

The theoretical and political framing of the population factor in development

Martha Campbell* and Kathleen Bedford

School of Public Health, University of California, Berkeley, CA 94720-7360, USA

The silence about population growth in recent decades has hindered the ability of those concerned with ecological change, resource scarcity, health and educational systems, national security, and other global challenges to look with maximum objectivity at the problems they confront. Two central questions about population—(i) is population growth a problem? and (2) what causes fertility decline?—are often intertwined; if people think the second question implies possible coercion, or fear of upsetting cultures, they can be reluctant to talk about the first. The classic and economic theories explaining the demographic transition assume that couples want many children and they make decisions to have a smaller family when some socio-economic change occurs. However, there are numerous anomalies to this explanation. This paper suggests that the societal changes are neither necessary nor sufficient for family size to fall. Many barriers of non-evidence-based restrictive medical rules, cost, misinformation and social traditions exist between women and the fertility regulation methods and correct information they need to manage their family size. When these barriers are reduced, birth rates tend to decline. Many of the barriers reflect a patriarchal desire to control women, which can be largely explained by evolutionary biology. The theoretical explanations of fertility should (i) attach more weight to the many barriers to voluntary fertility regulation, (ii) recognize that a latent desire to control fertility may be far more prevalent among women than previously understood, and (iii) appreciate that women implicitly and rationally make benefit–cost analyses based on the information they have, wanting modern family planning only after they understand it is a safe option. Once it is understood that fertility can be lowered by purely voluntary means, comfort with talking about the population factor in development will rise.

Keywords: demographic transition; barriers to family planning; evolution of sexuality; abortion; unmet need

1. INTRODUCTION

Since the 1990s, a silence on population has reverberated around the world. The media tell us of looming grain shortages, sinking water tables, shrinking energy supplies, over-fishing and loss of forests, but in neither academic articles nor news descriptions does one hear that a population factor is involved. At the same time, it is virtually impossible for countries with rapidly growing populations, where greater numbers of children are born each year, to keep up with their growing needs for healthcare and education.

This paper describes the complex links between a biological perspective of human reproduction, cultural and religious opposition to women's decision-making around childbearing, the current theoretical explanations of fertility decline, the political framing of population by women's health advocates at the time of Cairo, evidence of the many barriers to fertility regulation, and the importance of opportunity for women to be free of the unnecessary barriers. It explores the key elements behind the silence around population and family planning as it grew in the 1990s and proposes that with a better understanding

of the voluntary nature of opportunities for women, then the silence can end.

At the heart of the silence is a link between the two central common questions:

- (i) is population growth a problem?
- (ii) what causes birth rates to decline?

How people view the first question is often influenced by the answers to the second—that is, there is a reluctance to address the first question when answers to the second raise concern about any possible need for persuasion or coercion or about risking interference with traditional values in cultures and religions. When decision-makers in developing country governments and donor agencies are not aware that population is a factor open to change within a human rights framework, this constrains both policy development and the allocation of public funds.

2. BIOLOGICAL SCIENCES PERSPECTIVE

Darwinian evolution is driven by an unwitting reproductive competition in which those plants and animals who produce the most offspring are the ones that most successfully pass on their genes to future generations and their particular characteristics are perpetuated. For a long time, reproductive biologists and demographers followed parallel paths with little intellectual exchange, and in fact they ended up using the word

* Author for correspondence (campbell@berkeley.edu).

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'fertility' to mean two different things.¹ Recently, there has been a more fruitful interchange between the exploding literature of evolutionary psychology and demography. For example, primatologist *Borgerhoff Mulder (1998)* has written about the demographic transition from the perspective of an evolutionary biologist, while demographer *Lee (2003)* has used an evolutionary model to explore the transfer of resources across generations.

From a biological perspective, it is puzzling, then, that rich and powerful people do not have more children than the poor (*Vinning 1986*). One plausible explanation of this conundrum is that humans (mainly men) have evolved to seek frequent sex, while not desiring a specific number of conceptions, and humans (mainly women) have a drive to nurture their offspring (*Potts 1997*).

In the *Descent of Man*, *Darwin (1879)* was the first person to articulate that male and female mammals can have different reproductive agendas for explicable biological reasons. He saw that the competition exists not only between species, but also between the two sexes of the same species (*Hrdy 1977; Potts & Short 1999*). Among genuinely monogamous species, such as penguins, the two sexes are of the same size. Darwin understood the social implications of sexual dimorphism, where males are larger than females, and he wrote, 'the male... seems to owe his greater size to his ancestors having fought with other males during many generations' (*Darwin 1879*). Human males, on average, are 5–12% larger than women and have greater upper body strength, betraying the fact that today's humans are descended from a promiscuous or polygynous hominid stock (*Alexander et al. 1979; Lockwood et al. 2007*). It follows that over the millennia, those men who successfully sought the most frequent sex and successfully controlled the most females left the most genes to the next generations, reinforcing these tendencies.

The history of despotism, of many aspects of religion and much of the controversy surrounding contraception can be interpreted as expressions of an evolved human male agenda to control female child-bearing (*Betzig 1986*). The Bible tells of King Solomon having 700 wives and 300 concubines. Despots, from the Incas to Saddam Hussein, used power to control and rape women. A plausible interpretation of the curious fact that 16 million men carry the same Y chromosome, with many of these being in central Asia, is that they are all descendants of Genghis Kahn and his sons (*Zerjal et al. 2003*).

Bangladesh, Pakistan and Afghanistan have a long history of sequestering women in their home units, and China achieved this with foot binding. Female genital mutilation in Egypt, Sudan, Somalia, Eritrea and parts of West Africa controls women by destroying sexual pleasure.

Patriarchal traditions survive in the world today, as is illustrated in the stark contrasts of the history of oral contraceptive pills and Viagra. The pill was developed by academic researchers and marketed with the utmost reluctance by the major pharmaceutical companies, and it was first promoted for its side effect of regularizing the menstrual cycle rather than as an effective

contraceptive. Viagra was discovered as a side effect in the search for a cardiovascular drug, and aggressively and rapidly promoted by its pharmaceutical manufacturer. Rare mortality among early users of high-dose pills almost led to the removal of the product from the market, while the several hundred deaths associated with therapies for erectile dysfunction have rarely reached the media. It took Japanese regulatory authorities 40 years to approve oral contraceptives and six months to register Viagra (*Potts 2003*). In short, history and the contemporary world are replete with examples of ways men use their power to control women's reproductive lives.

3. CULTURAL AND RELIGIOUS PREFERENCES

Throughout history, most societies were polygamous and patriarchal. Western Christianity was unusual in promoting monogamy, although it did so within a negative framing of human sexuality. The mantra of Eve tempting Adam with carnal pleasures, and in the process condemning the human race to mortality and herself to the pains of childbirth, infused many aspects of European culture. The only justification for sex within marriage was to procreate. Until well into the twentieth century, contraception was condemned and abortion was abhorred. The religious and patriarchal hostility held back the acceptance and use of contraception. In examining Belgium's fertility decline between 1800 and 1970, *Lesthaeghe (1977)* found that the one factor that consistently accompanied fertility decline was secularization.

The framing of human sexuality by Western Christendom had a worldwide impact. Europe experienced its scientific revolution in the sixteenth century and its industrial revolution in the eighteenth century. By the end of the nineteenth century, European powers had colonized much of the rest of the world, disseminating its negative, largely patriarchal views of reproduction and sexuality. The religious and cultural biases were influential at a policy level in many countries (*Potts & Campbell 2008*).

- (i) They slowed the scientific development of contraception.
- (ii) The lack of access to modern methods of contraception often kept birth rates higher than they would have been otherwise.
- (iii) While European powers introduced basic public health measures and vaccination in their colonies (and the USA did the same for the Philippines), no western ruling power tried to support the introduction of family planning.
- (iv) France actively opposed contraception in its colonies.
- (v) All European colonial powers introduced anti-abortion legislation—much of which still persist today, especially in Africa, long after reforms have been enacted in the colonizing countries. Consequently, until the latter part of the twentieth century, unsafe abortion was a significant part of the burden of disease in Europe and North America, and it remains so in most of Africa and Latin America.

4. CLASSIC AND ECONOMIC DEMOGRAPHIC THEORIES

Notestein's (1953) classic theory on demographic transition, and the many variations that followed, have centred on couples' decisions about family size. They assume couples perceive the advantages of having a smaller family when influenced by any of a number of possible kinds of change, such as urbanization, economic change (up or down), education, improved economic opportunities or reduced infant or child mortality. Leibenstein (1957) and Becker (1991) led the development of micro-economic explanations for family size. In these theoretical explanations, couples or families are seen as weighing the costs and benefits of having a next child.

Both of these groups of theories are based on an assumption that it is natural for couples around the world to want many children and that they change their minds when some change in society occurs, such as the distal factors of improved education, or the education of girls and women in particular, or increased wealth, economic opportunity or reduced infant and child mortality. Increased poverty is also seen as one of these distal factors. Behind these theories is an assumption that when this exogenous change occurs, couples will find a way to achieve their smaller family size, through the proximate determinants of contraception, abortion, age of marriage or breastfeeding.

In analysing these relationships, demographers in the classic theory group have had a plethora of easily available economic and social datasets demonstrating a high correlation between total fertility rates (TFRs) and the data on the distal factors, which are viewed as causal or driving factors. Similarly, economists make use of ample available data to demonstrate the impact of couples' decision-making when the value of having another child declines for a range of possible reasons. However, correlations are not necessarily causal.

The evidence that barriers to fertility-regulation methods and correct information make a significant difference in the ability of couples, and especially women, to follow up on any decisions to have a smaller family has not come from large, smooth datasets as exist for socio-economic factors. For a number of reasons, including confidentiality and concealed bias by providers and other members of traditional communities, it seems likely that factors which are difficult or impossible to measure may be more influential in the timing and pace of fertility decline than the factors where ample data are within reach.

The widespread acceptance of causality between changes in TFR and economic or social factors was interrupted by the results of the Princeton Fertility Project in the 1970s. In this work, Coale, Watkins and others found that consistent patterns of socio-economic change were not always found in European examples of fertility decline in the eighteenth and nineteenth centuries (Coale & Watkins 1986). Cleland & Wilson (1987) described the problems in models of fertility that depended on couples' demand for contraception through distal factors, including the unevenness with which demand applied to experience

across geography and time. Later Cleland's application of innovation-diffusion theory was found to fit these previously unexplained examples of European fertility decline, with a note of caution that this theory did not explain the delay in the completion of the fertility transition in Africa (Cleland 2001*b*).

It is of interest that the classic and economic theoretical explanations of fertility decline have continued to be widely viewed as the ways fertility is best understood, even though it is beset with many anomalies that do not fit the data. In 1997, as president of the Population Association of America, Karen Mason wrote, 'exceptions to all the major theories of fertility transitions have been found...', and she suggested that there may not be a single driving factor behind all fertility decline (Mason 1997, p. 446). A recent indication that models of fertility need to be revisited is found in *Population in Twenty-first Century: The Role of the World Bank*. This report recognizes discrepancies between the assumed social and economic bases for couples' decisions to have a smaller family and the actual fertility decline in Bangladesh and Indonesia where these conditions were not present (World Bank 2007). Numerous other exceptions to the generalizations made by the classic and economic theoretical frameworks have been identified. Bongaarts & Watkins (1996) have pointed out that the success of organized family planning programmes in the 1960s and 1970s 'demonstrated that that there is no tight link between development indicators and fertility', but the authors nevertheless went on to assert that 'the role of socio-economic development in accounting for fertility declines remains inherently plausible, and benefit-cost models of individual decision making are central to the most influential interpretations of fertility decline'. (This paper will return later to agree with the second part of this statement.)

The economic model of parents' weighing the costs and benefits of having a child, much as they would weigh the costs and benefits before making purchase decisions for durable consumer goods, such as a major appliance or a car (Becker 1991), is not consistent with the biology of human reproduction. The fact that humans have sexual intercourse many hundreds or even thousands of times more frequently than is needed to achieve the desired number of pregnancies obviates the possibility of applying rational decision-making about when to have a baby. Unlike other mammals, ovulation is concealed in women, and given frequent intercourse, we are forced to take frequent, repeated, persistent and perfect steps 'to separate sexual intercourse from childbearing'. If human reproduction were like purchasing a major appliance for our homes, we would have to take the initiative of asking the store several times a week *not* to send a new appliance, and if we failed to do this repeatedly, perfectly and persistently, one would be delivered, by default, at our door a few days later (Engelman 2008).

There is no doubt that the oft-cited distal factors are influential in the process of fertility decline. Education, and in particular the education of women, is the most frequently mentioned factor. Bulatao (2001, p. 3) points out, however, that education is not a reason for fertility decline in itself, instead it

functions through its many assets, as 'educated individuals expect lower child mortality, feel more restricted by children, have easier access to reproductive healthcare, are more open to the media, and are more likely to influence others'. It is worth adding that education helps women to distinguish between the common barrier of misinformation about contraception (see §6) and the correct information they need to manage their childbearing. Women in urban areas generally have easier physical access to contraception than those in rural areas. It is not difficult to see the importance of the distal factors as well. However, the distal factors are neither necessary nor sufficient for low fertility to occur. Education is clearly beneficial for women themselves, their children's health and education, and their communities—while it is not a prerequisite for high contraceptive use. In the Philippines, where female literacy is high but access to modern contraceptive methods is low, women in the lowest economic quintile have an average of 6.5 children. By contrast, access to fertility regulation methods in still largely illiterate parts of rural Bangladesh has resulted in replacement level fertility (National Institute of Population Research and Training Dhaka Bangladesh 2007).

5. WOMEN'S HEALTH PERSPECTIVE

Women's health advocates have rightly drawn attention to the many patriarchal pressures that continue to marginalize women around the world. In many societies, women lack equal treatment under the law, are subject to domestic violence, have inadequate health services and are separated from educational and economic opportunities. In agrarian societies, women often do most of the agricultural work while not being permitted to hold or control property. During the 2 year process of the United Nations 1994 International Conference on Population and Development (ICPD, or Cairo), women's health advocates highlighted coercion in family planning, particularly in India in the 1970s and under China's one-child policy (Potts & Campbell 2005). There is no question that episodes of coercion in India and China were painful and highly reprehensible. Oddly, though, there was little attention paid to the coercion involved in forcing women to have pregnancies they did not want, which were and continue to be today, multiples larger. The disproportionate emphasis on coercive family planning helped to develop a strategy during the ICPD process for positioning issues about pregnancy and childbearing under a broad area of health problems that are particular to women, with the new title 'reproductive health'. As this term became widely accepted, the term 'family planning' became politically incorrect to use by itself in the policy and philanthropic communities.

The shift of acceptable language from family planning to reproductive health is likely to have led to reduced financial support for family planning budgets in foreign aid agencies—along with the new focus on AIDS funding (Speidel 2009). While the term reproductive health was easily adopted in the women's health community and in agencies working

in these international areas, it has been less well understood and less easy to identify with in the parliaments of Europe and the US Congress. A recent survey of leading insiders in the field of population studies that sought to understand factors contributing to the declining international visibility of the family planning movement elicited observations that the term reproductive health was not well defined and not a compelling concept (Blanc & Tsui 2005).

In addition to the loss of the terms 'family planning' and 'population', viewed as unacceptable, 'Malthusian' and even 'demographic' became pejorative terms describing those who continued to express interest in population growth. 'Population control', a term that had been virtually unused in the international policy community for well over a decade, became a popularized derogatory label identifying those who continued to be concerned about the population growth factor in development. In the West, the shift in language that occurred at Cairo has persisted until now, as many young professionals and students on university campuses have been taught over the past 15 years that the connection between population growth and the environment is not an acceptable subject for discussion (Campbell 2007).

Women's health advocates active in the Cairo process viewed the existing family planning budgets in USAID and other western foreign aid agencies as well funded, and a hope was to draw on these funds for the broader goals of improving women's health and empowerment in a wide variety of ways. Unfortunately, foreign aid in family planning from western donors had never been more than 1 or 2 per cent of foreign aid, and it was not adequate to cover the broad agenda needed to help women.

It is not clear whether, during the discussions about the importance of strengthening women's health and well-being, the creation of silence on population was a strategy or a natural drift. Sadly, it is increasingly recognized now that the shift of attention away from slowing population growth as the focus moved towards the broader priorities was at least partially counterproductive, as access to family planning options did not expand with the increase in the number of women who wanted them. In a number of African countries, the disparity in TFR between the richest and poorest economic quintiles has increased since the 1990s (figure 1). While the efforts of the women's health advocates did produce some important benefits for women, these have generally been on a small scale, and the expansion of access to family planning has not been among them. What was absent at Cairo was understanding of a gap later described by the Department for International Development in its written evidence for the 2006 UK Parliamentary hearings on the impact of population growth on the millennium development goals (MDGs): 'The ability of women to control their own fertility is absolutely fundamental to women's empowerment and equality' (DFID 2006; APPG 2007).

In seeking to establish the rights and opportunities long overdue to women of the developing world, women's health advocates almost universally wanted access to safe abortion, but they were split on positions

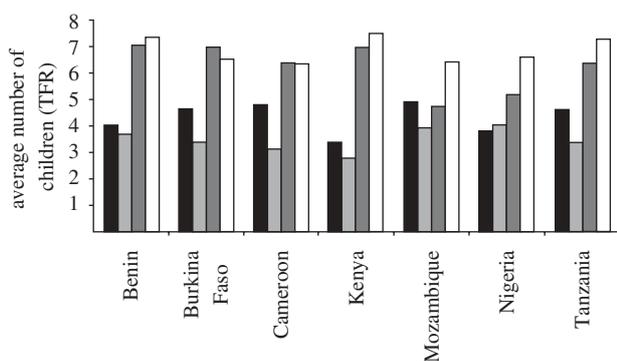


Figure 1. Disparities between the rich and poor have expanded in the past decade (African Population and Health Research Center, Nairobi, 1996). Between the DHS surveys in the 1990s and those in the first decade of the twenty-first century, we see a wider disparity between the TFRs of women in the richest (black bar, 1990s; light grey bar, latest) economic quintile in each of seven African countries and those in the poorest (dark grey bar, 1990s; white bar, latest) economic quintile. One way to interpret this is that the richer women were able to find opportunities to manage their childbearing, while the poorer women were left behind with fewer options for family planning.

concerning family planning. In general, they wanted family planning services as part of comprehensive health or reproductive health services, but some members of the group disliked high-technology means of contraception, including hormonal contraceptives such as pills and sub-dermal implants. In India, the strength of feeling among a powerful group of women's advocates against hormonal contraception led to legal steps, causing the government's highest court to outlaw injectable contraception from the government family planning programmes. This effective method is highly popular in other parts of the world not only for convenience, but for the very reason that it allows women to avoid pregnancy without their partners knowing they are using birth control.

A myth was developed that Cairo was a major success in its tectonic shift towards helping women, in comparison to everything that had happened before 1994, which was labelled population control—the term itself being unquestionably derogatory. This myth was framed in such a way as to exclude any mention of the numerically more common and successful voluntary family planning programmes that had been developed between the 1950s and 1990s. International family planning often began in the hands of relatively rich women who already enjoyed the privilege of being able to manage their own family size and who were intensely aware that the poor women around them had no such option. In addition, the vast majority of the successful national family planning programmes were designed to make contraception easier for women and men to obtain, not to force them to curtail their childbearing. In oral evidence in the UK Parliament's hearings on population and the MDGs, Sinding, as Director General of the International Planned Parenthood Federation, said with reference to the Cairo process, 'the taboo about

population... was the result of a mythology... that equated population policies with coercion' (APPG 2007).

Feminist objections to family planning programmes, building since the 1970s, gained strength before the Cairo conference (Hodgson & Watkins 1997). At the Global Forum, a large gathering of non-profit organizations in Rio de Janeiro during the same two weeks as the United Nations 1992 Conference on Environment and Development (the Earth Summit, near Rio), a key belief expressed repeatedly by women's advocacy leaders was that population growth was not important, although there was not a consensus on this point (Antrobus 1992). This idea was repeatedly presented in the form of logical syllogism but in inverted form: it was said that the population control community claimed that in order to have improved health systems, education and other forms of development (referring to Brazil and various other countries), women would need to reduce their fertility. The fertility level did drop, but the health systems did not improve, demonstrating that population growth is not significant (Rosenbluth 2002). What the advocates did not recognize was that population was only a factor, and smaller family size was necessary but not sufficient for development. In these extended discussions at Rio, attention to population growth came to be viewed as insensitive at best, and even possibly exploitive. Some of the speakers believed that a focus on population was driven not by humanitarian motives but by neo-colonial interests and a wish to protect and maintain the rich lifestyles of the North. More uniformly, the speakers at the Global Forum held the position that attention to population growth macro-level data was conducive to inhumane approaches in reducing birth rates, and therefore it was best to reduce discussion of the macro-level population concerns, in honour of disadvantaged women (Campbell 1998).

Thus, the roots of the silence around population pre-dated Cairo. Interestingly, the spread of this silence during and after Cairo was inconsistent with the ICPD's own formal *Programme of Action*.

6. BARRIERS TO FERTILITY REGULATION

Cleland's (2001b) work on diffusion and ideational change, with credit to Rogers' (1983) early concept of diffusion, provides an important theoretical foundation for looking at barriers. Cleland (1985, p. 227) suggested, '... knowledge of birth control, access to methods and their moral acceptability may constitute an important, independent part of any explanation of fertility decline'. However, things that are almost universal are sometimes difficult to see, and the pervasiveness of barriers to fertility regulation has been so vast and deeply infused into societies and medical structures that some contraceptive options are immediately crossed off in women's minds before they are even tried, owing to widespread misinformation, medical rules and additional barriers that prevent adoption of otherwise effective methods.

The ICPD Programme of Action was explicit about the danger of continued rapid population growth and

the need to focus on family planning in the short term, writing, 'during the remaining six years of this decade (1994–2000), the world's nations by their actions or inactions will choose from a among a range of alternative demographic futures' (United Nations 1996). The document emphasized the urgency of slowing rapid population growth by pointing out that the difference between the high and low projections (720 million) of global population between 1994 and 2015 'exceed the current population of the African continent' (United Nations 1996, para 1.4). The Programme stated that all the nations subscribing to the ICPD should 'meet the family planning needs of their populations as soon as possible and should in all cases by the year 2015, seek to provide universal access to a full range of safe and reliable family planning methods' (United Nations 1996, para 7.16). 'Governments should [remove] unnecessary legal, medical, clinical and regulatory barriers to information and to access to family planning services and methods' (United Nations 1996, para 7.20). Sadly, the ICPD goal of removing 'all programme-related barriers to family planning use by the year 2005' (United Nations 1996, para 7.19) is a long way from being fulfilled.

The many barriers to family planning vary from overt to subtle, and they are both tangible and intangible. What they have in common is separating women from the technologies and information they need to manage whether and when to have a child (Campbell *et al.* 2006). Obvious barriers to contraceptive use include laws making abortion and some contraceptive methods illegal, geographical distances from sources of supply or services, unaffordable financial costs, and shortfalls and breaks in commodity supplies. Where contraception is technically available, regulations often make access to contraception difficult to obtain, such as non-evidence-based prescription requirements prior to the use of specific contraceptives or burdensome parity requirements for sterilizations. Given the patriarchal underpinning of many societies, men often try to make reproductive decisions for their sexual partners, or in various ways constrain women's options for limiting or spacing their childbearing. In addition, the patriarchal control over women often plays out through provider biases or medical barriers to contraceptive use (Potts 2005), such as required blood tests before hormonal methods can be obtained or providers' refusing contraception unless a woman is menstruating on the day she reaches the clinic. Non-evidence-based medical practices are often deeply entrenched and surprisingly difficult to remove (Stanback *et al.* 1994).

Many of these barriers are easily overlooked by government policy-makers, even though from the consumer perspective they may be virtually insurmountable. For example, Pakistan's 10 000 lady health visitors working in rural areas are required to have an eighth grade education in order to distribute oral contraceptives. This seemingly trivial detail in fact denies millions of rural women access to the pill because in many villages there is no female resident with this level of education. Barriers to contraceptive use are not limited to the developing world. When the Kaiser Foundation Health Plan in California

removed all co-payments for contraception, the contraceptive prevalence rate rose 18 per cent and first-year failure rates for oral contraceptives and intra-uterine devices (IUDs) fell slightly from 7.0 per cent to 6.4 per cent (Postlethwaite *et al.* 2007).

Social barriers are also important, as cultural and religious rules, often accepted as traditional values, constrain women's options in their attempts to regulate their fertility (Campbell *et al.* 2006). Where the status of women is low, intangible social barriers to accessing family planning can be more formidable than the direct financial costs. Afghan refugees in a border town in Pakistan were asked by healthcare workers if they had their husbands' permission to use contraception (Tomczyk 2000), which may help explain the low prevalence of use in the community. Working in Matlab, Bangladesh, Phillips *et al.* (1996) describe a common situation of a young woman who must manage any visit to a clinic through conversation with her husband who in turn will talk with his mother, making getting help for problems with a contraceptive very costly. In the young wife's calculation, the social costs of managing a contraceptive problem may actually be greater for her than the cost of bearing and raising another child. In Punjab, Pakistan, Casterline *et al.* (2001) made detailed measurement of various perceived costs of practicing contraception and of the motivation to use contraception. They found that two leading obstacles to using contraception were the woman's perception that use would conflict with her husband's preferences and attitudes towards family planning, and her perception of the social or cultural costs of using family planning. Another recent study from Pakistan also indicated psychosocial barriers as the most important self-reported obstacle to the use of family planning among the urban poor, where physical and economic barriers were reported much less frequently. The psychosocial barriers were defined as religious interpretations and value systems that limit the mobility and decision-making abilities of women who were dominated by the males and older women (mothers-in-law) in the family (Stephenson & Hennink 2004).

Misinformation about contraception may be one of the leading barriers to family planning. It is well known that fear of side effects is widespread, and it is one of the most important explanations for non-use of contraception (Shah & Shah 1984; Grubb 1987; Hashmi *et al.* 1993; Bongaarts & Bruce 1995; Casterline *et al.* 1997; Asturias de Barrios *et al.* 1998; Viswanathan *et al.* 1998; Yinger 1998; El-Zanaty *et al.* 1999; Stash 1999; Casterline & Sinding 2000). However, although some of this fear is due to actual side effects of a method, a large portion across many countries is widespread misinformation, beliefs that contraceptive use will have negative health impacts. The diffusion of both correct and misleading information occurs continuously (Rutenberg & Watkins 1997) and comes from a variety of sources, from conversations in the market place to the religious clerics. As noted above, oral contraceptives, which are very safe, are often framed as highly dangerous, while Viagra deaths, which occur relatively often, go largely unnoticed. In many settings, oral

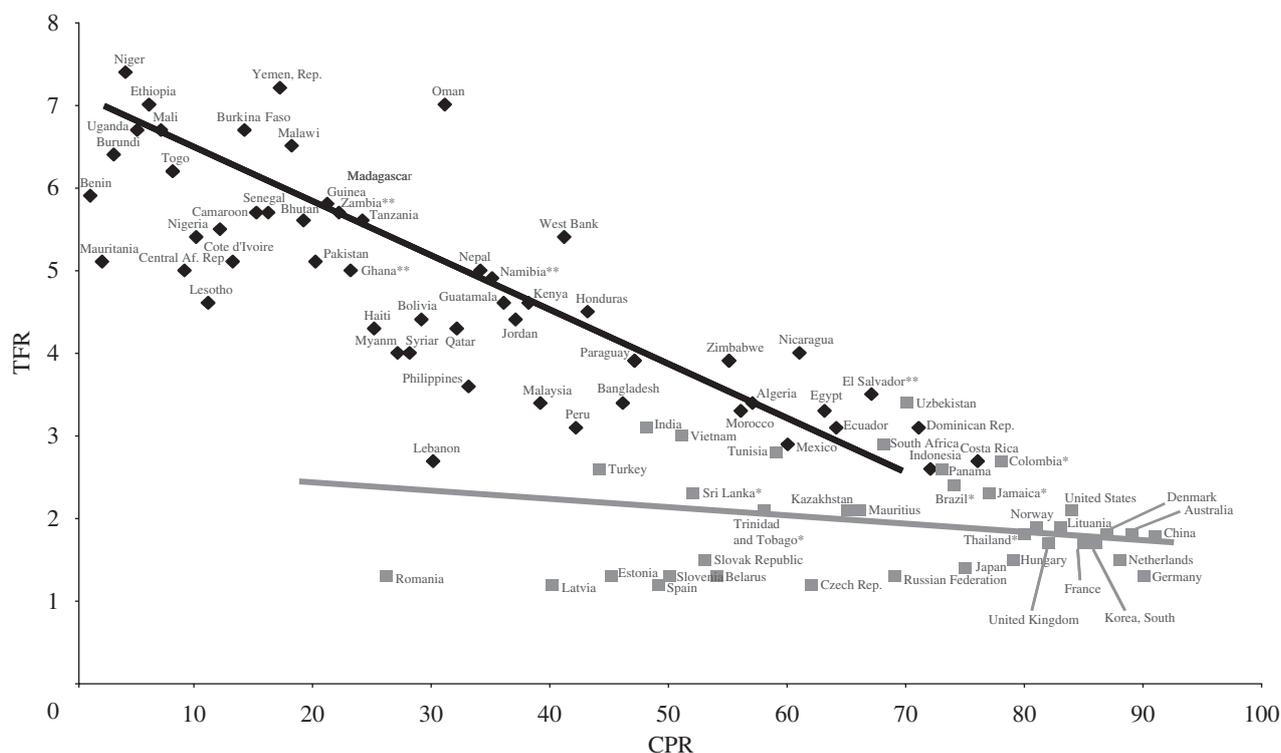


Figure 2. TFR with and without access to abortion. (D. Montagu 2005, personal communication). Abortion access is generally based on legal availability as analysed by IPPF. Note that some countries (starred) are listed as having accessible abortion, even though there are legal restraints they are not commonly followed. Others (double star) have legally accessible abortion, but practically availability is highly restricted. Diamonds, without abortion; squares, with abortion; black line, linear (without abortion); grey line, linear (with abortion).

contraceptives are perceived to be more dangerous than pregnancy, although in a low resource setting having a baby can actually be up to a thousand times as dangerous as taking the pill. Some African women believe that pills and injectables can cause infertility (Castle 2003), and others believe that IUDs can float upward into their stomachs. Qualitative interviews in a study in Punjab, Pakistan, revealed as a prominent factor, women's fears of the detrimental side effects of contraceptives on health (Casterline *et al.* 2001). Fear of harmful side effects also undermines contraception in the Philippines, where '[w]omen with an unmet need were more likely to view the pill and tubal ligation as more or equally harmful to health, compared with pregnancy' (Casterline *et al.* 1997).

One source of misinformation not usually recognized by policy-makers is the fact that oral contraceptive pills are still unnecessarily sold on prescription in many countries, even though safety is not a problem (World Health Organization 2004*a,b*). In the USA and Europe, commercial interests have trumped the evidence that oral contraceptives could be sold over-the-counter (Potts & Hunt 2000). The prescription status of these products in many countries reinforces the idea to both health workers and consumers that this method is dangerous.

One of the most deep-seated barriers to fertility regulation is the lack of access to safe abortion. In all societies where women on average have the number of children they want, this is achieved through a combination of contraception and abortion, although not every woman resorts to the use of abortion

(Van der Tak 1974; Potts *et al.* 1977; David 1999; Kulczycki 1999). Davis (1967) observed in the 1970s, 'induced abortion, for example, is one of the surest means of controlling reproduction, and one that has been proved capable of reducing birth rates rapidly... Yet this method is rejected by nearly all national and international... programmes'. In 1973, Tietze and Bongaarts calculated the role of abortion in fertility regulation and suggested, 'unless there is a major breakthrough in contraceptive technology or major modifications in human sexual behaviour, levels of fertility required for population stabilization cannot be easily obtained without induced abortion' (Tietze & Bongaarts 1975). For any contraceptive rate (CPR), if abortion is accessible in a country the TFR is likely to be one child lower than if abortion is not accessible. This is shown here graphically, but it is true in logistic regression as well after adjusting for income, urban/rural density and education (D. Montagu 2005, personal communication; figure 2). Analysis across 170 countries indicates that no country has reached replacement-level fertility without widespread access to safe abortion for poor women as well as the rich, who tend to have this access everywhere.

Many of the world's women lack access to safe abortion (Henshaw *et al.* 1999), making the cost of interrupting a pregnancy high and even life threatening. Barriers to accessibility for safe abortion for low-income women in developing countries can include price, sexual exploitation and threat of imprisonment. Those women for whom only unsafe abortion is available

risk extreme pain, debilitating injuries that often last a lifetime, and death. Even where abortion is legal, as in India, it is not universally available. Conversely, in some places, safe abortion has been made available even in the face of restrictive laws. In these cases, family size has fallen, as in Bali, Indonesia, where the availability of safe abortion not only helped women to manage their family size, but also improved the adoption and continuation of contraceptive use (Potts *et al.* 1977; Potts & Hayden 2008).

7. THE POWER OF OPPORTUNITY

None of the classic or economic theoretical explanations for fertility decline predicted or could explain the below replacement level fertility now found in Europe and Japan. Leading demographers doubted that the early efforts to make family planning more accessible would work (Davis 1967), as indeed they did. The standard theoretical framework did not explain the fall in Iran's TFR from 5.2 to 2 in the 12 years between 1988 and 2000 (United Nations Population Fund 1988; Iranian Ministry of Health 2002; Tarmann 2005; Vahidnia 2007) or Addis Ababa's decline in TFR to 1.8 while the whole of Ethiopia remained at a TFR of 5.9 (Sibanda *et al.* 2003). In short, the widely accepted theoretical explanations of the demographic transition do not meet the basic criteria for a scientific theory to describe a large number of observations in a plausible way and to make predictions that can be tested (Hawking 1988).

The classic and economic theoretical explanations for fertility decline, focusing mainly on distal factors as driving forces behind decisions to be made by parents, would benefit from attaching more weight to the many tangible and intangible barriers to fertility regulation methods, and at the same time to the importance of opportunities for women to manage their childbearing. Simply stated, it appears that the timing of fertility decline is dependent on the degree to which women have freedom from barriers to fertility regulation and are able to obtain both the technologies and the supporting information they need to manage whether or when to bear a child. This model has at first been identified as a 'reduced barriers', or 'freedom', model, but for greater clarity it is now being framed as an 'opportunity' model. Or the reader may prefer to see it as a modification of the existing theories.

An immediate question might be, but where does the demand for small families come from? The role of demand for contraception or of the desire for a smaller family is not disputed. Instead, the distinction between the suggested opportunity model and the classic and economic demographic theories turns on only the weight, source and timing of the initiation of this demand. While the normally recognized distal factors can influence fertility decline, a plausible case could be made that the reduction of patriarchal barriers to fertility regulation methods and information is necessary for replacement-level fertility to be achieved in any society. In addition, one could posit that disappearance of the barriers may be sufficient

as well, regardless of women's or couples' education or wealth.

It is worth highlighting a factor that has been buried in the literature for a long time. Bulatao (2001) suggests that improved access to fertility regulation, assuming there is some initial at least *latent desire* for it, should give an impetus to fertility decline (emphasis added). One possibility is that latent desire of women to control fertility is more widespread than is commonly recognized and that most women in all societies, if they had the means and understood that safe options were available, would choose not to bear many children. As Cleland (2001a) puts succinctly, '(T)he direct threat of pregnancy and childbirth to the life of the mother is no small consideration . . . It would thus hardly be surprising if, in most societies throughout most of history, reproduction has been regarded not as something to maximize but rather as a mixed blessing' (Cleland 2001a, p. 66).

Robinson & Cleland (1992, p. 119) observed 'a very genuine latent desire to limit further childbearing collides with very high perceived costs attached to the only birth limitation methods available'. Casterline *et al.* (2001) recognize the need for attention to this problem in research: '[T]he scant empirical attention to the magnitude of contraceptive costs and their effects on contraceptive decision making reflects less than full respect for the potential power of the various possible obstacles to contraceptive use' (Casterline *et al.* 2001).

Examining three decades of economic theory of fertility, Robinson (1996) explains that in societies with fertility below replacement level, economic explanations of fertility decline have lost all of their explanatory power, and he reminds us that 'fertility is a byproduct of the pursuit of heterosexual pleasure unless some deliberate control is used . . .' (Robinson 1996).

Caldwell (1983) recognized that one of the factors generating any fertility transition is the increased ability of women to determine their own fertility. Freedman (1997) wrote that availability of contraceptives can crystallize latent demand.

The concept of latent desire to control one's fertility is illustrated in published studies where women who had not expressed any desire for using family planning have nevertheless welcomed it once the opportunity arose. In Africa, providing general as well as specific information through the broadcast media has had positive influence on contraceptive use (Westoff & Bankole 1997). Curtis & Westoff (1996), who were testing the predictive validity of intentions to use family planning on actual use in Morocco, observed that 'women in societies, or in subgroups of the population in which contraceptive use is widespread, may find it *easier* to act on their contraceptive intentions, particularly if they are weakly held, than women in societies or communities in which contraceptive use is less common' [emphasis added] (Curtis & Westoff 1996).

Magnani *et al.* (1999) suggested a supply-side influence on fertility preferences. In analysing patterns of contraceptive use in Matlab, Bangladesh, Phillips *et al.* observed that latent demand for contraception was activated by appropriately delivered, socially

sensitive supply in an impoverished society, and this new opportunity also influenced desired family size. 'While Matlab brings into question conventional notions of supply, it demonstrates that the supply side can comprise an important institutional determinant of fertility change' (Phillips *et al.* 1988).

These examples fit one of two normal and well-documented patterns of consumer behaviour, where demand for a product arises only after it appears on the market (Hall 1991). Items such as garage door openers, Post-its, or TV remotes, iPods and the Internet were not particularly desired until the opportunities they showed up were realistic options. It appears that in many situations the decision to use family planning is approached in the same way, in what amounts to normal consumer behaviour (Campbell 2006). Given that a high prevalence of misinformation has caused women in many countries to consider contraception to be dangerous, it is logical to assume that many women, or perhaps even most women, are unlikely to seek contraception unless they recognize that it is safe. In another way to frame this, women are rationally making a benefit–cost analysis based on the information they have, which can be seen as consistent with the benefit–cost models of individual decision-making supported by Bongaarts and Watkins above.

While clearly there are other factors influencing fertility decline, a plausible case could be made that removing the unnecessary, constraining, tangible or intangible barriers to modern fertility-regulation methods is required for replacement-level fertility to be achieved in any society, and given what is likely to be women's natural latent desire to control fertility, such opportunities are likely to be sufficient as well, regardless of women's or couples' education or wealth. In fact, it is sensible to consider that these opportunities constitute a precondition for widespread access to education and healthcare on a large scale.

As noted, the standard demographic theory assumes the default position in the demographic transition is a desired high level of fertility, until some exogenous change drives couples' decisions to have a smaller family. But it is doubtful that couples make decisions about family size, because while they might well decide together where they should live and whether or where their children should go to school, this same kind of conversation and collaboration is less likely to take place on matters of sex and reproduction. It is unquestionably true that some percentage of couples may well make decisions together about their family size, which, where this works, is the most harmonious and efficient pathway to fertility regulation. But in societies where such cooperative relations between male and female do not exist on matters of sex and reproduction, ultimately the decision-making power needs to be in the hands of woman, because biologically she invests far more than a man in each child she conceives and carries. Mason (2001) observes that relative equality between the sexes within the conjugal family evidently lowers the cost of fertility regulation, and in this way, gender systems appear to play an important role in fertility transition, although not as master determinants. Where this equality does not now exist, the

place to start is in lowering the barriers to access to fertility regulation, including information campaigns to reduce the highly prevalent misinformation about contraception and a methodical elimination of all the unnecessary medical barriers in family planning services.

It is important to recognize that the successful programmes in the past, including those in Taiwan, Korea, Thailand and Mexico, were based on a model of systematically reducing the barriers to family planning, although the programmes were not conceptualized in this way at the time. Having pointed this out, it is worth noting that this paper is not concerned with family planning programmes, but instead with the ability of the individual, and specifically the individual woman, to obtain fertility-regulation methods easily if she wants them, from any convenient source, regardless of whether any programme is present.

8. ENDING THE SILENCE

Attention to population has been silenced by a 'perfect storm' of forces. The fertility decline in a number of the developing countries and in most developed nations has taken a sense of urgency out of the problem, and below replacement-level fertility, with special concerns about the ageing of populations in Europe and Japan has received much attention. The tragedy of AIDS has dominated international health concerns, and global warming has focused well justified attention on the impact of high levels of western consumption on the environment. Conservative political and religious forces, especially in the USA, have worked to reduce attention to the need for family planning. Thinking rationally about the population factor in development has been hindered by a millennium of cultural and religious opposition to a woman's ability to make decisions about the size of her family. Finally, the assumption behind the most broadly accepted theories of fertility decline that couples naturally want many children has made it difficult to see the many barriers blocking women's options to manage their own childbearing (Campbell 2007).

This paper suggests a shift of emphasis in theoretical explanations of fertility decline to:

- (i) attach greater weight to the many barriers that separate women from the fertility regulation methods and correct information they need to manage their family size;
- (ii) recognize that a latent desire to control fertility may be far more prevalent among women than previously understood; and
- (iii) appreciate that women under normal consumer behaviour rationally make benefit–cost analyses based on the information they have, wanting modern family planning only after they understand it is a safe option.

There is a large and in some places growing unmet need for family planning (Prata 2009) and empirical data from developed and developing countries support the generalization that once women have the

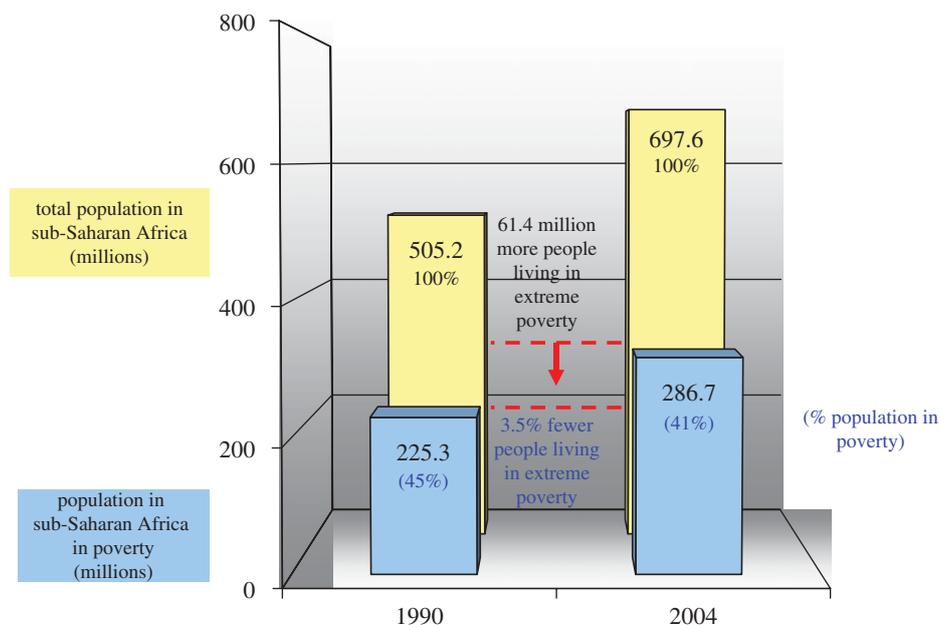


Figure 3. Changes in poverty levels, 1990–2004. While the percentage of people in sub-Saharan Africa who live in extreme poverty decreased slightly between 1990 and 2004, owing to the population growth the actual number of people in extreme poverty has increased by 61.4 million people.

opportunity to decide whether and when to have a child, then birth rates can be lowered in a human rights framework. An emphasis on opportunities to access family planning places female decision-making centre stage, respecting and empowering women to decide whether and when to have a child. Indeed, it is possible that this kind of opportunity is the one factor consistent with fertility decline virtually everywhere.

As long as theoretical explanations have been weighted towards social and economic changes as prerequisites for the demographic transition to take place, then the question about whether population growth is a problem has tended to be pushed aside by the media and policy-makers, because if needed socio-economic changes are not occurring then the inference is that either that the situation is hopeless or coercion is needed. An opportunity model means that fertility can decline (and has many times in the past) within a human rights framework, and when this is understood, there no longer needs to be a sense of fear that attention to population growth and fertility decline might abridge human rights.

If it is understood that birth rates can be lowered by purely voluntary means, then the question ‘is population growth a problem?’ can be addressed squarely. The report of the recent hearings in the UK Parliament on population growth concluded, ‘the MDGs are difficult or impossible to achieve with the current levels of population growth in the least developed countries and regions’ (APPG 2007, p. 4; Campbell *et al.* 2007; figure 3). For example, health and education systems in countries with high fertility cannot keep up with their rapidly growing populations. In the case of education, because of population growth, assuming a class size of 40, the developing world needs to meet the challenge of training and deploying two million new teachers every year just to stand still,

without any increase in the percentage of children in school—something that is not being achieved.

With respect to the intellectual and political framing of the population subject, two currents came together. First, attention to the population factor and its many interactions with economic development, the use of natural resources and even security issues, has been hindered by a lack of academic consensus and a lack of understanding among decision-makers that rapid population growth can be slowed in a human rights framework. Second, the political framing of the ICPD that gained the widest recognition was outside the formal Programme of Action, effectively silencing attention to population and portraying everything that happened before Cairo as tinged with coercion. This deterred biologists, climatologists and development specialists from asking obvious questions about the population growth factor in social development and in moving the planet to a biologically sustainable lifestyle.

The irony of the post-Cairo framing of population and family planning is that most poor women around the world are no better off and many are worse off than they were in 1994. The absolute number of maternal deaths is probably greater than those at the time of Cairo, while the number of people living in abject poverty in sub-Saharan Africa has hardly changed in percentage terms but has grown substantially in absolute numbers (figure 3). Differentials in TFR between the highest and lowest economic quintiles within developing nations have also widened, at least in sub-Saharan Africa—a sad statistic that almost certainly translates into further inequities in education and health between the rich and poor within these already poor societies.

The Programme of Action which came out of the ICPD conference emphasized the need to slow rapid population growth and mapped out a long-term goal

of improving broad aspects of reproductive health, beginning an effort to reverse centuries of patriarchal control of women. In some ways the implementation of the Programme was not radical enough, because it did not recognize that when women, even those in poor and illiterate communities, are given opportunities to manage their childbearing they would have smaller families, not dependent on exogenous social changes. The poorest and most vulnerable women in the world will be better off if policy-makers in developed countries understand that the wide range of tangible and intangible barriers to the use of fertility regulation methods are also barriers to development. Everything possible should be done to reach the ICPD goal of achieving 'universal access to a full range of safe and reliable family planning methods'. As it becomes increasingly apparent that birth rates can be slowed within a human rights framework, then those concerned with ecological change, resource scarcity, climate change, national security and other global problems can begin to look objectively and creatively at the role of the population factor in the problems they confront.

ENDNOTE

¹Biology: fertility = potential to become pregnant. *Demography*: fertility = number of births.

REFERENCES

- Alexander, R., Hoogland, J., Howard, R., Noonan, K. & Sherman, P. 1979 Sexual dimorphism and breeding systems in pinnipeds, ungulates, primates and humans. In *Evolutionary biology and human social behavior: an anthropological perspective* (eds N. Chagnon & W. Irons). North Scituate, MA: Duxbury Press.
- APHRC (African Population and Health Research Center) 2006 Nairobi, Kenya.
- APPG (All Party Parliamentary Group on Population, Development and Reproductive Health) 2007 Return of the population growth factor: its impact upon the millennium development goals. Report of hearings in parliamentary committee, UK Parliament, London, pp. 4, 11. <http://www.appg-popdevrh.org.uk>.
- Antrobus, P. 1992 *Address at Global Forum, Rio de Janeiro, 11 June 1992*. New York, NY: Tape by Helen Rosenbluth Duplications.
- Asturias de Barrios, L., de Rodas, I. M., Nieves, I., Matute, J. & Yinger, N. 1998 *Unmet need for family planning in a peri-urban community of Guatemala city*. Washington, DC: International Center for Research on Women.
- Becker, G. S. 1991 *A treatise on the family*, enlarged edn. Cambridge, UK: Harvard University Press.
- Betzig, L. 1986 *Despotism and differential reproduction: a Darwinian view of history*. New York, NY: Aldine Publishing Company.
- Blanc, A. K. & Tsui, A. O. 2005 *The dilemma of past success: insiders' views on the future of the international family planning movement*. Baltimore, MD: Johns Hopkins Bloomberg School of Public Health.
- Bongaarts, J. & Bruce, J. 1995 The causes of unmet need for contraception and the social content of services. *Stud. Fam. Plann.* **26**, 57–75. (doi:10.2307/2137932)
- Bongaarts, J. & Watkins, S. 1996 Social interactions and contemporary fertility transitions. *Popul. Dev. Rev.* **22**, 639–682. (doi:10.2307/2137804)
- Borgerhoff Mulder, M. 1998 Demographic transition: are we any closer to an evolutionary explanation? *Trends Ecol. Evol.* **13**, 266–270. (doi:10.1016/S0169-5347(98)01357-3)
- Bulatao, R. A. 2001 Introduction. In *Global fertility transition* (eds R. Bulatao & J. Casterline), p. 3. New York, NY: Population Council.
- Caldwell, J. 1983 Direct economic costs and benefits of children. In *Determinants of fertility in developing countries* (eds R. A. Bulatao, R. Lee, P. Hollerbach & J. Bongaarts). New York, NY: Academy Press.
- Campbell, M. 1998 Schools of thought: an analysis of interest groups influential in international population policy. *Popul. Environ.* **19**, 487–512. (doi:10.1023/A:1024660407333)
- Campbell, M. 2006 Consumer behavior and contraceptive decisions: resolving a decades-long puzzle. *J. Fam. Plann. Reprod. Health Care* **32**, 241–244. (doi:10.1783/147118906778586705)
- Campbell, M. 2007 Why the silence on population? *Popul. Environ.* **28**, 237–246.
- Campbell, M. M., Sahin-Hodoglugil, N. N. & Potts, M. 2006 Barriers to fertility regulation: a review of the literature. *Stud. Fam. Plann.* **37**, 87–98. (doi:10.1111/j.1728-4465.2006.00088.x)
- Campbell, M., Cleland, J., Ezeh, A. & Prata, N. 2007 Return of the population growth factor. *Science* **315**, 1501–1502. (doi:10.1126/science.1140057)
- Casterline, J. B. & Sinding, S. W. 2000 *Unmet need for family planning in developing countries and implications for population policy*. New York, NY: Population Council, Policy Research Division.
- Casterline, J. B., Perez, A. E. & Biddlecom, A. E. 1997 Factors underlying unmet need for family planning in the Philippines. *Stud. Fam. Plann.* **28**, 173–191. (doi:10.2307/2137886)
- Casterline, J. B., Sathar, Z. & Haque, M. 2001 Obstacles to contraceptive use in Pakistan: a study in Punjab. *Stud. Fam. Plann.* **32**, 95–110. pages 107, 181. (doi:10.1111/j.1728-4465.2001.00095.x)
- Castle, S. 2003 Factors influencing young Malians' reluctance to use hormonal contraceptives. *Stud. Fam. Plann.* **34**, 186–199. (doi:10.1111/j.1728-4465.2003.00186.x)
- Cleland, J. 1985 Marital fertility decline in developing countries: theories and the evidence. In *Reproductive change in developing countries: insights from the world fertility survey* (eds J. Cleland & J. Hobcraft), p. 227. London, UK: Oxford University Press.
- Cleland, J. 2001a The effects of improved survival on fertility: a reassessment. In *Global fertility transition* (eds R. Bulatao & J. Casterline), p. 66. New York, NY: Population Council.
- Cleland, J. 2001b Potatoes and pills: an overview of innovation-diffusion contributions to explanations of fertility decline. In *Diffusion processes and fertility transition: selected perspectives* (ed. J. Casterline). Washington, DC: National Academy Press.
- Cleland, J. & Wilson, C. 1987 Demand theories of the fertility transition: an iconoclastic view. *Popul. Stud.* **41**, 5–30. (doi:10.1080/0032472031000142516)
- Coale, A. J. & Watkins, S. 1986 The decline of fertility in Europe. In *The Revised Proceedings of a Conference on the Princeton European Fertility Project*. Princeton, NJ: Princeton University Press.
- Curtis, S. L. & Westoff, C. F. 1996 Intention to use contraceptives and subsequent contraceptive behavior in Morocco. *Stud. Fam. Plann.* **27**, 239–250. (doi:10.2307/2137996)
- Darwin, C. 1879 *Descent of man and selection in relation to sex*. London, UK: John Murray.
- David, H. 1999 *From abortion to contraception*. Westport, CT: Greenwood Press.

- Davis, K. 1967 Population policies: will current programs succeed? *Science* **158**, 730–739. (doi:10.1126/science.158.3802.730)
- DFID (Department for International Development) 2006 Written evidence for UK Parliament committee hearings on population growth and the MDGs. See <http://www.appg-popdevrh.org.uk>.
- El-Zanaty, F., Way, A., Kishor, S. & Casterline, J. B. 1999 Egypt in depth study on the reasons for non-use of family planning: results of a panel survey in Upper Egypt, National Population Council, Cairo, Egypt.
- Engelman, R. 2008 *More: population, nature, and what women want*. Washington, DC: Island Press.
- Freedman, R. 1997 Do family planning programs affect fertility preferences? A literature review. *Stud. Fam. Plann.* **28**, 1–13. (doi:10.2307/2137966)
- Grubb, G. S. 1987 Women's perception of the safety of the pill: a survey in eight developing countries. *J. Biosoc. Sci.* **19**, 313–321.
- Hall, J. A. 1991 *Bringing new products to market: the art and science of creating Winners*. New York, NY: Amacom (American Management Association).
- Hashmi, S. S., Alam, K. & Sheraz, A. 1993 *Non-users and unmet need for contraception*. Islamabad, Pakistan: National Institute of Population Studies.
- Hawking, S. W. 1988 *A brief history of time: from the big bang to black holes*. New York, NY: Bantaam Books.
- Henshaw, S. K., Singh, S. & Haas, T. 1999 The incidence of abortion worldwide. *Int. Fam. Plann. Perspect.* **25**, S30–S38. (doi:10.2307/2991869)
- Hodgson, D. & Watkins, S. C. 1997 Feminists and neo-Malthusians: past and present alliances. *Popul. Dev. Rev.* **23**, 469–523. (doi:10.2307/2137570)
- Hrdy, S. B. 1977 *The langurs of Abu: female and male strategies of reproduction*. Cambridge, MA: Harvard University Press.
- Iranian Ministry of Health and Medical Education 2002 Demographic and Health Survey Iran 2000, Tehran.
- Kulczycki, A. 1999 *The abortion debate in the world arena*. New York, NY: Routledge.
- Lee, R. D. 2003 Rethinking the evolutionary theory of aging: transfers not births, shape senescence in social species. *Proc. Natl Acad. Sci.* **100**, 9637–9642. (doi:10.1073/pnas.1530303100)
- Leibenstein, H. M. 1957 *Economic backwardness and economic growth*. New York, NY: Wiley.
- Lesthaeghe, R. J. 1977 *The decline of Belgian fertility, 1800–1970*. Princeton, NJ: Princeton University Press.
- Lockwood, C. A., Menter, C. G., Moggi-Cecchi, J. & Keyser, A. W. 2007 Extended male growth in a fossil hominin species. *Science* **318**, 1443–1446. (doi:10.1126/science.1149211)
- Magnani, R. J., Hotchkiss, D., Florence, C. & Shafer, L. 1999 The impact of family planning supply environment on contraceptive intentions and use in Morocco. *Stud. Fam. Plann.* **30**, 120–132. (doi:10.1111/j.1728-4465.1999.00120.x)
- Mason, K. O. 1997 Explaining fertility transitions. *Demography* **34**, 443–454. (doi:10.2307/3038299)
- Mason, K. O. 2001 Gender and family systems in the fertility transition. In *Global fertility transition* (eds R. Bulatao & J. Casterline). New York, NY: Population Council.
- National Institute of Population Research and Training Dhaka Bangladesh 2007 Bangladesh demographic and health survey: preliminary report. Measure DHS Macro International Inc., Calverton, MD.
- Notestein, F. W. 1953 Economic problems of population change. In *Proc. Eighth International Conf. of Agricultural Economists*. London, UK: Oxford University Press.
- Phillips, J., Hossain, M. B. & Arends-Kuenning, M. 1996 The long-term demographic role of community-based family planning in rural Bangladesh. *Stud. Fam. Plann.* **27**, 204–219. (doi:10.2307/2137954)
- Phillips, J. F., Simmons, R., Koenig, M. & Chakraborty, J. 1988 Determinants of reproductive change in a traditional society: evidence from Matlab, Bangladesh. *Stud. Fam. Plann.* **19**, 313–334. (doi:10.2307/1966627)
- Postlethwaite, D., Trussell, J., Zoolakis, A., Shabear, R. & Petitti, D. 2007 A comparison of contraceptive procurement pre- and post-benefit change. *Contraception* **76**, 360–365. (doi:10.1016/j.contraception.2007.07.006)
- Potts, M. 1997 Sex and the birth rate: human biology, demographic change and access to fertility regulation methods. *Popul. Dev. Rev.* **23**, 1–39. (doi:10.2307/2137459)
- Potts, M. 2003 Two pills, two paths: a tale of gender bias. *Endeavour* **27**, 127–130. (doi:10.1016/S0160-9327(03)00103-0)
- Potts, M. 2005 Why can't a man be more like a woman? Sex, power, and politics. *Obstet. Gynecol.* **106**, 1065–1070.
- Potts, M. & Campbell, M. 2005 Reverse gear: Cairo's dependence on a disappearing paradigm. *J. Reprod. Contracept.* **16**, 179–186.
- Potts, M. & Campbell, M. 2008 The origins and future of patriarchy: the biological background of gender politics. *J. Fam. Plann. Reprod. Health Care* **34**, 171–174. (doi:10.1783/147118908784734792)
- Potts, M. & Hayden, T. 2008 *Sex and war: how biology explains warfare and terrorism and offers a path to a safer world*. Dallas, TX: Benbella Books.
- Potts, M. & Hunt, W. L. 2000 Over-the-counter availability of oral contraceptives. *Infertil. Reprod. Med. Clin. North America* **11**, 531–544.
- Potts, M. & Short, R. 1999 *Ever since Adam and Eve: the evolution of human sexuality*. Cambridge, UK: Cambridge University Press.
- Potts, M., Diggory, P. & Peel, J. 1977 *Abortion*. Cambridge, UK: Cambridge University Press.
- Prata, N. 2009 Making family planning accessible in resource-poor settings. *Phil. Trans. R. Soc. B* **364**, 3093–3099. (doi:10.1098/rstb.2009.0172)
- Robinson, W. 1996 The economic theory of fertility over three decades. *Popul. Stud.* **51**, 63–74. (doi:10.1080/0032472031000149736)
- Robinson, W. & Cleland, J. 1992 The influence of contraceptive costs on the demand for children. In *Family planning programmes and fertility* (eds J. F. Phillips & J. A. Ross), p. 119. Oxford, UK: Clarendon Press.
- Rogers, E. 1983 *Diffusion of innovations*, 3rd edn. New York, NY: The Free Press.
- Rosenbluth, H. 2002 Tape recording in the woman's tent at the Global Forum, Rio de Janeiro, 1992. New York, NY: Helen Rosenbluth Duplications.
- Rutenberg, N. & Watkins, S. C. 1997 The buzz outside the clinics: conversations and contraception in Nyanza Province, Kenya. *Stud. Fam. Plann.* **28**, 290–307. (doi:10.2307/2137860)
- Shah, N. M. & Shah, M. A. 1984 From non-use to use: prospects of contraceptive adoption. In *Fertility in Pakistan: a review of findings from the Pakistan fertility survey*. (eds I. Alam & B. Dinesen), The Hague, Netherlands: International Statistical Institute.
- Sibanda, A., Woubalem, Z., Hogan, D. P. & Lindstrom, D. P. 2003 The proximate determinants of the decline to below-replacement fertility in Addis Ababa, Ethiopia. *Stud. Fam. Plann.* **34**, 1–7. (doi:10.1111/j.1728-4465.2003.00001.x)
- Speidel, J. J. 2009 Population policies, programmes and the environment. *Phil. Trans. R. Soc. B* **364**, 3049–3065. (doi:10.1098/rstb.2009.0162)

- Stanback, J., Smith, J., Janowitz, B. & Diadhiou, F. 1994 Safe provision of oral contraceptives: the effectiveness of systematic laboratory testing in Senegal. *Int. Fam. Plann. Perspect.* **20**, 147–149. (doi:10.2307/2133260)
- Stash, S. 1999 Explanations of unmet need for contraception in Chitwan, Nepal. *Stud. Fam. Plann.* **30**, 267–287. (doi:10.1111/j.1728-4465.1999.x)
- Stephenson, R. & Hennink, M. 2004 Barriers to family planning service use among the urban poor in Pakistan. *Asia-Pacific Popul. J.* **19**, 5–26.
- Tarman, A. 2005 *Iran achieves replacement-level fertility*. Washington, DC: Population Reference Bureau.
- Tietze, C. & Bongaarts, J. 1975 Fertility rates and abortion rates: simulations of family limitation. *Stud. Fam. Plann.* **6**, 119.
- Tomeczyk, B. 2000 Summary from a reproductive health survey among Afghan refugees in Pakistan. Unpublished technical report.
- United Nations 1996 *Programme of Action adopted at the International Conf. on Population and Development, Cairo*, 5–13 September 1994, paras 1.4, 7.16, 7.19, 7.20. New York, NY: United Nations Population Fund.
- United Nations Population Fund 1988 Country report on population, reproductive health and family planning program in the Islamic Republic of Iran. Family Health Department, Undersecretary for Public Health, Ministry of Health and Medical Education (ed.), Tehran.
- Vahidnia, F. 2007 Case study: fertility decline in Iran. *Popul. Environ.* **28**, 259–266. (doi:10.1007/s11111-007-0050-9)
- Van der Tak, J. 1974 *Abortion, fertility and changing legislation: an international review*. Lexington, MA: D.C. Heath and Company.
- Vinning, D. R. 1986 Social versus reproductive success: the central theoretical problem in human sociobiology. *Behav. Brain Sci.* **9**, 167–260.
- Viswanathan, H., Godfrey, S. & Yinger, N. 1998 *Reaching women: a study of unmet need in Uttar Pradesh*. Washington, DC: International Center for Research on Women.
- Westoff, C. & Bankole, A. 1997 Mass media and reproductive behavior in Africa. Demographic and health surveys [DHS] analytical reports. Macro International Inc., Calverton, MD.
- World Bank 2007 *Population in the 21st century: the role of the World Bank*. Washington, DC: The International Bank for Reconstruction and Development.
- World Health Organization 2004a *Medical eligibility criteria for contraceptive use*, 3rd edn. Geneva, Switzerland: Reproductive Health and Research. See <http://WHO.Int/ReproductiveHealth/Publications/RHR002>
- World Health Organization 2004b *Selected practice recommendations for contraceptive use*, 2nd edn. Geneva, Switzerland: Department of Reproductive Health and Research Family Planning and Community Health. See <http://WHO.Int/ReproductiveHealth/Publications/RHR027/Index.htm>.
- Yinger, N. V. 1998 *Unmet need for family planning: reflecting women's perceptions*. Washington, DC: International Center for Research on Women.
- Zerjal, T., Xue, Y. & Bertorelle, G. 2003 The genetic legacy of the Mongols. *Ann. Hum. Genet.* **72**, 717–721.