analysis, months 1–36 preceding the survey):

f_a = age-specific fertility rate in age-group a ;

u_a = proportion of births unwanted among all births to women in age-group a ;

B_a = total number of births to women in age-group a ; and

W_a^n = total number of woman-years spent wanting no more births in age-group a .

Age-groups are the seven conventional five-year age-groups, from 15–19 to 45–49.

A commonly used measure of period unwanted fertility, which adopts a woman-based perspective, is the *unwanted total fertility rate* (uTFR). The uTFR is the number of unwanted births a woman would bear if she were exposed during her entire reproductive career to the age-specific unwanted fertility rates of a specific period. The age-specific unwanted fertility rate is defined as the number of unwanted live births divided by total woman-years in that age-group:

$$\text{uTFR} = 5 \times \sum_a u_a f_a. \quad (1)$$

uTFR is the measure of unwanted fertility featured in DHS analyses, including survey main reports and StatCompiler. An appealing attribute of uTFR is its formal comparability to the TFR, the standard measure of period fertility.

However, uTFR is an imperfect indicator of trends in the achievement of fertility preferences, for the following reason. If two populations have the same level of success in preventing unwanted births, the population with a higher proportion of women wanting no more children will have higher unwanted age-specific fertility rates and, hence, a higher uTFR. As an illustration, assume a specific age-group in which women who want more children bear 200 children per 1,000 woman-years of exposure, while women who want no more children bear 100 children per 1,000 woman-years of exposure. The age-specific unwanted fertility rate would be 20 children per 1,000 woman-years if 20% of women want no more children, while it would be 80 children per 1,000 woman-years if 80% of women want no more children. Hence, an increase over time in uTFR can occur even if childbearing among women who want no more children remains constant if the composition of women shifts toward a larger fraction of women wanting to stop childbearing, as is expected to occur in the course of fertility transition. This can render uTFR a misleading indicator of trends in successful implementation of preferences.

To adjust for variation among countries and within countries over time in the fertility preference composition of women of reproductive age, we propose a new measure of unwanted fertility, the *conditional unwanted fertility rate* (CUFR). This is defined as the number of unwanted births per 1,000 woman-years lived in the state of wanting no (more) children:

$$\text{CUFR} = 1,000 \times \frac{\sum_a u_a B_a}{\sum_a W_a^n} \quad (2)$$

Unlike uTFR, CUFR is not formally dependent on the preference composition of the population (setting aside selection on fecundability that may be associated empirically with the fraction of women who want no more). Hence, in comparisons across countries or across time, CUFR serves as an indicator of success in the realization of fertility preferences unaffected by variation in population composition according to fertility preferences.¹ We calculate W_a^n relying on age- and order-specific proportions not wanting another birth at the survey; these aggregate-level proportions are assumed stable over the brief 36-month reference period.

We present CUFR as a new measure of unwanted fertility, but it is in fact a reintroduction of a measure that has been sporadically proposed over the past five decades. In the 1970s, conditional rates figured centrally in an intense debate about the nature of the sharp decline in U.S. fertility that began in the early 1960s (the “baby bust”). At issue was the relative contributions of change in fertility desires and improved success in avoiding unplanned births. To obtain a clearer picture of the latter source of change, Ryder (1976) and Westoff and Ryder (1977) argued for the

¹ For the CUFR to be defined, a positive fraction of the women in the population need to want no more children. In some settings, this condition may not obtain at young ages, but this does not threaten the overall CUFR, which is defined as the weighted average of age-specific conditional rates—that is, age-specific conditional rates with zero denominator are weighted by zero.

analytical value of eliminating from measures of unwanted fertility the confounding effect of preference composition. They proposed a measure that adheres to the “classic form of demographic rate”: an unwanted fertility rate that is “unwanted births per thousand women-years of exposure to risk of an unwanted birth” (Westoff and Ryder 1977:263). Westoff and Ryder concluded that improved success in avoiding unplanned births—itsself because of both new contraceptive technology and more disciplined contraceptive practice—made a substantial contribution to the fertility decline, accounting for at least half of the decline. Blake and Das Gupta (1975, 1978) disputed this conclusion, instead arguing that changes in fertility desires accounted for almost all the decline. The empirical basis for their stance was a decomposition exercise that also relied on the conditional unwanted rate (but their values differed substantially from Westoff and Ryder’s). A further contribution to this literature was Lee’s (1977) innovative effort to model joint trends in fertility and fertility desires; Lee too devised a conditional rate, in his case a conditional wanted fertility rate. In the four decades after 1980, however, the lone employment of a conditional rate that we have located is Bongaarts (1992).² Bongaarts specified a fertility rate equivalent to our CUFR and employed it in multicountry DHS analysis; to our knowledge he has not employed it since. We suspect the argument that a measure resembling CUFR would be analytically useful has appeared now and again in the literature: for example, in a review of race and ethnic differentials in fertility in the United States, Sweeney and Raley (2014) suggested that the birth rate among women who do not intend to become pregnant might be revealing, and then lamented the unavailability of such information in the literature.³

A third indicator that can be used to measure the incidence of unwanted fertility in a population is the *percentage of births unwanted* (PBU). In contrast to both uTFR and CUFR, which are woman-based measures, PBU is child-based: the proportion of births occurring in a specific period that are unwanted—that is, the proportion of a birth cohort that is unwanted:

$$\text{PBU} = 100 \times \frac{\sum_a u_a B_a}{\sum_a B_a}. \quad (3)$$

Formally, PBU is independent of the overall level of fertility, in contrast to uTFR and CUFR. PBU is a function of the ratio of conditional wanted and unwanted rates. As illustration, consider a population in which preference composition remains stable and both conditional fertility rates are halved—that is, the ratio of conditional wanted and unwanted rates is unchanged. In this scenario, all woman-based fertility rates would decline by half (the conditional wanted rate, the conditional unwanted rate, and the

² The estimation approach of Bearak et al. (2018, 2020) uses conditional rates that are essentially equivalent to what we propose here, but only unconditional rates are presented and discussed.

³ We speculate that the difficulty of ascertaining woman-years of exposure to an unwanted birth is a main reason for the neglect of conditional rates in the literature. Ryder (1976) and Westoff and Ryder (1977) allocate exposure to the states of wanted versus unwanted through a complicated tracking of months in women’s recent histories. This approach places very heavy demands on measurement. Our approach is far simpler: we rely on preference composition at the survey (age- and order-specific), making the assumption that this changes minimally over a brief reference period. Bongaarts (1992) does the same.

unwanted total fertility rate), but the percentage of births unwanted would remain the same. While the explicit distinction between woman-based and child-based measures is missing from the recent literature on undesired fertility, demographers have long been attuned to this distinction. For example, Preston (1976) explicated the numerical difference between the average number of children of a cohort of women and the average sib-set size of a cohort of children. A more recent instance of research that hinges on this distinction is the Smith-Greenaway and Trinitapoli (2020) analysis of the contrast between infant mortality rates and maternal experience of a child death in sub-Saharan Africa.

Emphasizing different aspects of the fertility preference–behavior nexus, the empirical association of the three measures of unwanted fertility is relatively unconstrained. They may also exhibit different patterns of change with typical changes in TFR. Assuming that changes in preferences precede behavioral changes that implement the emerging desire for fewer children, we can expect the following historical trajectories. In the first stage of fertility transition, both uTFR and PBU increase while CUFR remains stable. As the fertility transition progresses and behavioral implementation of the emergent desire to avoid births becomes more common, CUFR declines, while uTFR and PBU level off and then start to decline. Both uTFR and PBU, hence, are expected to follow an inverted-U pattern during fertility transition (Bongaarts 1997). Because it is less dependent on the overall level of fertility, PBU is expected to exhibit a slower decline with the decline in TFR than would uTFR. These are the *expected* patterns under a *typical* scenario of fertility transition. The experience of individual countries, of course, can depart from these stylized patterns. It should be stressed, in addition, that none of the three indicators of unwanted fertility adjusts for concomitant changes in the reproductive career that are common components of fertility transition, such as nuptiality change and changes in interbirth intervals.

Data and Methods

Data Sources

This study makes use of a large archive of 360 fertility surveys covering 78 LMICs from five geographic regions (East and South Africa, Middle and West Africa, Latin America, South and Southeast Asia, and West Asia and North Africa). The analysis is based on data on live births and fertility preference from at least two surveys per country. The included surveys are from five major survey programs:

- World Fertility Survey (1975–1983) (WFS),
- Demographic and Health Surveys (1985–2019) (DHS),
- Reproductive Health Surveys (1984–2008) (RHS),
- Pan-Arab Child Health and Family Health Surveys (1990–2004) (PAP), and
- Multiple Indicator Cluster Surveys (2010–2019) (MICS).

In addition, we included a few local surveys that were not associated with any of these major survey programs. (Table A1 in the online appendix provides a list of countries and surveys included in the analysis, classified by region.) [Table 1](#)

Table 1 Sample sizes and median values of unwanted fertility indicators, by region

Region	Sample Sizes			Median Values of Indicators		
	Countries	Surveys	Women ^a	uTFR	CUFR	PBU
East and South Africa	16	73	670,498	1.35	120	22.1
West and Middle Africa	21	90	921,917	0.57	96	8.3
Latin America	18	89	1,158,412	1.27	88	33.3
South and Southeast Asia	12	59	1,102,395	0.90	63	24.6
West Asia and North Africa	11	49	434,902	1.01	97	26.5
Total	78	360	4,288,124	0.98	98	23.2

Notes: uTFR = unwanted total fertility rate; CUFR = conditional unwanted fertility rate; PBU = percentage of births unwanted.

^a Women asked the fertility preference item.

presents the number of countries, surveys, and women used in the analysis, as well as the median values for each of the three measures of unwanted fertility, classified by region.⁴

Estimating Unwanted Fertility Measures

The three measures of unwanted fertility introduced earlier require calculation of the fraction of births occurring during a reference period that were unwanted. This calculation can be done directly or indirectly from fertility survey data. Direct estimators identify whether a specific birth is wanted, while indirect estimators infer the fraction of unwanted births without identifying the wantedness status of each individual birth.

There are three direct ways to identify whether a birth is wanted. The most straightforward measure assigns wantedness status to each birth on the basis of responses to a pair of direct retrospective items: “When you got pregnant with [name], did you want to get pregnant at that time?” and, if the response was no, “Did you want to have a baby later on, or did you not want any (more) children?” Regardless of its face validity, this approach has been shown to exhibit low test–retest reliability and to suffer from a strong tendency for ex-post rationalization in favor of births being wanted (Casterline and El-Zeini 2007; Cleland et al. 2020).

The second direct way to identify the wantedness status of births makes use of the prospective question “Would you like to have (a/another) child, or would you prefer not to have any (more) children?” to infer the status of subsequent births. Studies have shown that answers to questions about future fertility preferences are far more reliable than answers to retrospective questions (Casterline and El-Zeini 2007). The main drawback of the direct prospective approach is the requirement of longitudinal

⁴ Tables A2 and A3 in the online appendix show the distribution of surveys by region and historical period and by level of TFR, respectively. The number of surveys in each cell is acceptably large, with the exception of low fertility (TFR < 4.0) in Middle and West Africa and high fertility (TFR ≥ 6.0) in Latin America and in South and Southeast Asia. We do not present estimates for these TFR ranges in these regions.

observation of the same women, ideally in a short observation period to ensure stability of individual preferences.

In light of the lack of panel data and distrust for direct retrospective responses, the DHS employs a third approach to identify unwanted births. A woman's actual number of living children at the time of each birth is compared with her ideal number of children as stated in the survey interview, and on the basis of this comparison, individual births are classified as wanted or unwanted. The woman's ideal number of children is solicited using the question "If you could go back to the time you did not have any children and could choose exactly the number of children to have in your whole life, how many would that be?" This method, developed by Lightbourne (1985), has gained wide acceptance because of its adoption by DHS despite the low reliability of the ideal family size item and several other defects in using it as an approach for identifying unwanted births (Bongaarts 1990; Casterline and El-Zeini 2007). Ex-post rationalization and the implicit assumption of constant fertility desires (regardless of the sex composition of living children and changes in material circumstances, among other things) are two serious problems that threaten the validity of estimates from this approach.

Because the estimation of aggregate-level unwanted fertility rates does not intrinsically require the classification of individual births as wanted or unwanted, some scholars have proposed indirectly inferring the fraction of births unwanted without classification of individual births (Bongaarts 1990; Casterline and El-Zeini 2007; Kulkarni and Choe 1998). All indirect approaches have in common the reliance on the prospective preference item, which, as already noted, is generally regarded as the most valid and reliable fertility attitude item. We adopt here the aggregate prospective approach to the estimation of unwanted fertility proposed by Casterline and El-Zeini (2007). This approach is briefly specified in the online appendix. In this sample of surveys, the Casterline–El-Zeini estimate of the percentage of births unwanted is, on average, about 65% higher than the direct retrospective percentage and 36% higher than the ideal versus actual method developed by Lightbourne.

Using the Casterline–El-Zeini approach, we can derive PBU estimates, stratified by mother's age. With these in hand, uTFR and CUFR can be straightforwardly calculated using formulas (1) and (2). Note that uTFR is the only one of the three measures that is age-standardized and expressed in terms of a synthetic cohort. CUFR is equivalent to the unwanted general fertility rate,⁵ while PBU is simply the fraction of births unwanted among all births regardless of the mothers' ages.

All surveys included in this study provide detailed birth histories and answers to the prospective preference item "Would you like to have (a/another) child, or would you prefer not to have any (more) children?" with only slight variations among surveys in the wording of this item. There is, however, intersurvey variability in the sample of women asked the prospective fertility question that could threaten estimation of trends. First, in most surveys, fertility preferences are not available for women who self-report as infecund ("cannot get pregnant"). Because the fraction of

⁵ Although it is computationally possible to calculate a synthetic cohort conditional rate, it is meaningless to assume a cohort experiencing only one kind of fertility preference throughout life. Alternative approaches to age standardization were tried and found to produce similar results to those produced using unstandardized rates.

such women varies among surveys, we exclude these women from estimation of the birth order-specific percentage of births unwanted.⁶ This is tantamount to assuming that fertility preferences are random with respect to self-reported infecundity, conditional on age and parity. Second, some surveys ask the fertility preference item only of women currently in a union. As it happens, there is very high correspondence between the union statuses of women asked the fertility preference item and the incidence of births outside of unions: where only currently in-union women are asked, the incidence of out-of-union births is very low. Hence, we generate birth order-specific (and, from this, age-specific) estimates of the percentage of births unwanted among births occurring 1–36 months before each survey, using the sample of women asked the prospective preference item in each survey. The order-specific and age-specific estimates of PBU are then applied to births of all women. The total number of women whose answers are used as the basis for estimating unwanted fertility measures are shown in [Table 1](#).

Modeling Trends

We examine two types of trends. The first is the historical trend, modeled through regressing each measure of unwanted fertility on survey year. Although global events can concurrently affect different countries, cross-national comparisons are best performed controlling for other structural features beyond calendar dates. Hence, the trend in unwanted fertility with the *decline* in TFR is also examined. To preserve historical direction, in regressions and figures, we treat TFR in reverse from higher to lower values. To achieve the same end in an analysis of trends in unwanted fertility, Bongaarts (1997) replaced historical time by the stage of fertility transition proxied by the percentage of women wanting no more children. Here, we adopt a similar approach, but use the national TFR as an overt measure of stage of fertility decline.⁷ One drawback of this choice is that it obscures the pace of decline; this is better reflected in the historical trend in unwanted fertility, our rationale for also showing historical trends.

Trends are summarized by regressing each of the three measures of unwanted fertility either on survey year or on reversed TFR using mixed-effects linear regression models. To allow for nonlinear trends, the models include quadratic terms for historical year and TFR. The five regions are explicitly represented by a five-category variable. Through interaction terms, regression coefficients (both linear and quadratic) are permitted to differ between the five regions. To represent country-specific

⁶ In the 360 surveys in this analysis, the mean percentage of women self-reporting as infecund is 3.3% and the median is 2.9%. In 10% of the surveys, the percentage infecund exceeds 7%. Excluding the women self-reporting as infecund raises the mean percentage of women not wanting another child by 1.3 percentage points (from 38.7% to 40.0%).

⁷ Bongaarts (1997) chose fertility preference as an indicator of fertility transition, understood as a change in the perceived balance of costs and benefits of childbearing, arguing that actual fertility is in part a function of success in the implementation of preferences. As far as it is parity-dependent, the percentage of women who want no more children is not completely pure of such implementation. Compared with actual TFR, fertility preference has the disadvantage of being stable within countries over time, such that overall trends become highly confounded with intercountry differentials in preferences.

eccentricities, a country-specific random effect is included in each model. Note that in obtaining the fitted regional trends, all countries in the region that offer more than one demographic survey receive equal weight. The lines do *not* summarize the experience of all women of reproductive age in the region, but rather the experience of a subset of countries.

Results

Historical Trends

Fitted curves relating the three unwanted fertility measures to historical years—stratified by region and showing 95% confidence intervals for each region—are displayed in [Figure 1](#). Slopes and predicted values at selected years are shown in [Table 2](#).

The unwanted fertility rate (panel a of [Figure 1](#)) shows a large linear decline during the last four decades in the three regions outside sub-Saharan Africa. In the two sub-Saharan regions, however, uTFR has been increasing slightly or almost flat for most of the decades of observation. The regional difference is evident in levels as well as trends, with uTFR in West and Middle Africa around half a child less per woman throughout the period, hardly exceeding the lowest level observed at any time in any region outside sub-Saharan Africa. This differential is even more striking when we consider that overall fertility levels in sub-Saharan Africa are far higher than in the other regions.

Table 2 Trends in unwanted fertility by historical year, by indicator and region

Region	Slope ^a at Specified Years		Predicted Values at Specified Years		
	1990	2010	1985	2000	2015
A. Unwanted Total Fertility Rate (uTFR)					
East and South Africa	0.23	-0.24	1.22	1.48	1.22
West and Middle Africa	0.06	-0.07	0.56	0.63	0.55
Latin America	-0.42	-0.39	1.82	1.20	0.61
South and Southeast Asia	-0.31	-0.34	1.44	0.97	0.47
West Asia and North Africa	-0.39	-0.35	1.64	1.06	0.52
B. Conditional Unwanted Fertility Rate (CUFR)					
East and South Africa	-38	-7	174	122	105
West and Middle Africa	-26	-3	133	99	91
Latin America	-32	-26	127	80	40
South and Southeast Asia	-29	-24	112	69	31
West Asia and North Africa	-38	-30	159	103	57
C. Percentage of Births Unwanted (PBU)					
East and South Africa	9.4	-1.8	14.1	26.1	25.5
West and Middle Africa	2.2	-0.3	6.5	9.4	9.4
Latin America	-2.4	-5.3	37.7	33.5	26.1
South and Southeast Asia	-1.5	-5.9	29.7	26.7	18.7
West Asia and North Africa	-1.3	-7.4	28.4	25.4	15.5

^a Amount of change in indicator per decade.

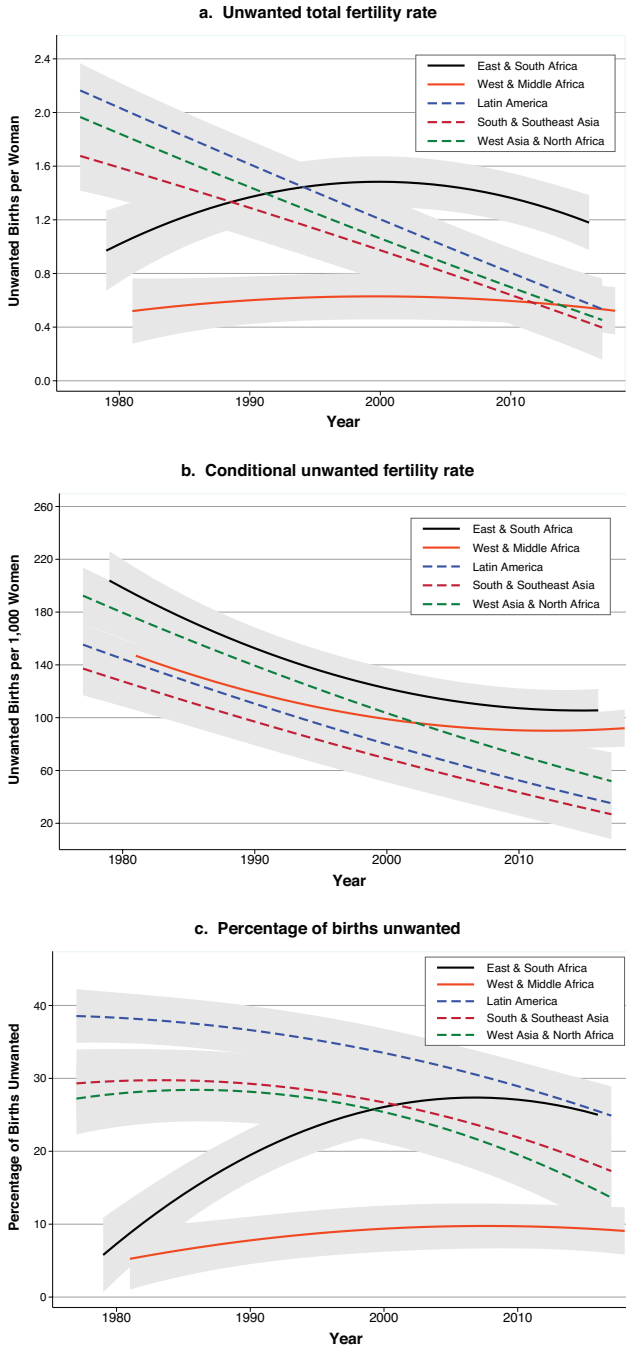


Fig. 1 Trends in (a) unwanted total fertility rate (uTFR), (b) conditional unwanted fertility rate (CUFR), and (c) percentage of births unwanted (PBU), by historical year. Shaded areas indicate 95% confidence intervals.

When we control for differences in fertility preference composition, however, we obtain a completely different picture in terms of both trends and levels.⁸ Conditional unwanted rates (panel b of Figure 1) have been declining in all regions and relatively rapidly. In all five regions, the fitted slope of decline in 1990 is steeper than in 2010, with this difference being largest in the two African regions and in West Asia and North Africa. Indeed, a leveling of the trend in the African regions at rates well above the other regions is evident. Moreover, average historical levels of CUFR in the sub-Saharan countries are consistently higher than those in Latin America and in South and Southeast Asia (although on par with the levels in West Asia and North Africa, except most recently).

Contrasting the historical trends in these two types of unwanted fertility rate, we can say that uTFR in the two sub-Saharan African regions has been relatively low and stable during the past four decades; however, this is mainly because of the pronatalism of these societies, especially in West and Middle Africa, such that the percentage of women wanting no more children is small. On the other hand, among those African women who want no more children, the rate of bearing unwanted births (i.e., CUFR) has been relatively high, though declining, during the same period. This marked decline is not evident if one depends solely on unconditional rates. The recent stall is a reason for concern. By the second decade of the twenty-first century, the decline in the average level of conditional unwanted fertility rates in sub-Saharan Africa is stalling at relatively high levels comparable to rates experienced in other regions two or three decades earlier.

Turning to the child-based measure of unwanted fertility, PBU (panel c of Figure 1) shows more divergent regional levels and trends. Considered together, however, the five curves hint at an inverted-U pattern: initial increase followed by subsequent decline. While the two sub-Saharan African regions appear to be still progressing through the first phase of increase, the other three regions have passed that phase by the start of the analysis period. Throughout the decades examined here, unwantedness as a birth-cohort attribute is significantly higher in Latin America and lower in West and Middle Africa than in the other three regions.

Smoothed fitted curves clarify patterns but hide within-region variation. This variation is depicted in Figures A1–A3 in the online appendix, in which both country lines and the fitted regression line are shown region by region. A general observation is that within-region variability in CUFR is less pronounced than variability in uTFR. National uTFR trajectories show several instances of increases and plateaus between consecutive surveys. In contrast, CUFR trajectories—except for a few outliers—are more uniformly declining. This gives further support to the conditional unwanted rate as a complement to the other established measures of unwanted fertility.

⁸ uTFR is age-standardized (equal weights for each age-group), whereas CUFR is not. We have calculated a non-age-standardized version of uTFR, analogous to the General Fertility Rate. Trends in this alternative indicator closely resemble trends in uTFR. From this, we conclude that the markedly different trends in uTFR and CUFR cannot be attributed to the fact that uTFR is age-standardized.

Trends With Fertility Transition

Historical trends are informative but confounded by level of fertility when comparing countries that stand at starkly different stages in their fertility transitions. To draw a clearer picture of how unwanted fertility changes over the course of fertility transition, we replace historical year with (reversed) TFR. Figure 2 displays these alternative trends, and Table 3 shows slopes and predicted levels for the three measures at selected TFR values. Regional slopes in Figure 2 differ from those in Figure 1 because of differential pace of fertility decline. And the relative horizontal positions of the regional curves are markedly different. (Country-specific lines and the fitted regional lines are shown in Figures A4–A6 of the online appendix.)

This horizontal shift clarifies several puzzling features with respect to the historical trend in sub-Saharan Africa. In comparison of sub-Saharan Africa to other regions at a similar stage of fertility transition in Figure 2, some African peculiarities in Figure 1 disappear while others are confirmed. The large differences in slopes in uTFR between sub-Saharan Africa and the other regions evident in panel a of Figure 1 are much attenuated when the comparison is made at similar levels of TFR, as shown in panel a of Figure 2. On the other hand, unwanted fertility levels in sub-Saharan Africa—especially in West and Middle Africa—are substantially lower than corresponding levels in other regions. Note that for the conditional rate, this

Table 3 Trends in unwanted fertility by TFR, by indicator and region

Region	Slope ^a at TFR = 4.5	Predicted Values at Specified Values of TFR		
		TFR = 6.0	TFR = 4.5	TFR = 3.0
A. Unwanted Total Fertility Rate (uTFR)				
East and South Africa	-0.07	1.42	1.35	1.20
West and Middle Africa	-0.11	0.62	0.54	— ^b
Latin America	-0.57	— ^b	1.96	1.08
South and Southeast Asia	-0.35	— ^b	1.50	0.84
West Asia and North Africa	-0.42	1.99	1.49	0.74
B. Conditional Unwanted Fertility Rate (CUFR)				
East and South Africa	-26	146	107	70
West and Middle Africa	-15	108	82	— ^b
Latin America	-42	— ^b	137	73
South and Southeast Asia	-38	— ^b	113	58
West Asia and North Africa	-37	186	134	76
C. Percentage of Births Unwanted (PBU)				
East and South Africa	6.0	19.1	26.6	37.1
West and Middle Africa	1.7	8.0	10.8	— ^b
Latin America	-2.5	— ^b	39.1	32.0
South and Southeast Asia	-0.6	— ^b	29.9	24.8
West Asia and North Africa	-2.6	29.5	27.7	21.7

Note: TFR = total fertility rate.

^a Amount of change in indicator for a one-birth decrease in TFR.

^b Insufficient empirical support.

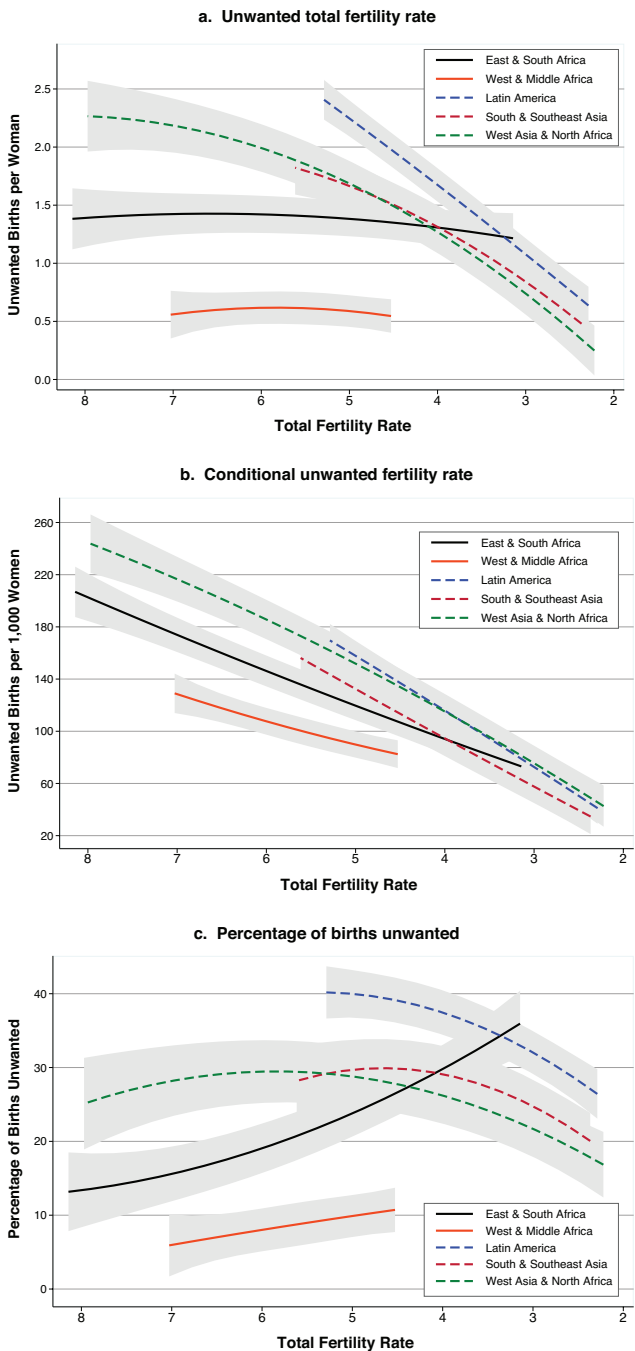


Fig. 2 Trends in (a) unwanted total fertility rate (uTFR), (b) conditional unwanted fertility rate (CUFR), and (c) percentage of births unwanted (PBU), by total fertility rate (reversed). Shaded areas indicate 95% confidence intervals.

conclusion differs from [Figure 1](#), in which, if anything, CUFR is somewhat higher in sub-Saharan Africa; controlling for the stage of fertility decline significantly alters the regional comparisons. The recent stall in CUFR decline in sub-Saharan Africa does not disappear, however.

The use of TFR in place of historical year when depicting trends in PBU gives some support to the speculation, noted earlier, that the pattern of change is similar among the major regions. The exception is East and South Africa, where PBU continues to increase even at a relatively advanced stage of fertility transition (panel c of [Figure 2](#)). But estimates for this region for $TFR < 4.0$ are, to this point, based on limited data (a few surveys for a few countries); it is too soon to draw any firm conclusions about how PBU will fare as fertility falls to low levels in this region. The more notable conclusion from [Table 3](#) and [Figure 2](#) is that where the child-based PBU has declined (i.e., outside of Africa), the declines are not nearly so large in proportionate terms as the declines in the woman-based uTFR and CUFR. The transition from high to low fertility entails an average reduction in uTFR and CUFR of two thirds or more; the average reduction in PBU, by contrast, is well below one half.

Using TFR as the temporal dimension when examining trends reveals an interesting feature that is not evident from regional comparison of historical trends—namely, a narrowing of regional differentials. For each of the three measures, the differences among regions are roughly as large in recent years as they were several decades ago (see [Figure 1](#)). On the other hand, for all three measures, the regional differences at low TFR are significantly smaller than the corresponding regional differences at high TFR (see [Figure 2](#)). For uTFR, this pattern is essentially per definition: as overall fertility declines, so too must the uTFR, and the lower the rates, the lower the potential variability. This is not the case, however, for the other two measures.

Discussion

This article has two principal goals: to consider alternative measures of unwanted fertility and, in particular, to make the case for CUFR; and to examine trends in unwanted fertility in LMICs from the mid-1970s to the present, with attention to regional differences and contrasting woman-based and child-based perspectives.

The analytical appeal of the conditional unwanted fertility rate—unwanted fertility among women at risk of unwanted births—is its control for preference composition. As a purer indicator of women's success in achieving their reproductive preferences than other conventional measures of unwanted fertility, CUFR is valuable when considering only one cross-sectional estimate. It is even more valuable in analysis of trends because the confounding effect of change in preference composition is eliminated. An increase in the fraction of women who do not want another child—an expected component of most fertility declines—places upward pressure on the unwanted TFR, and hence trends in uTFR often understate the amount of historical improvement in the translation of fertility preferences into reproductive outcomes.

This expectation is confirmed in this research: while the unwanted TFR has declined in all countries outside sub-Saharan Africa, the decline in the conditional unwanted rate is sharper and more uniform across countries. That African women who wish to stop childbearing have been increasingly successful over the past several decades is an important development that would not be recognized if one relied entirely on the conventional uTFR.

The consistent and substantial declines in the CUFR may be regarded as the most significant empirical finding of this research. Such enormous declines as documented here are indicative of an improvement in the exercise of fertility control that is remarkable in its magnitude and universality. This should be regarded as one of the major public health achievements of the past three decades. Identifying the factors behind this change is beyond the scope of this article. No doubt new contraceptive technology has contributed, in combination with the expansion of public and private provision of family planning services that has facilitated the adoption and continued use of the new technology.

Recognition that unwanted fertility rates have declined substantially in recent decades must be counterbalanced, however, by the fact that PBU has declined far less proportionately in most countries and has remained stable or even increased in a few countries. This is a birth cohort measure and is not a simple function of the unwanted fertility rates, but rather a function of the relative rates of wanted and unwanted childbearing. When rates of both wanted and unwanted childbearing decline, as has been the case in many countries, the fraction of births that are unwanted is not constrained to follow the downward trajectory of the woman-based unwanted fertility rates. What this analysis documents is that the incidence of unwanted fertility in recent generations of children has declined little relative to the decline in woman-based unwanted fertility rates, indeed, across birth cohorts, unwanted fertility has increased in almost all sub-Saharan African countries (albeit starting from very low levels). The triumph of vastly improved fertility control evident in the sharp decline in the conditional unwanted fertility rate corresponds with a far more modest accomplishment from a child-centered perspective. If it is the case that children from unwanted pregnancies are disadvantaged in various respects, as is documented by many empirical studies (Gipson et al. 2008), our results caution against mechanistic models of gains in child well-being following rather automatically on fertility decline.

Whether or not sub-Saharan Africa is following a pathway different from that of other regions is hard to ascertain. In this region, unwanted TFR is low in the earliest surveys, reflecting the small fraction of women who do not want another child. The conditional unwanted rates, by contrast, are not especially low in the earliest surveys, but after controlling for overall level of fertility, they are consistently lower than the conditional rates in other regions. On the face of it, this indicates that African women are more successful than women in other regions in translating their fertility preferences into reproductive outcomes. One plausible explanation for this unexpected finding is that women in sub-Saharan Africa who express a desire to terminate childbearing are, to this point, a select subset whose motivation (and means) is especially strong. It may also be the case that well-established birth spacing practices in African societies assist in the avoidance of unwanted births. The recent stall in the decline in conditional rates—even controlling for TFR—raises an important red flag: whatever

the factors are that kept unwanted fertility as low in sub-Saharan Africa as in other regions, their power is subsiding. Absent effective interventions, as the fraction of African women who want to limit childbearing grows, there is a risk that unwanted fertility may make an upward turn.

This is already evident for the birth cohort measure of unwanted fertility (PBU). The distinction in trajectories between sub-Saharan Africa and the other regions—“African exceptionalism”—is sharpest in panels c of [Figures 1](#) and [2](#), both of which show PBU increasing historically and as fertility declines in sub-Saharan Africa. Note that the African regions differ less from other regions in PBU in more recent surveys; instead, what sets apart the African regions is the relatively low PBU in the earliest surveys. That is, the eccentric African trajectories can be attributed mainly to differences in the pretransition reproductive regimes. The larger point is that in claiming “African exceptionalism,” it is important to be clear on its nature and sources.

Conclusion

Unwanted fertility is a reproductive outcome of long-standing interest because it is thought to be detrimental to the well-being of women and children ([Gipson et al. 2008](#)). Many previous studies that documented declines in the incidence of unplanned pregnancies and births suffered from one or more of the following limitations: confounding trend in preferences with trend in the success of implementing those preferences, failing to distinguish between woman- and child-based perspectives, and relying on retrospective reports of birth wantedness known to be downwardly biased. We addressed these limitations by studying trends in three complementary measures of unwanted fertility and employing a method for estimating unwanted fertility that hinges on prospective fertility preferences—arguably the most valid and reliable fertility attitude item offered by the international demographic survey programs.

Our analysis of trends in LMICs since the 1970s confirms the gains from adopting and contrasting different perspectives. The trend in unwanted fertility rates conditional on exposure to unwanted fertility has revealed substantial improvement in the success of women in achieving their fertility preference. From a child-based perspective, however, the picture is different: indeed, in many settings, the incidence of being unwanted among successive birth cohorts of children has hardly declined or even increased. This trend is evident in all the major geographic regions. By contrast, sub-Saharan Africa is distinctive in the marked deceleration of the decline in unwanted fertility from a woman-based perspective. This deceleration is evident if trends in rates are indexed by historical year or by level of total fertility. Further research is needed to better understand the factors behind this recent halting in sub-Saharan Africa of gains in woman’s effective exercise of fertility control. ■

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References

- Bearak, J., Popinchalk, A., Alkema, L., & Sedgh, G. (2018). Global, regional, and subregional trends in unintended pregnancy and its outcomes from 1990 to 2014: Estimates from a Bayesian hierarchical model. *Lancet Global Health*, 6, e380–e389. [https://doi.org/10.1016/S2214-109X\(18\)30029-9](https://doi.org/10.1016/S2214-109X(18)30029-9)
- Bearak, J., Popinchalk, A., Ganatra, B., Moller, A.-B., Tuncalp, O., Beavin, C., . . . Alkema, L. (2020). Unintended pregnancy and abortion by income, region, and the legal status of abortion: Estimates from a comprehensive model for 1990–2019. *Lancet Global Health*, 8, e1152–e1161. [https://doi.org/10.1016/S2214-109X\(20\)30315-6](https://doi.org/10.1016/S2214-109X(20)30315-6)
- Blake, J., & Das Gupta, P. (1975). Reproductive motivation versus contraceptive technology: Is recent American experience an exception? *Population and Development Review*, 1, 229–249.
- Blake, J., & Das Gupta, P. (1978). Reply to “On the time series of American fertility.” *Population and Development Review*, 4, 326–329.
- Bongaarts, J. (1990). The measurement of wanted fertility. *Population and Development Review*, 16, 487–506.
- Bongaarts, J. (1992). Do reproductive intentions matter? *International Family Planning Perspectives*, 18, 102–108.
- Bongaarts, J. (1997). Trends in unwanted childbearing in the developing world. *Studies in Family Planning*, 28, 267–277.
- Bongaarts, J., & Casterline, J. (2013). Fertility transition: Is sub-Saharan Africa different? *Population and Development Review*, 38(S1), 153–168.
- Casterline, J. B., & El-Zeini, L. O. (2007). The estimation of unwanted fertility. *Demography*, 44, 729–745.
- Cleland, J., Machiyama, K., & Casterline, J. B. (2020). Fertility preferences and subsequent childbearing in Africa and Asia: A synthesis of evidence from longitudinal studies in 28 populations. *Population Studies*, 74, 1–21.
- Davis, K. (1967). Population policy: Will current programs succeed? *Science*, 158, 730–739.
- Galor, O. (2012). The demographic transition: Causes and consequences. *Cliometrica*, 6, 1–28.
- Gipson, J. D., Koenig, M. A., & Hindin, M. J. (2008). The effects of unintended pregnancy on infant, child, and parental health: A review of the literature. *Studies in Family Planning*, 39, 18–38.
- Günther, I., & Harttgen, K. (2016). Desired fertility and number of children born across time and space. *Demography*, 53, 55–83.
- Knodel, J., & van de Walle, E. (1979). Lessons from the past: Policy implications of historical fertility studies. *Population and Development Review*, 5, 217–245.
- Kreager, P. (1982). Demography *in situ*. *Population and Development Review*, 8, 237–266.
- Kulkarni, S., & Choe, M. K. (1998). *Wanted and unwanted fertility in selected states of India* (National Family Health Survey Subject Reports, No. 6). Mumbai, India: International Institute for Population Sciences; Honolulu, HI: East-West Center Program on Population.
- Lee, R. D. (1977). Target fertility, contraception, and aggregate fertility rates: Toward a formal synthesis. *Demography*, 14, 455–479.
- Lightbourne, R. (1985). Individual preferences and fertility behaviour. In J. Cleland & J. Hobcraft (Eds.), *Reproductive change in developing countries: Insights from the World Fertility Survey* (pp. 165–198). Oxford, UK: Oxford University Press.
- Preston, S. H. (1976). Family sizes of children and family sizes of women. *Demography*, 13, 105–114.
- Pritchett, L. H. (1994). Desired fertility and the impact of population policies. *Population and Development Review*, 20, 1–55.
- Ryder, N. B. (1976). The specification of fertility planning status. *Family Planning Perspectives*, 8, 283–290.
- Sedgh, G., Singh, S., & Hussain, R. (2014). Intended and unintended pregnancies worldwide in 2012 and recent trends. *Studies in Family Planning*, 45, 301–314.
- Singh, S., Sedgh, G., & Hussain, R. (2010). Unintended pregnancy: Worldwide levels, trends, and outcomes. *Studies in Family Planning*, 41, 241–250.
- Smith-Greenaway, E., & Trinitapoli, J. (2020). Maternal cumulative prevalence measures of child mortality show heavy burden in sub-Saharan Africa. *Proceedings of the National Academy of Sciences*, 117, 4027–4033.
- Sweeney, M. M., & Raley, R. K. (2014). Race, ethnicity, and the changing context of childbearing in the United States. *Annual Review of Sociology*, 40, 539–558.

- United Nations. (2019). *World population prospects 2019: Highlights* (Report). New York, NY: United Nations, Department of Economic and Social Affairs.
- Westoff, C. F., & Ryder, N. B. (1977). *The contraceptive revolution*. Princeton, NJ: Princeton University Press.

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