Below-Replacement Fertility

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Abstract

When a human population has underlying birth rates too low to sustain its current population size, it has *below-replacement fertility*. If mortality rates are low, then replacement-level fertility is slightly above two births per woman. Currently, over 50% of the global population lives in a country with below-replacement fertility; below-replacement fertility is especially widespread in developed countries and is emerging in many developing ones. But there is substantial variation in degree—some countries having very low fertility (below 1.5 births) and other countries (such as the United States) have levels at or near the replacement level. Because the level of fertility intended (or desired) approximates two births per woman in most countries, explanations for fertility levels below replacement levels focus on why people fail to have the number of children they intend. An important factor is fertility timing. Postponement of fertility to older ages reduces birth rates in current periods (lowering period fertility rates), but it also exposes persons to events and experiences that may lead them to forego childbearing or additional births. Below-replacement fertility produces important macro-level effects (e.g., a population with older persons and a declining population size). Average fertility below two births also impacts families and individuals' life courses and activities.

INTRODUCTION

Below-replacement fertility exists when the average woman does not replace herself with a female child before her death. The *net reproduction rate* (NRR) precisely measures this concept of "replacement," and it is a widely used measure of species/population reproductive fitness. Using this measure, below-replacement fertility exists when the NRR < 1.0; if such a rate were maintained at the global level, it would lead to species extinction (because NRR < 1.0 means that each generation will be smaller than the preceding one). The disappearance of many evolutionary strands of humans as well as many other species is the result of this imbalance of vital rates favoring mortality. In contrast, dramatic human population growth over the past few centuries is the result of fertility levels well above mortality levels (and thus NRR well above 1.0).

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While less precise, other measures of replacement-level fertility are commonly used for human populations. Specifically, when mortality is low and sex ratios modest (as in most contemporary developed countries), an average of 2.1 children will approximate replacement-level fertility—two children to "replace" each parent and the 0.1 as an adjustment for the few women who do not survive through the childbearing years. Thus, birth cohorts of women that average 2.1 children, or a sustained period in which the sum of age-specific fertility rates (the total fertility rate, TFR) equals 2.1, will result in replacement-level fertility. Approximately half of the world's population now lives in a country with a TFR < 2.1, many countries have TFRs below 1.5, and "lowest-low fertility" (i.e., TFRs < 1.3, see Kohler, Billari, & Ortega, 2002) is not uncommon.

To illustrate contemporary variation in below-replacement fertility, Table 1 lists selected countries with their estimated NRRs (column 1) and TFRs (column 2) for the period 2005–2010. If these rates were maintained over a long period, they imply, taking Germany as an example, that each succeeding generation would be 65% as large as the former (the NRR) and that women would average 1.36 births (the TFR). These rates imply a negative growth rate of 1.42% per year (column 3) and 49 years for the population to reach half its size (the halving time, column 4). Column 5 shows that most of these countries have had low fertility for several decades, for instance Germany's TFR fell below 2.1 in the 1970–1975 period.

For two reasons, below-replacement fertility does not imply immediate population decline, and replacement-level fertility does not imply zero population growth. First, immigration adds to the population, just as births do, and thus can offset the effects of low birth rates on population size. Secondly, positive *population momentum* can also offset low birth rates; this refers to a young age structure that will produce increasing proportions (and numbers) of reproductive age women in subsequent years. Becuase the number of births is the product of birth rates and the number of women of childbearing age, an increasing number of reproductive age women can offset low or declining birth rates, at least in the near term. To illustrate, Table 1 column 6, shows the actual population change experienced by these low-fertility countries in the 2005–2010 period. In most cases, population declines are not observed despite subreplacement-level fertility due to the effects of population momentum and/or immigration.

The difference in recent experience (rough stability or population growth in column 6) and the long-term projections (some countries experiencing dramatic population decline, columns 3 and 4) are striking. The long-term projections are not inevitable. Immigration can continue indefinitely if source populations remain and receiving countries are willing to accept migrants. However, sustained low fertility will slowly transform a population's age

Table 1
Variation in Low Fertility Rates

Country	NRR 2005–2010[a]	TFR 2005–2010[a]	NRR implied % growth rate[b]	Implied years to halve[c]	Period when TFR first fell below 2.1[a]	Obs. rate of pop. change 2005–2010[a]
	(1)	(2)	(3)	(4)	(5)	(6)
Europe						
France	0.95	1.97	−0.17	414	1975–1980	0.6
Germany	0.65	1.36	−1.42	49	1970–1975	−0.1
Russian Federation	0.68	1.44	−1.29	54	1965–1970	−0.1
Italy	0.66	1.38	−1.37	50	1975–1980	0.6
Spain	0.68	1.41	−1.30	53	1980–1985	1.2
Sweden	0.91	1.64	−0.30	231	1970–1975	0.8
Asia						
China	0.71	1.64	−1.12	62	1990–1995	0.5
Japan	0.64	1.32	−1.50	46	1955–1960	0
S. Korea	0.61	1.29	−1.67	42	1985–1990	0.5
Australia/New Zealand						
Australia	0.93	1.75	−0.25	274	1975–1980	1.7
North America						
Unites States	1.00	2.07	−0.01	6921	1970–1975	0.9

[a] *Source*: United Nations (2011).
[b] Long-term growth rate assuming mean age of childbearing equals 30 and no migration. $R = (\ln(\text{NRR}))/30$. See Preston *et al*. (2001), p. 152.
[c] Time to halve equals the absolute value of $(100 \times \ln(2))/(\%\ \text{growth rate})$. See Preston *et al*. (2001), p. 12.

structure as low fertility replaces larger birth cohorts (produced by higher fertility in the earlier period) with smaller ones. This "top-heavy" age structure generates *negative population momentum* (a reversal of the earlier pattern) that can sustain population decline even if fertility rates begin to recover. Again, column (5) shows that below-replacement fertility has been in place for several decades and thus the force of positive population momentum is waning. If we assume that immigration will eventually cease and acknowledge that the effect of positive population momentum is time limited, then the import of fertility well below replacement cannot be ignored—halving times of 50 years portend serious societal challenges.

Very low fertility has many consequences. At the macro level, fertility is the primary determinant of a population's age structure and low fertility reduces population size. The lower the fertility rate, the more rapid and dramatic are these changes (see Table 1). Specifically, below-replacement fertility shifts the age distribution of the population upward. Aging populations impact many societal institutions that are age graded—schools for children, labor force opportunities for adults, social security for the elderly, and so

Table 2
Variation in Low Fertility Rates[a]

	One child (1)	Two children (2)	Three children (3)
Grandparents	4	4	4
Aunts/uncles	0	2	4
Parents	2	2	2
Siblings	0	1	2
Cousins	0	4	8
Total	6	13	20

[a]Ego's parents and grandparents have the number of children indicated. This calculation assumes no mortality.

on. These age distribution shifts (e.g., more elderly persons) require institutional adjustment (e.g., additional resources for elderly care and support). Declining population size can also be a concern. Initially, low fertility impacts demand/consumption of goods for children, but eventually it reduces the number of consumers at all ages. A smaller population can also reduce the tax base and effect economies of scale; thus, the ability to support infrastructure may decline. Further, a reduced population size may be a major threat if key societal positions cannot be filled. Population size can also affect a country's military strength by constraining the size of its armed forces. This in turn might influence a country's ability to negotiate or demand favorable interactions with other countries (Teitelbaum & Winter, 1985).

At the household level, low fertility has a dramatic effect on family composition by shifting the number and character of available kin. For instance, the first column of Table 2 shows that a singleton born to singleton parents has no siblings, no aunts/uncles, and no cousins. Assuming no mortality, the singleton does have two parents and four grandparents. Thus, low fertility produces small kin networks dominated by the older generations. These relatives may provide considerable support when ego is young; but the burden of old age care on ego could be significant as the senior generation ages. If we assume constant fertility across generations of two or three births, in columns 2 and 3 respectively, we see much larger and more diverse kinship networks. Finally, at the individual level, fertility may be lower than intended or desired by women and men. Most persons in most developed countries state preferences for at least two children. Thus, given the desires of potential parents, childlessness and one-child families may not be optimal for individual well-being or happiness.

But there are also advantages of low fertility, and some concerns attributed to subreplacement fertility may be exaggerated. First, when fertility first falls to low levels, there is a "demographic dividend" because the first age

groups to grow larger in an aging society are working age persons (Mason & Lee, 2006). Thus, for a few decades the *dependency ratio* (number of persons too young or old to work divided by number of working age persons) remains small, and the resources needed for the education and/or care of dependents is reduced. This allows for lower taxes and/or greater investments in infrastructure in the short term. In the longer term, low fertility (and a smaller population) places less pressure on natural resources and on the environment. In addition, concerns about an aging population may be exaggerated. Older persons, especially if in good health and with support for life-long learning, can be a valuable resource. Pay-as-you go support systems for retirees can be adjusted (e.g., by increasing the eligibility age) so that expenses equal revenues. Finally, the reduced numbers of siblings and cousins resulting from low fertility may increase intergenerational transfers advantaging the fewer children that are born. Nonfamilial transfers (e.g., by the government), if maintained at a given level, imply higher per-capita investments in children (because of their smaller number). And finally, for adults, having fewer children may allow greater time and resources for activities that are equally or more rewarding than parenthood.

FOUNDATIONAL RESEARCH

Demographic Interrelations

The mathematical interrelations of birth, death, and migration rates and their impacts on the population's age structure are well understood (Preston, Heuveline, & Guillot, 2001). Several aspects are especially important for low-fertility populations and were noted in the earlier section. First, replacement (NRR = 1) can hold under conditions of high and low fertility, as not all children will survive to adulthood. Espenshade, Guzman, and Westoff (2003) show that in the period 1995–2000, replacement-level fertility (measured as the TFR) ranged from 2.1 (e.g., in Europe and the North America) to 2.7 (in Africa), with the variation produced by higher mortality in developing countries.

Second, we alluded earlier to positive population momentum—young age structures (produced by several decades of above-replacement fertility) guarantee larger proportions/number of women in the childbearing years over the next generation (approximately 30 years). This momentum can keep populations growing even as fertility falls to the replacement level or below. But several decades of below-replacement fertility will result in the opposite effect—an older age structure with negative momentum (shrinking population) for approximately a generation, even if replacement-level fertility returns. Lutz, O'Neill, and Scherbov (2003) show that Europe's age structure had modest negative momentum by the year 2000. Continued low

fertility will increase the duration and magnitude of this negative population momentum.

Cohort and Period Fertility

Cohort fertility refers to the sum of births that women have over their life, usually represented by an average (e.g., cohort replacement level equals 2.1 for women surviving to the age 45). Notably, these figures can only be obtained after each member of the *actual* cohort has aged through the reproductive lifespan and completed childbearing. Period fertility, by contrast, measures births in a given year and is often characterized by the sum of current age-specific rates, such as the TFR. The TFR thus describes the number of births a *hypothetical* cohort would have if they experienced the current age-specific fertility rates for the rest of their lives (again replacement-level fertility = TFR = 2.1). This distinction is critical, as an upward shift in the ages of childbearing would reduce the period TFR even if (completed) cohort fertility does not change, a phenomenon known as a *tempo* effect (Bongaarts & Feeney, 1998). Declining ages at childbearing increase the TFR relative to cohort rates; postponement of childbearing has the opposite effect. While this fact is well known, the magnitude and duration of these timing changes on the TFR are less well known and have been the focus of much research over the past two decades. This dynamic is very important for understanding below-replacement fertility because timing changes, specifically fertility postponement, has contributed greatly to the very low fertility rates as measured by the TFR. The problem is that the TFR, as with all period rates, contains information on both the number (*quantum*) and timing (*tempo*) of births. Shifts in the latter (e.g., younger cohorts having children later in life) can therefore deflate the TFR even if the quantum remains fixed. Bongaarts and Feeney (1998) provide a simple measure of this tempo effect and Bongaarts (2002) shows that it frequently reduces the TFR by 0.15 to 0.35 for several decades. The magnitude of the effect is directly related to mean shifts in ages at childbearing and the effect lasts as long as these shifts are taking place. Importantly, these tempo effects are time-limited—they cannot go on forever—they stop when ages at childbearing stop increasing. Recent increases in lowest-low fertility in some European countries are primarily the result of a cessation of fertility postponement (Goldstein, Sobotka, & Jasilioniene, 2009).

Proximate Determinants of Low Fertility

In most countries with below-replacement fertility, women report fertility intentions that average two births (i.e., at or near the replacement level).

Thus the question, why do women frequently have fewer children than they intend? Bongaarts (2001) proposed a useful macro-level conceptual model for understanding this discrepancy between intentions and behavior. He decomposes the TFR into a set of scaling factors that represents a current (period) fertility regime. Specifically,

$$\text{TFR} = \text{Ft} \times (\text{IP}) \times (\text{Fu} \times \text{Fg}) \times (\text{Fi} \times \text{Fc}).$$

The level of current fertility (i.e., the TFR) is first adjusted by the factor Ft for the tempo effects of shifting births toward younger or older ages at childbearing, as suggested by Bongaarts and Feeney (1998) and discussed earlier. In recent decades, pervasive postponement implies Ft values well below 1.0 (i.e., $\text{Ft} < 1.0$). Thus, TFR/Ft equals the quantum of period fertility (i.e., period fertility corrected for the effects of shifts in fertility timing).

Key to explaining TFR/Ft (quantum) is the intended parity (IP, the number of births intended) of young women (e.g., those aged 21–25). In turn, IP is increased or decreased by a set of model parameters that reflects forces not incorporated into women's reports of childbearing intentions. These factors are not incorporated into stated intentions because they cannot be well anticipated. Factors that increase fertility relative to earlier stated intentions are as follows:

Fu: unwanted fertility. Unwanted births measured through women's retrospective reports, that is, women are asked "at the time you became pregnant did you intend to have any more children?" Thus, these pregnancies (and births) would not have occurred in a "perfect contraceptive" society. Unwanted fertility increases TFR relative to IP (and $\text{Fu} > 1.0$, estimates for the United States in recent decades would be 1.1 to 1.15).

Fg: gender preferences. Some couples who intend to have two children will have strong preferences for at least one son and one daughter (see Pollard & Morgan, 2002). But given that sex of children is not easily controlled or anticipated, roughly half of such couples will reach the two-child goal but not have their preferred gender composition. These couples may revise their IP upward. Such preferences and behavior would increase TFR relative to IP (and $\text{Fg} > 1.0$).

Factors that reduce fertility relative to intended parity are as follows:

Fi: impaired fecundity. In general, women (and their partners) will not know if they are, or when they will become, sub- or infecund. Thus, women cannot factor impaired fecundity into their IP reports. A few women are infecund at young ages (1% or 2% at ages 15–19; see Bongaarts &

Potter, 1983), but the proportion increases with age (especially after age 35; see Bongaarts & Potter, 1983, Menken, 1985) and with the prevalence of some diseases/infections. Male fecundity declines with age also, but its onset is much later than for females and its pattern of decline less certain. Clearly, impaired couple fecundity decreases TFR relative to IP (and Fi < 1.0).

Fc: competition. Women/couples can also revise their IP upwards or downwards depending on their experiences, opportunities, and constraints (that encourage or compete with childbearing). Following Bongaarts, we refer to this broad class of constraints and competing opportunities as competition. Some of this competition may be anticipated and incorporated into IP. What is not, for example, the unanticipated difficulty of combining career and family responsibilities, of finding a suitable partner, and so on, is reflected in this parameter. In contemporary settings, Fc is expected to be <1.0.

In this framework, observed fertility reflects the balance of these forces. Morgan *et al*. (Hagewen & Morgan, 2005; Morgan, 2003; Morgan & Hagewen, 2005; Morgan & Rackin, 2010; Quesnel-Vallée & Morgan, 2003) have applied this framework in several different contexts as a conceptual and as an analytic model.

Distal Determinants of Low Fertility

The proximate framework given earlier is of limited value because it leaves fundamental questions unanswered: Why does a collective have a given intended family size (e.g., two children)? Why does one population have high levels of unwanted births compared to another? Why is postponement of childbearing or competition between childbearing and other activities more intense in one population compared to another? While the conceptual distinction can be substantively problematic (as discussed later), distal determinants are often classified as either material or ideological. Material ones include many of the factors that increase the costs of children—the inability of children to be economically productive in a modern economy and the cost of their extended periods of education and job training. Also included are the opportunity costs of a parent's foregone labor and/or leisure activities. Many of these changes are considered to be constituent parts of economic development and thus take on an inevitable and secular character. The ideological determinants include "modern" schemas (or world views) that celebrate independence and self-actualization. Sometimes these schemas are viewed as powerful forces sweeping the globe because of

their intrinsic power or usefulness to individuals (Goode, 1963; Lesthaeghe, 1995; Lesthaeghe & Neidert, 2006) or because they are conflated with the power, wealth, and prestige of being "modern" (Thornton, 2001, 2005).

This material/ideological distinction is problematic because the structural and ideological are not separate or additive effects. Predictable behaviors are the product of both material clues and means and the schemas that explain and rationalize their use (Johnson-Hanks, Bachrach, Morgan, & Kohler, 2011; Sewell, 1992, 2005). The material and schematic are both interdependent and interactive; each can change with repercussions for the other. For instance, day care for children can reduce the tension between labor force participation and parenthood and thus increase fertility (Rindfuss, Guilkey, Morgan, & Guzzo, 2007; Rindfuss, Guilkey, Morgan, & Kravdal, 2010). But this scenario depends upon day care facilities being available and affordable (material aspects) and their use must be acceptable (schematic aspects).

CUTTING-EDGE RESEARCH

To avoid long-term decline, the human population will ultimately need to approximate replacement-level fertility—thus, women, on average, will need to have two births before the end of reproduction. Obviously, a mean of two can be produced by very different distributions and women can have births within a broad age range. The future mean and distribution of family size and ages at childbearing will almost certainly vary across population groups and understanding these patterns is a goal of future research. Cutting-edge research focuses on the proximate determinants identified in the previous section and an attempt to understand change/stability in them, and in turn, the reasons for variation in period or lifetime fertility.

Fertility timing. As described, the postponement of childbearing to later ages is a major reason for below-replacement fertility (Kohler *et al*., 2002). This fact is now well known. The remaining key question here is how much longer before ages of childbearing stabilize. Some countries (such as Italy) would seem to be approaching a very late pattern of childbearing with little room for further upward movement. In fact, the rate of postponement in several European countries has slowed since 2000 (Goldstein *et al*., 2009). In contrast to these late patterns, ages at childbearing are still quite young in places as diverse as the United States, China, and Thailand. So, monitoring future changes in ages at childbearing remains important.

Postponement of childbearing can also affect the number of children women eventually have—fertility postponed is fertility at least partially foregone. To explain, postponement is associated with lower levels

of childbearing (Billari & Kohler, 2004; Morgan & Rindfuss, 1999), but the extent to which this is true varies somewhat across countries (Lesthaeghe, 2010). The mechanisms that produce this are (i) increasing sub- or infecundity associated with older ages and (ii) the competition (or opportunity costs) from other activities that can increase over time, leading to downward revisions in children intended. Both these mechanisms are discussed later.

Fertility intentions. It is now widely documented that fertility intentions (desires or ideals) are generally near replacement levels even when fertility is well below replacement levels. This is a favorable situation in that returning to replacement-level fertility requires only that women/couples have the children they intend to have (judging from their reports). A different scenario is that future intentions will fall well below two children, making a return to replacement-level fertility contingent on both increasing women/couple's intent for more children and assisting them in realizing these increased intentions. Thus, a key question is how persistent is the desire to have at least two children? There is substantial stability in the time series of the preferred or ideal family size in the United States (Hagewen & Morgan, 2005). But there is also evidence that economic conditions can force very low fertility for a generation so that low fertility (and low-fertility intentions) becomes the "new normal." With decades of experience, childlessness and one-child families become much more acceptable. Goldstein, Lutz, and Testa (2003) claim this is happening in German-speaking Europe. It may also be happening in urban China, where the one-child option is becoming individuals' preferred family size following a generation of low fertility encouraged by the one-child policy (Merli & Morgan, 2011; Merli & Smith, 2002). Stability and change in family size intentions remain an important research area.

Unwanted fertility. The concept of unwanted fertility is controversial and its measurement difficult. Much of the controversy can be put aside by agreeing on its meaning: An unwanted birth is one that occurred to a woman who did not, *at the time of the child's conception*, intend to have any more children. The measurement issue is more difficult because some women may not have had a clear intention at the time of conception, do not remember accurately what the intention was, or are hesitant to report that a child was unintended. It is commonly assumed that estimates of unwanted fertility are biased downward—primarily because of a reluctance to identify a child as unintended after the fact. Regardless of the difficulty of measurement, the concept is an important one that

clearly impacts fertility levels and does so differentially across populations. For the United States as a whole, 10–15% of births are estimated to be "unwanted." These estimates are stable across the past four decades. While the measurement of unwanted fertility is not attempted in some contexts, it is assumed to be much lower in many places. Greater availability and acceptability of abortion likely reduce unwanted fertility.

A large proportion of births (in the United States an additional 20–30%) are also mistimed—the mother reports that when the child was conceived she wanted to have a child sometime in the future but did not intend to have a child at this time. These "earlier-than-expected" births increase period fertility rates because they lower the ages at childbearing (compared to a counterfactual of a perfect contraceptive regime) and likely increase cohort fertility by nullifying the effect of postponement that operates via competition (or opportunity costs) at older ages.

Gender preferences. If women/couples intend, for instance, to have two children and simultaneously hold strong gender preferences, then they may have an additional child to realize these gender preferences. In many Western countries including the United States, the desire for balance (one son and one daughter) is most common. Given that the sex of children is generally not controlled and that the chance of a son/daughter is roughly 0.5, 50% of those with two children do not have their preferred gender composition (a daughter and a son). Consistent with this argument, there is substantial evidence that having two children of the same sex increases the intent to have another child and the likelihood of doing so. In other populations (as with many in Asia) there is a strong desire to have at least one son. With two children, approximately one-quarter will not have a son. But with only one child, the proportion without a son is close to 50%. Note that in the absence of sex selection, gender preferences affect fertility more at low fertility levels. At low fertility levels, there are fewer births to realize any preferred gender composition. The persistence of gender preferences is an active research question (see Bongaarts, 2013). Pollard and Morgan (2002) claim that an emerging "gender indifference" accompanies greater gender equality in the Untied States. If true, the long-observed desire for a balanced gender composition will cease to affect fertility intentions and behavior. Using data for the egalitarian Nordic countries, Andersson, Hank, Ronsen, and Vikat (2006) present some evidence for the effects of a desire for "balance" and for some emerging new preferences. There is mixed evidence on the decline of sex preference in China (Hesketh & Xing, 2006).

At present, the only widely available form of sex preselection is selective abortion—using a sonogram or some other technique to determine

the sex of the fetus and abort if it is not the preferred sex. Given that the ratio of male/female births is very close to 1.04 across time, space, and parity, one can detect the use of selective abortion if sex ratios are significantly higher than this value.[1] Recent evidence suggests that the wide use of sex-selective abortion in South Korea was reduced by making the practice illegal (Hesketh & Xing, 2006).

Sub- or infecundity. Being unable to conceive or carry a birth to term can obviously lead women/couples to have fewer children than they intended. Fecundity declines with age and the decline is more rapid after the mid-30s. Many women are sub- or infecund by age 40 and almost all are by age 50. Men's fecundity declines with age as well but much more slowly than for women. Fecundity can also be affected by disease, such as sexually transmitted diseases, so that fecundity can vary across populations and across time with the prevalence of relevant diseases.

Some causes of sub- and infecundity are treatable. At present, the inability to conceive via sexual intercourse can sometimes be obviated by *in vitro* fertilization (a process by which an egg is fertilized by the sperm outside the body, e.g., in a laboratory dish/tube, and then implanted in the uterus). This process was highly controversial in the 1960s but, while an expensive and intrusive procedure, is becoming commonplace. Roughly 1 of every 100 US births was conceived via *in vitro* fertilization in recent years (2005–2010) and proportions are higher in other countries (Billari, Kohler, Andersson, & Lundström, 2007; Sobotka, Hansen, Jensen, Pedersen, Lutz, & Skakkebæk, 2008). The development, dissemination, and acceptability of such procedures could reduce the effect of sub- and infecundity.

Competition. In the proximate determinants framework mentioned earlier, *competition* refers to the alternatives to childbearing (or the opportunity costs) that become apparent at older ages (i.e., were not factored into fertility intentions at younger ages). For simplicity, let us divide all decisions into one of three domains: family, work, and leisure. At young ages, the trade-offs between choices in one of these domains and others may not be obvious. But as the life-course unfolds, decisions to marry or to have children may impact other domains. To the extent that family (i.e., fertility-related) events are postponed or foregone because of the emerging opportunity costs (to career or leisure), we can say that competition is lowering fertility. An extreme case would be where mothers

1. Other possible reasons for high sex ratios would be infanticide or neglect of girl babies or a failure to register them. These alternatives may be relevant in some contexts but not in the recent case of very high sex ratios for third and fourth births in South Korea, for instance. Sex-selective abortions are considered the more important mechanism producing abnormally high sex ratios in India and China after 2000.

find it very difficult to work in full-time jobs because of the institutional incompatibility of family and work. McDonald (2000) has conceptualized this as variable gender equity across institutions. In recent decades, the degree of gender equity in formal education and market employment has increased dramatically. But there is, he argues, substantial variability in movement toward gender equity in the family. When gender equity in the family domain lags behind that in other institutions, many women may forego marriage, childrearing, or larger families. Very low fertility may result.

KEY ISSUES FOR FUTURE RESEARCH

A key question for future research: Is below-replacement fertility inevitable? There are three possible answers. First, the cross-country and cross-time associations suggest that with economic development and associated changes, fertility decline from high levels is inevitable. These declines are driven by a combination of institutional/material changes and the diffusion of "modern" schema or ideas. Some argue that these forces are far from running their course and that as a result below-replacement fertility will be a broad-based twenty-first century crisis (Lesthaeghe, 2010).

A second position is that below-replacement fertility is transitional. Myrskyla, Kohler, and Billari (2009) analysis of cross-country and cross-time data leads them to argue that advanced levels of development lead to an upturn in very low fertility. But their analysis and discussion do not identify the mechanisms that lead to the reversal and thus counter the arguments given. Ongoing work by Myrskyla, Kohler, and Billari (2012) suggests that the upturn associated with advanced economic development is concentrated in countries that have attained greater levels of gender equity in the family institution.

Third, Morgan (2003), consistent with the notion of differential levels and differential response, argues that existing diversity will not disappear. Some developed countries have never experienced fertility well below replacement and have stable and sustainable fertility at near-replacement levels (e.g., the United States). For other countries, a full-blown crisis exists (e.g., Japan). Inability to even approximate replacement-level fertility on a decadal time scale is a crisis because the implications of very low fertility are clear—either dramatic population decline or very high levels of immigration. Given this fact, there are powerful incentives to identify and pursue policies that facilitate replacement-level higher fertility. Identifying policies that work and policies that work better/worse in particular contexts are very important contemporary research questions (see McDonald, 2006).

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Also see http://www.cpc.unc.edu/people/fellows/bio?person=morganp

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