The Impact of Freedom on Fertility Transition: Revisiting the Theoretical Framework

Martha Campbell, Ndola Prata and Malcolm Potts
University of California, Berkeley

File: Impact of Freedom Sept 4, 2007.doc

Martha Campbell is Lecturer, Ndola Prata is Assistant Adjunct Professor, and Malcolm Potts is the Bixby Professor, School of Public Health, University of California, Berkeley. 239 University Hall, University of California, Berkeley, CA 94720-7360. E-mail: campbell@berkeley.edu

Submitted for publication.

Abstract

Demographers have worked for decades to try to identify the conditions common to all the declines in fertility constituting each country's final stage of the demographic transition. This paper suggests that the reduction of barriers that separate women from the technologies and information they need to manage whether and when they have a child may provide a plausible explanation for the timing of fertility decline across all societies. The proposed "freedom" model suggests that a latent desire for controlling their family size may be virtually ubiquitous among women, who act upon it only when they perceive the costs (defined broadly) of seeking or using fertility regulation methods to be lower than the benefits, and when they recognize that they actually have options about their childbearing. While clearly there are other influential factors, the significant reduction of barriers to contraceptive use could possibly be the only factor consistently associated with all instances of fertility decline, introducing the possibility that this relationship might be more causal than has usually been recognized. An important implication may be that high and stalled birth rates are open to change within a human rights framework. In addition, it may no longer be necessary to identify any exogenous source of inspiration for couples' decisions to have a small family.

The Impact of Freedom on Fertility Transition: Revisiting the Theoretical Framework

Martha Campbell, Ndola Prata and Malcolm Potts
University of California, Berkeley

INTRODUCTION

Demographers have worked for over a half-century to identify the conditions influencing the timing of the fertility decline constituting the final stage of countries' demographic transitions. The classic theory of the demographic transition as expressed by Notestein (Notestein 1953) and the many variations that followed have centered on couples' decisions to have a particular family size. Notestein's original assumption that urbanization was the driving force for these decisions has been followed by observations of close association between declining fertility with various aspects of socio-economic change and economic behavior regarding costs and benefits of having another child. It is well known in the community of demographers that anomalies to all of the posited influences abound.

In 1997 Karen Mason noted, "A claim that only one factor causes all fertility transitions can be destroyed by discovering a single exception….Exceptions to all the major theories of fertility transitions have been found…" (Mason 1997)(page 446). The search for a plausible, consistent explanation of fertility decline has continued. While the numerous demand-oriented theories have long been criticized (Cleland and Wilson 1987) (Robinson and John 1992) and technically falsified, there still remains a lingering, widespread assumption that something in society that is exogenous to the couple is driving fertility decline or the delays in timing of that decline.

We recently published a comprehensive review of the wide range of barriers that separate women from the technologies and information they need to manage whether and when they have a child (Campbell et al, 2006). These barriers are so vast and deeply infused into societies and medical structures that many contraceptive options are never even considered by women due to lack of awareness or unfamiliarity, while other options are immediately crossed off in women's minds before they are even tried -- due to misinformation or other barriers that prevent adoption of otherwise effective methods. We believe that the currently held theoretical explanations for fertility decline would benefit from a greater emphasis on these many barriers. Going further, in this paper we wish to suggest a relatively simple theory, which we have termed the freedom model, which essentially says that the timing of fertility decline appears to be dependent on the degree of ease, or freedom, with which women can obtain the technologies and supporting information they need to decide how many children they wish to bear.

For this paper we are labeling as "the standard models" the entire group of widely respected theoretical explanations for fertility decline based on the influence of societal

changes on couples' decisions about fertility, as well as economic models of couples' assessments of costs and benefits having another child. We recognize the many differences among these "standard" models, but they share in common couples' decision-making based on changes in exogenous factors in either their social and economic environments or their own economic situations.

The role of demand for contraception or of the desire for a smaller family is not disputed in this paper. Instead, the distinction between the freedom model and the standard models turns on the weight, source and timing of the initiation of this demand. We give more weight than previous authors to the presence of barriers to fertility regulation. Indeed, the most parsimonious explanation for fertility decline is that the reduction of practical barriers is the only factor consistently associated with all instances of reduced total fertility rates (TFRs), and it is tempting to suggest that this relationship may be more causal than is generally recognized.[i] It fits the timing of fertility decline in low resource settings as well as the very low fertility in industrialized nations.

A key source of demand in the freedom model is the realization by the woman that there is a safe option available to her to manage her fertility. This is relevant because in many countries with high fertility, the perceived costs or deleterious effects of seeking or using contraception are exceedingly high, an unfortunate consequence of certain societal beliefs that must more accurately be seen as misinformation (Campbell, Sahin-Hodoglugil et al. 2006).[ii] We suggest that vast numbers of people, and particularly women, are unlikely to express desire for a small family when they have serious concerns about the safety of certain methods of contraception, which may be exacerbated by limited access (or lack of knowledge) about methods they would find acceptable. There are documented cases demonstrating that women who do not want contraception or a small family have been known to change their minds after it became readily available to them along with correct information. We have discovered that this pattern of decision-making fits a well documented pattern of normal consumer behavior (Campbell 2006) in other aspects of people's lives beyond sex and reproduction.

Bulatao has listed eight basic explanations for fertility decline, and in the sixth he saw the potential power of combining latent desire and access to fertility regulation.

> Improved access to effective fertility regulation. Better methods of contraception and abortion, and less-fettered access to such methods, should make it easier to control fertility. Assuming some initial at least latent desire to do so, greater access should give an impetus to fertility decline (Bulatao, 2001) (page 3).

Cleland provided the insight that this might apply in particular to women, due to the dangers of childbearing and consequently high maternal mortality. He comments, "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 2001)(page 66).

The proposed freedom model suggests that, given the dangers in giving birth and the burdens on mothers of child rearing, a latent desire for having control over their childbearing, based on a natural comfort with the idea of bearing fewer than the maximum possible number of children, may be virtually ubiquitous among women. This desire may remain latent as long as women do not recognize they actually have viable, culturally acceptable options to regulate their childbearing, or if the costs of seeking and/or using fertility regulation methods are perceived to be higher than the benefits. Later in this paper we will expand on these thoughts.

It is important to understand that the freedom model is not concerned with family planning programs, but instead with the ease with which individuals are able to have access to fertility regulation, regardless of whether any program is present. We define ease of access as the significant reduction of barriers to fertility regulation methods and supporting information.[iii] Barriers to fertility regulation are the many medical, economic and logistic factors that hinder realistic availability of either the technologies or the correct information that women need if they want to have control over whether and when to have a child, or both. By technologies we mean any method, whether a product, breast feeding, *coitus interruptus,* or a medical service that is needed for fertility regulation, including the range of family planning methods and safe abortion. We consider the sources of these technologies to be any channels within women's reach, including government services, NGOs, and the commercial private sector including pharmacies and chemical sellers, as appropriate per method. Sources of correct information might be broadcasting, posters, the print media, pharmacies and chemical sellers, in addition to counselors in clinics, because we recognize that in many low resource countries most women will never reach a full service clinic.

Our focus on the freedom model which depends on on ease of access to fertility regulation is based heavily on previous theoretical work by a number of leading demographers. Twenty years ago John Cleland and Christopher Wilson described problems in models of fertility that depended on couples' demand for contraception, including the unevenness with which it applied to experience across countries and time (Cleland and Wilson 1987). Cleland's own subsequent work on diffusion and ideational change, with credit to Everett Rogers' early concept of diffusion (Rogers 1983) plays an important role in our own theoretical explanation (Cleland 2001). Curtis and Westoff, 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 and Westoff 1996)(page 240). Magnani et al expanded on this concept to suggest a supply-side

influence on fertility preferences (Magnani, Hotchkiss et al. 1999). In analyzing patterns of contraceptive use in Matlab, James Phillips and his co-authors observed that latent demand for contraception was activated by appropriately delivered, socially sensitive supply in an impoverished society, and it 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, Simmons et al. 1988) (page 328). The authors also recognized the institutional constraints for replicating the Matlab experience. They called for more research, noting, "A shift in emphasis is needed from an analysis of the institutional determinants of demand to those of supply" (Phillips, Simmons et al. 1988) (page 328).

In 1992, Warren Robinson and John Cleland, writing on the impact of contraceptive costs, observed, "…a very genuine latent desire to limit further childbearing collides with very high perceived costs attached to the only birth limitation methods available" (Robinson and John 1992)(page119). Casterline agrees, saying, "the 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, Sathar et al. 2001)(page107). Robinson, examining three decades of economic theory of fertility, explains that in societies with fertility below replacement level, economic explanations of fertility decline have lost all of their explanatory power. He points out that "fertility is a byproduct of the pursuit of heterosexual pleasure unless some deliberate control is used…" (Robinson 1996)(page68).[iv] Viewing fertility within a biological framework, Potts (1997) observes that preventing a conception is exceeding difficult in the context of frequent sexual intercourse, which is virtually universal among humans. Westoff and Bankole demonstrated that in Africa the influence of general as well as specific information through the broadcast media on contraceptive use (Westoff and Bankole 1997). Caldwell recognized that one of the factors generating any fertility transition is the increased ability of women to determine their own fertility (Caldwell 1983). And finally, Bulatao's suggestion, as noted, that improved access to fertility regulation, assuming some initial at least latent desire for it, should give an impetus to fertility decline (Bulatao, 2001) has encouraged us to examine the concept of "latent".

Stephen Hawking has written, "A theory is a good theory if it satisfies two requirements. It must accurately describe a large class of observations on the basis of a model that contains only a few arbitrary elements, and it must make definite predictions about the results of future observations."[v] (Hawking 1988)(page 9). None of the standard models of the demographic transition predicted or could explain the below replacement level fertility now found Europe and Japan. Neither could any of them have predicted the relatively rapid fertility decline observed in some developing countries which took place in the second half of the twentieth century, while leading demographers dismissed the early efforts to make family planning more accessible as wishful thinking. They are not able to explain the fall in Iran's total fertility rate (TFR) from 5.5 to 2 in the 11 years

between 1989 and 2000 (Tarmann 2005), or Addis Ababa's decline in TFR to 1.8 while the whole of Ethiopia remained at a TFR of 5.9 (Sibanda, Woubalem et al. 2003).

The freedom model fits the delays in fertility decline in countries in sub-Saharan Africa today, as well as in Afghanistan, Pakistan and Yemen. It fits the rise in TFR found in some African communities as the focus moved away from family planning following Cairo. It is consistent with the diffusion of innovations, information and ideas within cultural or language groups, and it could fit the isolated instances of low fertility found in parts of Europe in the 18th and 19th centuries. The freedom model could explain the extremely low fertility in Europe and Japan today. It helps to explain examples of rapid increases in contraceptive use where an established demand for family planning had not been evident prior to the realistic availability of family planning. It is consistent with the biology of human reproduction, a connection we will discuss below. It certainly fits Coale's three requirements for reduced birth rates.[vi] And finally, we are positing that the freedom model will lead to predictions more reliable than those associated with the standard models.

The newest indication that the theoretical model of fertility needs to be revisited can be found in the recently published report, *Population in the Twenty-first Century: The Role of the World Bank* (2007) (add ref). The Bank's renewed attention to the population growth factor in development is to be applauded, and it repeatedly recognizes discrepancies between the assumed socioeconomic bases for couples' decisions to have a smaller family and the actual fertility decline in Bangladesh, Indonesia and other countries where these conditions were not present (ref and pages). It is our hope that our work in this area will help to provide a useful way to understand what at first look like contradictions.

In the remainder of this paper we will describe each of the components that together have led us to suggest the freedom model of fertility decline. First, we will give an abbreviated description of the published comprehensive review of barriers to fertility regulation, with special emphasis on medical barriers, misinformation and the role of unsafe and safe abortion. In the next section, we review published situations where the arrival of realistic options for couples and women to have contraception has influenced not only contraceptive use but also desired family size. This is followed with a section describing a mismatch between assumptions in the standard models of fertility and the biology of human reproduction, based primarily on Potts' core paper on this subject, Sex and the Birth Rate, published in 1997. The section on the influence of opportunity contains a discussion of the convergence between latent desire and the lifting of barriers to fertility regulation in the context of normal consumer behavior. In the final section before the conclusion, we point out some language problems that we feel have constrained understanding of fertility decline, and we offer a test for the freedom model in the form of outcomes we believe we can expect if it is implemented.

Barriers to fertility regulation

As the freedom model is based on the experience of places where the barriers to fertility regulation are insurmountable to large numbers of low income women, it is necessary to describe the range of the barriers that persist in high fertility settings around the world. As noted, the more lengthy comprehensive description has been published, and we are presenting here only a brief summary.

The importance of barriers to family planning was recognized in the ICPD Programme of Action, which stated in paragraph 7.20:

> "Governments should make it easier for couples and individuals to take responsibility for their own reproductive health, by removing unnecessary legal, medical, clinical and regulatory barriers to information and to access to family planning services and methods (United Nations 1994)

A comprehensive review of barriers to fertility regulation has been conducted to describe the wide range of constraints facing women in developing countries (Campbell, Sahin-Hodoglugil et al. 2006). A second review has focused on documented cases where the preference for smaller families did not precede the availability of fertility regulation methods, but followed the arrival of opportunities for women to have control over their own reproduction; and on the literature of consumer behavior around products and services unrelated to sex or pregnancy (Campbell 2006).

Awareness of barriers to family planning constitutes an important common thread in much of the previous literature based on analysis of patterns of contraceptive use, and our review (Campbell, Sahin-Hodoglugil et al. 2006) was stimulated by this important work. We were not reviewing programs, but rather examining barriers from the consumer perspective, considering whether the individual, and specifically the individual woman, can obtain fertility regulation methods easily if she wants them, from any convenient source, not necessarily from a particular location or some organized provider. Only a small sampling of this large collection of evidence of barriers will be discussed here.

The ICPD goal of removing "all programme-related barriers to family planning use by the year 2005" (United Nations 1994)(paragraph 7.19) remains unfulfilled. The recent review of barriers categorizes them as a series of functional obstacles, including the status of women, geographic access, unaffordable financial costs, medical rules and restrictions, shortfalls and breaks in commodity supplies, contraceptive side effects, misinformation, and laws restricting the provision of safe abortion. With regard to the status of women, we suspect that societies' cultural rules may influence women's family planning options more than their preferences. Mason writes, "…women's freedom of movement, awareness, and control of resources may determine how quickly they learn about contraception, how able they are to seek out contraceptive supplies, and whether

they can afford the transportation and direct costs involved in obtaining them" (Mason 2001)(page 169). The control of women often plays out through provider biases or medical barriers to use (Potts 2005). The documented evidence of medical barriers alone is extensive, with many examples not based on any scientific evidence, such as required blood tests before hormonal methods can be obtained, requirements that a woman be menstruating on the day she reaches the clinic, and rules prohibiting nulliparous or unmarried women, or women with varicose veins, from taking the Pill. Non-evidence based medical practices are often deeply entrenched and surprisingly difficult to remove. Many of these are easily overlooked by policy makers, even though from the consumer perspective they may be virtually insurmountable.

Another major set of barriers is revealed in survey data regarding side effects of contraceptive methods. The demographic literature often makes little distinction between actual side effects and the perception of harmful health impacts from using contraception. We would classify the latter as misinformation. Fear of side effects is widespread, and it is one of the most important explanations for non-use of contraception (Bongaarts and Bruce 1995; Asturias de Barrios, De Rodas et al. 1998) (Shah and Shah 1984; Grubb 1987; Hashmi, Alam et al. 1993; Casterline, Perez et al. 1997; Viswanathan, Godfrey et al. 1998; Yinger 1998; El-Zanaty, Way et al. 1999; Stash 1999; Casterline and Sinding 2000). In Mali, some women believe that pills and injectables can cause infertility (Castle 2003). Qualitative interviews in the study in Punjab, Pakistan by Casterline et al. revealed as a prominent factor women's fears of the detrimental side effects of contraceptives on health (Casterline, Sathar et al. 2001). Casterline et al. report that in the Philippines, "[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, Perez et al. 1997)(page 181). Surveys in both developed and developing countries show that many women perceive pill use to be more dangerous than having a pregnancy, and in a study of eight developing countries, 50-70% of women thought pills posed considerable health risks (Grubb 1987). Low dose oral contraceptive pills are officially on prescription in most developing countries, although safety is not a problem (World Health Organization 2004) (World Health Organization 2004). The prescription status of the Pill implicitly conveys the idea to both health workers and consumers that this widely available method is dangerous – an important example of misinformation. Even in the US and Europe, commercial interests trump the evidence that oral contraceptives could be sold over-the-counter (Potts and Hunt 2000). It seems reasonable to expect that perception of harm in contraception would easily deter many women from believing that they have any option to control their fertility.

New evidence from Pakistan comes from an analysis of the Lady Health Workers' program in the country's rural areas in the north, where in spite of the ambitious effort to train and deploy reportedly 10,000 women whose tasks include provision of family planning, analysis shows that it is far from success. A key reason is a rule that to distribute birth control pills a woman must have at least an 8th grade education, but so

few villages have any women with education that high, most poor women still do not have access to a form of contraception they can control. Again, the unfortunate rule about educational level is not evidence-based, because in other countries (e.g. Thailand), even women with low literacy can be and have been trained successfully to distribute oral contraceptive pills. (Ref: PAA Pakistan paper, 2007)

Ultimately, in all societies where women on average have the number of children they want, this is achieved through a combination of contraception and abortion (Potts, Diggory et al. 1977). A number of authors have found empirical evidence that in every society induced abortion is an intrinsic variable in average family size (Van der Tak 1974; Potts, Diggory et al. 1977; David 1999; Kulczycki 1999), even though not every woman resorts to this fertility regulation method. 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 behavior, levels of fertility required for population stabilization cannot be easily obtained without induced abortion." (Tietze and John Bongaarts 1975)(page 119). However, many of the world's women lack access to safe abortion (Henshaw, Singh et al. 1999), making the cost of interrupting a pregnancy high and even life threatening. Barriers to access for abortion for low income women in developing countries can include price, sexual exploitation, pain, imprisonment and death. Kingsley Davis observed in the 1970s, "…despite its emphasis on technology, current policy does not utilize all available means of contraception, much less all birth-control measures…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…programs" (Davis 1967)(page 732). Some countries continue to be burdened with restrictive abortion laws inherited from previous colonial powers, even though nearly all of the former colonizers have reformed their own legislation. Elsewhere, as in India, the abortion law has been liberalized but regulations limit provision to physicians who by and large do not work in rural areas. Non-physicians can be responsibly trained to perform first trimester abortions (IPAS 2002) (Bhatia, Faruque et al. 1980), but once again non-evidence based policies act as an almost insuperable barrier to access to fertility regulation for low-income women. Information we have obtained 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.[vii]

The power of realistic options

A number of studies have found situations where substantial percentages of women who said they did not intend to use contraception nevertheless used it a short time later (Bhatia 1982; Curtis and Westoff 1996; Magnani, Hotchkiss et al. 1999; D'Agnes 2001). Poor and uneducated women, who according to a demand model of the demographic transition are not good candidates for family planning, have shown rapid uptake of

contraception when it became realistically available for them. In all of these cases, representing a variety of settings unassociated with significant improvement in socioeconomic status, the introduction of family planning options appears to have driven a rise in contraceptive use, and in several cases explicit survey evidence exists documenting the downward shifts in desired family size (Campbell 2006). Mason has observed that high CPRs can occur in the absence of large-scale socio-economic change (Mason 2001). This has been documented in, for example, Nigeria (Farooq and Adeokun 1976), Bangladesh (Caldwell and Caldwell 1992; Haaga and Maru 1996; Phillips, Hossain et al. 1996; Konje and Ladipo 1999; United Nations 2003), Morocco (Curtis and Westoff 1996; Magnani, Hotchkiss et al. 1999), Guatemala (Bertrand, Guerra de Salazar et al. 1999; Bertrand, Seiber et al. 2001), West Bengal, India (Chacko 2001), Pakistan (Shelton, Bradshaw et al. 1999), Ghana (Debpuur, Phillips et al. 2002). Fertility declined similarly in South Korea and Cuba with extremely different economic profiles (Noble and Potts 1996) (Noble, 1996). One especially interesting case has been Morocco, where the 1992 DHS-II and 1995 panel surveys, with data for 910 women, showed that approximately 30% of those women who reported in 1992 that they did not intend to use a contraceptive in the future were actually using a method in the 1995 survey (Curtis and Westoff 1996; Magnani, Hotchkiss et al. 1999).[viii]

Freedman argued that the rapid rise in contraceptive prevalence (CPR) in Ishan, Nigeria was doubtful and its documentation may reflect a problem in the survey (Freedman and Berelson 1976). However, an even more extreme rise in CPR occurred among Cambodian refugees living in the Khao-I-Dang camp in eastern Thailand, where CPR jumped from virtually zero prevalence to 52% of married women using contraceptives within one month (D'Agnes 2001). In a neighboring camp, Sakaew, within three days 2,252 out of 10,000 married women sought family planning advice. In one week contraceptive prevalence had jumped more than it climbed in most countries in a generation (Potts 1980).

The rapid fertility decline in the Islamic Republic of Iran has been a startling success that cannot be accounted for by exogenous societal factors influencing couples' decisions. In 1987 the religious leadership accepted a policy initiative of the Ministry of Health to make a full range of contraceptive choices, including voluntary male and female sterilization. The reasons for reducing fertility were to avoid poverty, enhance education and preserve the environment. All couples planning to marry were, and are now, required first to receive instruction in contraception. A well organized system of health workers introduced family planning in the rural areas. This voluntary program was associated with one of the most rapid declines in TFR ever recorded, from a TFR of 5.6 in 1985 to 2.0 in 2000 (United Nations Population Fund 1988). The gap in TFR narrowed from 3.6 more births in rural compared to urban areas in 1976 to only 0.6 more births in 2000 (Iranian Ministry of Health and Medical Education 2002). Iran did not reform the abortion law, but both medical and surgical abortion do seem to be available, at least to some women. The Iran-Iraq war, 1980-88, was deeply disruptive. There was a temporary

fall in per capita income followed by a rise while fertility continued to fall. There was no rise in the fertility rate as the men returned from war, as has often occurred in other countries. The government improved access to education, but this would not have affected the older women of childbearing age in this brief period. It seems likely, then, that the access to family planning in the Government's campaign in this program, including information contained in the publicity, had significant influence over the fall in fertility. Women's university education increased during this period, and maternal and infant mortality declined, but it is as plausible that these were driven by the declining fertility as vice versa.

There are a number of instances where realistic access to a range of contraceptive techniques, backed up by safe abortion, has been associated with a decline in fertility without significant exogenous change in socio-economic or other distal factors.

In Bali in the 1970s, a senior gynecologist (now deceased) began to offer manual vacuum aspiration (MVA) early abortion to women who became pregnant using an IUD. Later, this assurance was extended to all methods of contraception. The availability of safe abortion not only helps limit family size, but also improves the adoption and continuation of contraceptive use (Potts, Diggory et al. 1970). It seems plausible to conclude that the increase in use of MVA, linked to good advice on contraception, is key to explaining why the TFR on this Hindu island fell more rapidly (from 6 in 1970 to 2.1 in 1994) than elsewhere in Indonesia, even though minority societies typically have a higher birth rate than the neighboring majority population.

An even more rapid fertility decline has occurred in Addis Ababa, Ethiopia, where the TFR plummeted from 3.1 in 1990 to 1.8, with a desired family size of 1.6 (Central Statistical Authority Ethiopia and ORC Macro 2001). The rapid fall was not predicted by any demographer or sociologist, and even as recently as 1990, "Ethiopia was not considered among the countries at or near the start of the transition to low fertility" (Sibanda, Woubalem et al. 2003). Despite pervasive poverty, Addis has become the first capital city in sub-Saharan Africa to reach below replacement fertility. The age of marriage has risen and premarital childbearing remains low. However, while the mean age of marriage in Pakistan has risen significantly, family size has not fallen to the extent observed in Addis. Sibanda et al. "suspect that abortion and increased access to contraception are the immediate mechanisms by which out of wedlock births are being averted among single women in Addis Ababa" (Sibanda, Woubalem et al. 2003)(page 6). Data is emerging to support our view that ease of access to contraception and safe abortion for sexually active women, married or not, could possibly be the most influential factor driving the rapid fertility decline. In 2005, Ethiopia reformed its abortion law and abortion data became more openly available. In 2005, Marie Stopes International, which runs several reproductive health clinics in Addis Ababa, saw 85,000 clients[ix] and over 30,000 MVA comprehensive abortion care procedures were done (Marie Stopes International 2005).[x] It seems plausible that when women learned in the

community that they had an option to manage their own childbearing through means that were safe, the idea of limiting the size of their family became a liberating thought, presenting an attractive alternative in shaping their reproductive lives, over which they previously had had virtually no control.

Fitting the biology of human reproduction

Demand-oriented theories of fertility transition have a long history. Notestein's description of the fertility transition as the shift from high mortality and high fertility to low mortality and low fertility was accompanied by his conviction that in addition to mortality decline, factors of modernization spurred a desire for controlling family size (Notestein 1953). Further explanations centered on the impact of socioeconomic change were followed by the precisely constructed microeconomic explanation by Leibenstein and Becker in which couples or individuals were seen as weighing the costs and benefits of having a next child (Leibenstein 1957; Becker 1991). For many years the high correlations between data on wealth, education and urbanization and TFR were interpreted as causal, and most demographers have tended to view these as distal factors influencing birth rates through the proximate determinants of contraception, abortion, age of marriage and mortality.

These models of fertility emphasizing decision-making by couples about whether to have a next child do not explain how parents get from a decision to implementing it. Becker suggests that parents weigh 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 major appliances or cars (Becker 1991). However, this model is not consistent with the biology of human reproduction. Unlike almost all other mammals, humans have sexual intercourse many hundreds or even thousands of times more frequently than is needed to achieve the desired number of pregnancies. These high coital frequencies in virtually every human society obviate the possibility of applying rational choice in the economic sense to decisions about when to have a baby. Not everyone can make a rational decision about conceiving a child, because our reproductive biology places beyond our conscious awareness the initiation of a pregnancy, and instead we must take frequent, repeated, persistent, and perfect steps *to separate frequent sexual intercourse from conception*. 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 fail to do this repeatedly, perfectly, and persistently, one would be delivered, by default, at our door a few days later.

On the whole, demand-oriented models are difficult to explain biologically. Darwinian evolution is driven by reproductive competition, in which the plants and animals able to produce more offspring who in turn live to reproduce are the ones successfully passing their genes to the next generation. In the human world, if, as seems plausible, wealth and education are makers of individual reproductive success, then the most likely

behavior would be for rich and powerful people to choose to have large families (Vining 1986). Haaga and others have called attention to the paradox that "people who appear to be able to afford more children than their parents nevertheless want, have – and even say they can afford – fewer children" (Haaga 2001)(page 56). One of us (Potts 1997) has suggested that an escape from this paradox is possible by postulating that (i) unlike most mammals, as humans (especially men) we are evolved to seek and have frequent sexual intercourse; (ii) both sexes (especially women) are predisposed to treasure and nurture any children we produce, making it unlikely for mothers to say they did not want a child born to them; and (iii) we do not have a predisposition to have any specific number of children. In other words, there is no evidence of any sort of an evolved behavioral "kinderstaat" driving the desire to have either a large or a small family[xi]. In pre-literate societies, hormonal mechanisms, which are unconscious and are beyond volitional control, determine the total fertility rate in women.

A self-imposed, but we would argue unnecessary constraint burdening demographic theorizing is the almost universal quest for population "equilibrium".[xii] There is no biological or empirical basis for assuming any sort of necessary equilibrium between birth rates and death rates. Humans beings and our primate ancestors were evolved to invest in relatively few offspring [xiii] and thus have a low total fertility rate. In a favorable environment, such as perhaps after the first human migration across the Bering Strait into the western hemisphere containing ample nutritional sources, the birth rate may have exceeded the death rate for long intervals (Alroy 2001). It is also possible that if a religion such as Mormonism were able to retain intellectual control over its flock for many generations, then a subgroup within the population could maintain a TFR above two for a long time.

In a historical time frame populations often grew slowly and then were cut back by famine or epidemic disease (Wrigley 1969). Genetic studies suggest that about 150,000 years ago the death rate may have exceeded the birth rate to such an extent that human populations could have been reduced to perhaps 20,000 individuals (Cann, Stoneking et al. 1987). But the most compelling and best documented evidence against any intrinsic tendency towards demographic equilbrium comes from the below-replacement family size now common in Europe and emerging in parts of Asia. These 'low' birth rates are a surprise only if it is assumed that births and deaths "ought" to balance one another in some intrinsic way.

Normal consumer behavior

The widespread acceptance of causality between socioeconomic factors and TFR was interrupted by the results of the Princeton Fertility Project in the 1970s, in which Coale, Watkins and others found that consistent patterns of socioeconomic change were not always found in European examples of fertility decline in the 18th and 19th centuries (Coale and Watkins 1986).[xiv] By the mid-1990s it had become clear that all of the major theories attempting to explain fertility transition had failed, as noted (Mason 1997).

Three years later, leading demographers met "to examine the state of theories of the global fertility transition and eventually to produce a volume of papers that both assess the current state of affairs and challenge researchers to explore new theoretical leads" particularly in light of new developments in "ideational change, public policy, and gender relations to contemporary fertility change" (Sinding 2001)(page: ix). In the resulting book *Global Fertility Transition* edited by Bulatao and Casterline (Bulatao and Casterline 2001), eight authors describe their respective theoretical approaches applied to the diverse experiences of fertility transition around the world. It was in the introduction to this volume that, Bulatao has listed, as noted earlier, a set of eight basic explanations for fertility transition, not intended to line up with the eight essays: mortality reduction, reduced economic contributions from children, opportunity costs of childbearing, family transformation, vanishing cultural props for childbearing, improved access to effective fertility regulation, marriage delay, and diffusion (Bulatao 2001). This list does not include, because by then it had been discarded, any general assumption that structural changes in a society or economy must precede fertility decline. Bulatao explains also that some operationalizing factors have a role to play in many of these explanations, and the example given is education. It is of interest that all of the authors' essays following the introduction implicitly assume there must be an exogenous societal change influencing couples' decision-making. The growing complexity in their theoretical explanations for fertility decline, on which Bulatao commented, may be a consequence of this persistent assumption. Notably, none of the essays emphasizes the sixth explanation for fertility transition offered by Bulatao, that where there is at least latent desire to control fertility, greater access to fertility regulation methods should give an impetus to fertility decline (Bulatao 2001)(page 3).

As we have stated above, we are suggesting that virtually all women everywhere have a latent desire for having control over their own fertility, and a woman's conscious perspective about her reproductive life can shift when she learns of the availability to her of a way to take control of her own childbearing, a way that she perceives will be less costly to her than another pregnancy.

In his chapter in the same book, Cleland points out that the one possible remaining exogenous condition found in association with all fertility decline is reduced infant and child mortality. However, he also recognizes that trying to interpret this relationship as causal is problematic (Cleland 2001). He also recognizes that maternal mortality is an entirely separate matter, and he describes the sad reality we referred to briefly in the introduction above.

> "[T]he direct threat of pregnancy and childbirth to the life of the mother is no small consideration. Assuming a maternal mortality ratio of 1,500 per 100,000 live births and total fertility rate of 6 births, the lifetime risk of dying from maternal causes is nearly one in ten. 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 2001)(page 66).

Birth has been a dangerous process for mothers since time immemorial. It is largely for this reason that we suspect virtually all women have, and have always had, a natural, built-in comfort with the idea of being subject to fewer than the maximum possible number of pregnancies.[xv] We add to this idea the information from studies in which women who did not plan to use contraception nevertheless started using it when it became realistically available; and knowledge that this is a normal and well recognized pattern of consumer behavior in other aspects of our lives outside the realm of sex and human reproduction (see below). Combining these factors, we should not be surprised that the natural comfort of controlling one's own fertility would logically be activated upon the arrival of technologies and information that make the option realistic. And as noted, we suggest that women's natural comfort with the idea of limiting the number of their pregnancies serves as, or is synonymous with, Bulatao's "latent desire" to control fertility (Bulatao 2001)(page 3). This combination of circumstances might possibly be the most influential factor leading to fertility decline.

We recognize that many societies have had pronatalist traditions, and in these settings women have been socialized and not infrequently even coerced into childbearing. The rate at which these constraints have dissolved in some contemporary situations suggests that the freedom model could be used to solve the decades-old problem of finding the influential societal factors behind increased use of fertility regulation. We suggest further that in the freedom model of fertility decline, the decades-old problem of finding an exogenous or external source of inspiration for changed fertility preferences may melt away.

It is well known that the rapid worldwide growth of population in the past 200 years can be attributed mainly to reduced mortality. The declines in mortality over the past 200 years were achieved with the introduction of technologies and their associated information, leading to cleaner water, improved nutrition, vaccines, and better hygiene. Saving children's lives is a priority for most people, and taking these steps has generated little controversy. In contrast, allowing women to have the technologies and information they need for managing their own reproductive lives and for reducing their chances of an early death is often controversial and debated, and consequently the realistic availability of fertility regulation methods has been severely delayed in many countries. When the rules around fertility regulation are not science-based, they often serve to control women (Potts 2005). Medical barriers and misinformation are especially common constraints on a woman's access to the means to limit the size of her family. The fact that the barriers to fertility regulation are often masked in subtlety has led to undue emphasis on demand side explanations of fertility decline, when a sensitively framed supply-oriented model in fact works well.

Why has the arrival of realistic options changed women's fertility preferences and influenced their decisions to use contraception? The needed research to understand this exists not in the literature on human fertility but in the literature on consumer behavior. It suggests that when people decide after fertility regulation becomes realistically available that they prefer a small family or want to use contraception, their sequence of behavior is consistent with other well-documented consumer behavior in other aspects of our lives. The literature on marketing psychology describes a number of situations where demand has arisen only after the opportunity to use a product has shown up, as has been documented in the case of the original Xerox machine, *Cuisinart* food processors, disposable diapers, automated teller machines, Post-its, personal computers, TV remote controls, and garage door openers (Hall 1991). In 1966 Rex Campbell defined two decision processes in the adoption of consumer goods: the rational problem solving process, when the consumer becomes aware of the problem and then looks for a solution; and rational innovation, when the consumer becomes aware of the innovation before he or she recognizes the problem (Sheth 1974). Everett Rogers published in 1983 his analysis of how innovations are diffused throughout a market or society. He observed, "An individual may develop a need when he or she learns that an innovation exists. Therefore, innovations can lead to needs as well as vice versa" (Rogers 1983)(page 166).

It seems plausible that contraceptive methods are treated like any other of the consumer products that we never new we wanted until they arrived as new options in our lives. Indeed, Caldwell recognizes that it is unlikely that people will express a preference for a smaller family before they have access to contraception. In a broad review of the demographic transition, he describes the absence of a preference for smaller family when the family planning is not available.

> "For 40 years we have been asking, in surveys and one-on-one anthropological investigations in sub-Saharan Africa, rural South India, and rural Bangladesh, both of contraceptive users and nonusers, whether their parents used contraception or worried about the inability to control family size. The answers have been the same. The parents had not practiced birth control because they had no access to services. They had never contemplated restricting family size *because, without the methods for doing so, it was unimaginable"* (Emphasis added) (Caldwell 2001) (page 103).

While some authors, as noted, have recognized the role of ease of access and the supply side as a possible influence on fertility decline, there also appears to have been some discomfort with the concept, and we see several reasons for this. First, "supply side" is a politically burdened term, reminding some people of the Reagan administration's "trickle down" economic policies bringing a small economic benefit to the poor while the incomes of the rich grew more rapidly. Second, in family planning, "supply" is commonly viewed as only physical commodities such as pills or IUDs, without the

benefit of respectful and caring advice to accompany it, and is viewed by some as "inundating" people with contraceptives insensitively; while "demand" is everything else, including a woman's perceptions and her social environment. In contrast, in the freedom model we are placing correct information on the supply side of the equation, because it is something that a woman must be permitted or enabled to receive, regardless of her educational level. With this adjusted configuration, it is easier to understand how supply – now viewed this broader sense - can influence demand. In a perfect world, the dissemination of correct information would be the responsibility of a health agency or service provider, to overcome the incorrect information that is widely expressed in terms of fear of harmful health consequences of contraceptive use. In the real world, information comes from a plethora of sources, from conversations in the road to the Internet. Dissemination of information occurs continuously, and it is sometimes helpful and sometimes misleading. For example, in many cultures oral contraceptives are perceived as more dangerous than childbirth, although in a low resource setting having a baby can be up to 1,000 times as dangerous as taking the Pill. We have every reason to believe that if the widespread misinformation and misperceptions described above were replaced with correct information, and if the needed technologies were available as well, the latent desire for a smaller family size and for contraception would be unleashed. In short, we have shifted correct information and misinformation from the demand side of the equation to the supply side, because we believe that is where it belongs, and we are suggesting that the supply side – and we must repeat, it is only in this broader definition of the term - is likely to be extremely important in determining when countries' fertility transitions are completed.

We have also explored a final possible reason for persistent adherence to demand-side thinking, and this is the nature of some of the key terms used in the field of demography, which may subtly and inadvertently obfuscate concepts by containing assumptions leaning in one direction.[xvi]

How, then, should we interpret the observed high correlations between low fertility, education, wealth, and women's opportunities? Socioeconomic advantages appear to work by enabling women to overcome the many barriers that can be insurmountable for uneducated women living in more limited conditions. Education helps women to be critical consumers of information, able to distinguish the correct from the improbable. Our reading is that in settings where family planning is hard to get, the more educated women are better equipped to overcome the barriers to family planning. Beyond the relationship between education and fertility regulation, however, education is an immensely important factor for the empowerment of women, for the well-being of their families and their communities, and for countries' economic and social development. We recognize, then, that a number of factors do influence fertility decline, but even where they are not present, the absence of barriers can act alone and in fact provide the leading impetus to fertility decline – and inversely, the barriers alone all too often delay fertility decline. The minimization or absence of barriers might possibly be, in fact, the

key to fertility decline across all societies, from Addis Ababa's dramatic shift from high to low fertility to Corsica's persistent decline into its low-low fertility.

Data problems and research challenges

Analysis of barriers to fertility regulation methods is made difficult by the fact that the data available for scrutiny are of inconsistent quality. While all countries have comparable measures of education, economic status, industrialization and urbanization, none collect systematic data on the personal biases of family planning providers, or on decisions made by medical associations that have no scientific evidence base but make contraception difficult to obtain. As noted, misperceptions about harmful health impacts of family planning methods are often buried in survey data about side effects. These asymmetries in quantitative data have led, easily and naturally, to an emphasis on the socioeconomic data sets that are the clearest and most extensive, and thus the easiest to compare with fertility trends, at the expense of analysis of the barriers to the use of fertility regulation. Sketchy data should not be allowed to imply that the facts involved are less important. Given the delicacy of issues around sex and fertility, the factors with less complete data may actually be more important.

The self-reporting of induced abortion is unreliable, national statistics on legal abortion are often incomplete, and the various methodologies used to estimate illegal procedures rarely give consistent results. For example, illegal abortion paid an important role in the low fertility observed in Europe between the two World Wars, but statistical data is limited.[xvii] The uneven data and the controversy surrounding this sensitive topic all inhibit demographic analysis. Consequently, in a complex area burdened with ambiguous data, the role of abortion is commonly underestimated. It is worth noting that poor data on the barriers to fertility regulation and the barriers themselves share a common cause. The evolutionary forces behind the continued attempts to control women's reproductive lives (Potts 2003), even in their residual phase in more progressive societies, also spur secrecy around the use of abortion, even though it is extremely common in all regions of the world.

The first and most obvious challenge for future research that comes from this new perspective on fertility decline is to try to quantify the barriers to fertility regulation. To what extent this can be done remains to be seen, as barriers are likely to remain more difficult to quantify than measures of socioeconomic change. The second challenge concerns research methodology. The methodological question might be, under what circumstances could a demographic theory be supported credibly with compelling evidence that is not derived from large data sets? Correlations between TFR and elements of large and convenient data sets have supported the demand-side theories of fertility transition to date, although each of these theories derived from them has been discarded because of anomalies, the examples of where they do not work. In contrast, in developing the freedom model we have been working with data that is uneven and scant, and likely to remain so given the nature of some of the barriers, but we have not

found any time or place where this model would not plausibly fit the experience of fertility decline or its delay.

Future research should also include tests of the freedom model. As Hawking asserts, a practical theory "must make definite predictions about the results of future observations" (Hawking 1988)(page 11). If the freedom model is valid, then we should expect to see:

1. Over time, wherever women have access to a range of contraceptive methods with correct information and backed up by safe abortion, fertility will reach replacement level or below.
2. As long as the international community fails to focus on family planning, and the shortfall in money and commodities persists, there will be further stalls in fertility decline (or an actual rise in family size), particularly among the poorest economic quintiles in low income countries.
3. A moderate to rapid decline in family size will occur, if and when genuine contraceptive options, backed by access to safe abortion, becomes widely available in African cities other than Addis Ababa.
4. Any country that introduces new constraints to access to contraception, correct information, or safe abortion will see a slowing or reversal in fertility decline, especially amongst the lowest economic quintiles.
5. No country will achieve replacement level fertility before 2050 without *de jure* or *de facto* access to safe abortion.

Conclusion

From the evidence gathered for this paper we may infer that average family size is open to change, even rapid change, from high levels of fertility to replacement level, as we have recently seen in Iran and Addis Ababa. And importantly, the freedom model means that the final stage of the fertility transition does not require an abridgment of rights. Instead it requires that women be free to have control over their childbearing, enabling them to have access to their preferred method of fertility regulation, within a human rights framework.

It is time to give poor women the ability to make decisions about when and whether they will bear another child. Economically marginalized women in low-resource settings often have only limited opportunities, if any, to obtain the technologies and information required for managing their own childbearing. The barriers separating women from the technologies and information they need to limit their family size hurt the most vulnerable women the most tragically. The freedom model places women's decision-making center stage. It provides a theoretical framework for interpreting the vast amount of observational data collected on the demographic transition in a wide variety of settings. It sets a research agenda to quantify the many and various existing barriers

to access to voluntary fertility regulation, and to reconsider the primacy of evidence based on large data sets; and it suggests a range of policy choices.`

REFERENCES

Alroy, J. (2001). "A multispecies overkill simulation of the end-Pleistocene megafaunal mass extinction." Science **292**(5523): 1893-1896.

Asturias de Barrios, L., I. M. De Rodas, et al. (1998). "Unmet Need for Family Planning in a Peri-Urban Community of Guatemala City." April 2006, from http://catalog.icrw.org/docs/1998_report_unmetneed.pdf.

Becker, G. S. (1991). A Treatise on the Family. Enlarged Edition. Cambridge, Harvard University Press.

Bertrand, J. T., S. Guerra de Salazar, et al. (1999). "Promoting birthspacing among the Maya-Quiche of Guatemala." International Family Planning Perspectives **25**(4): 160-167.

Bertrand, J. T., E. Seiber, et al. (2001). "Contraceptive dynamics in Guatemala: 1978-1998." International Family Planning Perspectives **27**(3): 112-136.

Bhatia, S. (1982). "Contraceptive intentions and subsequent behavior in rural Bangladesh." Studies in Family Planning **13**(1): 24-31.

Bhatia, S., A. Faruque, et al. (1980). "Assessing menstrual regulation performed by paramedics in rural Bangladesh." Stud Fam Planning **11**(6): 213-218.

Bongaarts, J. and J. Bruce (1995). "The causes of unmet need for contraception and the social content of services." Studies in Family Planning **26**(2): 57-75.

Bulatao, R. A. (2001). Introduction. Global Fertility Transition. R. Bulatao and J. Casterline. New York, Population Council**:** 1-14.

Bulatao, R. A. and J. B. Casterline, Eds. (2001). Global Fertility Transition. New York, Population Council.

Caldwell, J. (1983). Direct economic costs and benefits of children. Determinants of Fertility in Developing Countries. R. A. Bulatao, R. Lee, P. Hollerbach and J. Bongaarts. New York, Academy Press. **1:** 458-493.

Caldwell, J. C. (2001). The Globalization of Fertility Behavior. Global Fertility Transition. R. Bulatao and J. Casterline. New York, Population Council**:** 93-115.

Caldwell, P. and J. C. Caldwell (1992). "What does the Matlab fertility experience really show?" Studies in Family Planning **23**(5): 292-310.

Campbell, M. M. (2006). "Consumer Behavior and Contraceptive Decisions." Journal of Family Planning and Reproductive Health Care **32**(4).

Campbell, M. M., N. N. Sahin-Hodoglugil, et al. (2006). "Barriers to Fertility Regulation: A Review of the Literature." Studies in Family Planning **37**(2): 87-98.

Cann, R. L., M. Stoneking, et al. (1987). "Mitochondrial DNA and human evolution." Nature **325**: 31-36.

Casterline, J. B., A. E. Perez, et al. (1997). "Factors underlying unmet need for family planning in the Philippines." Studies in Family Planning **28**(3): 173-191.

Casterline, J. B., Z. Sathar, et al. (2001). "Obstacles to contraceptive use in Pakistan: A study in Punjab." Studies in Family Planning **32**(2): 95-110.

Casterline, J. B. and S. W. Sinding (2000). Unmet need for family planning in developing countries and implications for population policy. New York, Population Council, Policy Research Division.

Castle, S. (2003). "Factors influencing young Malians' reluctance to use hormonal contraceptives." Studies in Family Planning **34**(3): 186-199.

Central Statistical Authority Ethiopia and ORC Macro. (2001). "Ethiopia Demographic and Health Survey 2000."

Chacko, E. (2001). "Women's use of contraception in rural India: A village level study." Health and Place **7**: 197-208.

Cleland, J. (2001). The Effects of Improved Survival on Fertility: A Reassessment. Global Fertility Transition. R. Bulatao and J. Casterline. New York, Population Council**:** 60-92.

Cleland, J. (2001). Potatoes and pills: an overview of innovation-diffusion contributions to explanations of fertility decline. Diffusion Processes and Fertility Transition - Selected Perspectives. J. Casterline. Washington, D.C., National Academy Press**:** 39-65.

Cleland, J. and C. Wilson (1987). "Demand theories of the fertility transition: An iconoclastic view." Population Studies **41**(1): 5-30.

Coale, A. J. and S. Watkins (1986). The Decline of Fertility in Europe: The Revised Proceedings of a Conference on the Princeton European Fertility Project, Princeton, Princeton University Press.

Curtis, S. L. and C. F. Westoff (1996). "Intention to use Contraceptives and Subsequent Contraceptive Behavior in Morocco." Studies in Family Planning **27**(5): 239-250.

D'Agnes, T. (2001). From Condoms to Cabbages; The Authorized Biography of Mechai Viravidya. Bangkok, The Bangkok Publishing Public Company, Ltd.

David, H. (1999). From Abortion to Contraception. Westport, CT, Greenwood Press.

Davis, K. (1967). "Population Policies: Will Current Programs Succeed?" Science **158**(3802): 730-739.

Debpuur, C., J. Phillips, et al. (2002). "The impact of the Navrongo Project on contraceptive knowledge and use, reproductive preferences, and fertility." Studies in Family Planning **33**(2): 141-164.

Easterlin, R. A. (1975). "An economic framework for fertility analysis." Studies in Family Planning **6**: 54.

El-Zanaty, F., A. Way, et al. (1999). Egypt Indepth Study on the Reasons for Nonuse of Family Planning: Results of a Panel Survey in Upper Egypt. Cairo, Egypt, National Population Council.

Farooq, G. and L. Adeokun (1976). "Impact of rural family planning program in Ishan, Nigeria, 1969-72." Studies in Family Planning **7**(6): 158-169.

Freedman, R. and B. Berelson (1976). "The record of family planning programs." Studies in Family Planning **7**(1): 3-40.

Grubb, G. S. (1987). "Women's perception of the safety of the pill: A survey in eight developing countries." Journal of Biosocial Science **19**(3): 313-321.

Haaga, J. G. (2001). Comment: The Pace of Fertility Decline and the Utility of Evolutionary Approaches. Global Fertility Transition. R. Bulatao and J. Casterline. New York, Population Council.

Haaga, J. G. and R. Maru (1996). "The effect of operations research on program changes in Bangladesh." Studies in Family Planning **27**(2): 76-87.

Hall, J. A. (1991). Bringing New Products to Market: The Art and Science of Creating Winners. New York, Amacom (American Management Association).

Hashmi, S. S., K. Alam, et al. (1993). Non-users and Unmet Need for Contraception. Islamabad, National Institute of Population Studies.

Hawking, S. W. (1988). A Brief History of Time: From the Big Bang to Black Holes. New York, Bantaam Books.

Henshaw, S. K., S. Singh, et al. (1999). "The incidence of abortion worldwide." International Family Planning Perspectives **25**: S30-S38.

IPAS, I. (2002). "Deciding women's lives are worth saving: expanding the role of mid-level providers in safe abortion care." Issues in Abortion Care 7.

Iranian Ministry of Health and Medical Education (2002). Demographic and Health Survey Iran 2000. Tehran.

Konje, J. C. and O. A. Ladipo (1999). "Barriers to uptake and use of modern methods of contraception in developing countries." International Journal of Obstetrics and Gynaecology **65**(3): 287-294.

Kulczycki, A. (1999). The Abortion Debate in the World Arena. New York, Routledge.

Leibenstein, H. M. (1957). Economic Backwardness and Economic Growth. New York, Wiley.

Magnani, R. J., D. Hotchkiss, et al. (1999). "The impact of family planning supply environment on contraceptive intentions and use in Morocco." Studies in Family Planning **30**(2): 120-132.

Marie Stopes International (2005). personal communication. London.

Mason, K. O. (1997). "Explaining fertility transitions." Demography **34**(4): 443-454.

Mason, K. O. (2001). Gender and Family Systems in the Fertility Transition. Global Fertility Transition. R. Bulatao and J. Casterline. New York, Population Council**:** 160-176.

Noble, J. and M. Potts (1996). "The fertility transition in Cuba and the Federal Republic of Korea: the impact of organized family planning." Journal of Biosocial Science **28**: 211-225.

Notestein, F. W. (1953). Economic problems of population change. Proceedings of the Eighth International Conference of Agricultural Economists. London, Oxford University Press**:** 13-31.

Phillips, J., M. B. Hossain, et al. (1996). "The long-term demographic role of community-based family planning in rural Bangladesh." Studies in Family Planning **27**(4): 204-219.

Phillips, J. F., R. Simmons, et al. (1988). "Determinants of reproductive change in a traditional society: Evidence from Matlab, Bangladesh." Studies in Family Planning **19**(6): 313-334.

Potts, M. (1980). "Refugees - even those fleeing from genocide - do not want to start families." People **7**(4): 28-29.

Potts, M. (1997). "Sex and the birth rate: Human biology, demographic change, and access to fertility-regulation methods." Population and Development Review **23**(1): 1-39.

Potts, M. (2003). "Two pills, two paths: a tale of gender bias." Endeavour **27**(3): 127-130.

Potts, M. (2005). "Why can't a man be more like a woman? Sex, power, and politics." Obstet Gynecol **106**(5 Pt 1): 1065-70.

Potts, M., P. Diggory, et al. (1970). Abortion. Cambridge, Cambridge University Press.

Potts, M., P. Diggory, et al. (1977). Abortion. Cambridge, Cambridge University Press.

Potts, M. and W. L. Hunt (2000). "Over-The-Counter availibility of oral contraceptives." Infertility and Reproductive Medicine Clinics of North America **11**(4): 531-544.

Potts, M. and R. Short (1999). Ever since Adam and Eve: The Evolution of Human Sexuality. Cambridge, Cambridge University Press.

Robinson, W. (1996). "The economic theory of fertility over three decades." Population Studies **51**: 63-74.

Robinson, W. and C. John (1992). The influence of contraceptive costs on the demand for children. Family Planning Programmes and Fertility. J. F. Phillips and J. A. Ross. Oxford, Clarendon press**:** 106-122.

Rogers, E. (1983). Diffusion of Innovations. Third Edition, The Free Press.

Shah, N. and M. Shah (1984). From non-use to use: Prospects of contraceptive adoption. Fertility in Pakistan: A Review of Findings from the Pakistan Fertility Survey. I. Alam and B. Dinesen. Netherlands, International Statistical Institute**:** 149-162.

Shelton, J. D., L. Bradshaw, et al. (1999). "Putting unmet need to the test: Community-based distribution of family planning in Pakistan." International Family Planning Perspectives **25**(4): 191-195.

Sheth, J. (1974). Models of Buyer Behavior, Harper & Row.

Short, R. V. (1984). "Breast Feeding." Scientific American **250**: 35-41.

Sibanda, A., Z. Woubalem, et al. (2003). "The proximate determinants of the decline to below-replacement fertility in Addis Ababa, Ethiopia." Studies in Family Planning **34**(1): 1-7.

Sinding, S. W. (2001). Foreword. Global Fertility Transition. R. Bulatao and J. Casterline. New York, Population Council**:** x - xii.

Stash, S. (1999). "Explanations of unmet need for contraception in Chitwan, Nepal." Studies in Family Planning **30**(4): 267-287.

Tarmann, A. (2005). "Iran Achieves Replacement-Level Fertility." Retrieved January 2005, from http://www.prb.org/Template.cfm?Section=PRB&template=/ContentManagement/ContentDisplay.cfm&ContentID=5679.

Tietze, C. and J. John Bongaarts (1975). " Fertility rates and abortion rates: Simulations of Family Limitation." Studies in Family Planning **6**(5): 114-120.

Tsui, A. O. (2001). Population policies, family planning programs, and fertility: The record. Global Fertility Transition. R. Bulatao and J. Casterline. New York, Population Council.

United Nations. (1994). "United Nations International Conference on Population and Development (ICPD). Section VII: Reproductive Rights and Reproductive Health. Paragraph VII.19." Retrieved Accessed May 10, 2006., from http://www.iisd.ca/Cairo/program/p07007.html.

United Nations. (1994). "United Nations International Conference on Population and Development (ICPD). Section VII: Reproductive Rights and Reproductive Health. Paragraph VII.20." Retrieved Accessed May 10, 2006, from http://www.iisd.ca/Cairo/program/p07007.html.

United Nations. (2003). "Social aspects of sustainable development in Bangladesh." from http://www.un.org/esa/agenda21/natlinfo/countr/banglade/social.htm.

United Nations Population Fund, U. (1988). Country Report on Population, Reproductive Health and Family Planning Program in the Islamic Republic of Iran. U. f. P. H. Family Health Department, Ministry of Health and Medical Education. Tehran.

Van der Tak, J. (1974). Abortion, fertility and changing legislation: an international review. Lexington, MA, D.C. Heath and Company.

Vining, D. R. (1986). "Social versus reproductive success: The central theoretical problem of human sociobiology." The Behavioral and Brain Sciences **9**: 167-260.

Viswanathan, H., S. Godfrey, et al. (1998). Reaching Women: A Study of Unmet Need in Uttar Pradesh, India. Washington, DC, International Center for Research on Women.

Westoff, C. and A. Bankole (1997). Mass Media and Reproductive Behavior in Africa. Demographic and Health Surveys [DHS] Analytical Reports. A. R. N. 2. Calverton, MD, Macro International Inc.

World Health Organization. (2004). "Medical Eligibility Criteria for Contraceptive Use. Third Edition." from http://www.who.int/reproductive-health/publications/RHR_00_2_medical_eligibility_criteria_3rd/.

World Health Organization. (2004). "Selected Practice Recommendations for Contraceptive Use Second Edition." from http://www.who.int/reproductive-health/publications/rhr_02_7/index.htm.

Wrigley, E. A. (1969). Population in History. London, World University Library.

Yinger, N. V. (1998). Unmet Need for Family Planning: Reflecting Women's Perceptions. Washington, DC, International Center for Research on Women.

FOOTNOTES

[i] However, arguably the most successful family planning programs in the past 30 years have adhered to something akin to the freedom model more than any of the standard models of fertility decline.

[ii] Whether the misinformation is culturally driven but based on behavior that can be explained by evolutionary behavior of males who often set the social rules in cultures is beyond the scope of this paper. Recognizing the high prevalence and sources of the misinformation is all that is needed for the time being in this paper.

[iii] We are wary of depending on the term "access" in this paper because the tradition in demography is to use this word to mean that contraceptive methods are geographically available. If it were not for this commonly limited usage of the term "access" in demography, we could have called this an access model of fertility decline. To us, access should mean far more than geographic presence – including correct information and the absence of other barriers such as provider bias and medical rules that are not evidence-based.

[iv] Robinson also points out that to achieve control of fertility, purchases for prevention are required – and prevention in many aspects of their lives is a benefit that is difficult for people to envision and place in highest priority (ref. Robinson, W. (1996). "The economic theory of fertility over three decades." Population Studies **51**: 63-74.
)(page68).

[v] Hawking goes on to say, "Any physical theory is always provisional, in the sense that it is only a hypothesis: you can never prove it. No matter how many times the results of experiments agree with some theory, you can never be sure that the next time the result will not contradict the theory. On the other hand, you can disprove a theory by finding even a single observation that disagrees with the predictions of the theory….[and] if ever a new observation is found to disagree, we have to abandon it or modify the theory" (Hawking, S. W. (1988). A Brief History of Time: From the Big Bang to Black Holes. New York, Bantaam Books.
(page 10). Mason recognizes that this applies as well to the social science of demography (Mason, K. O. (1997). "Explaining fertility transitions." Demography **34**(4): 443-454.

[vi] (To be added: Ansley Coale's three requirements for fertility decline, circa 1973.

[vii] This is an example of a situation where judgment rests on a mixture of uneven quantitative data and qualitative data based on the broad international experience of the authors, which covers the majority of the countries discussed.

[viii] A poignant fact arose in the Moroccan data: "More than half of the women who in 1992 said that they did not want another child gave birth between 1992 and 1995" (Curtis, S. L. and C. F. Westoff (1996). "Intention to use Contraceptives and Subsequent Contraceptive Behavior in Morocco." Studies in Family Planning **27**(5): 239-250.
) (page 248).

[ix] CYP = 13 cycles of oral contraceptives.

[x] Knowledgeable observers suggest that over 40,000 safe induced abortions now occur in urban Ethiopia annually. However, the source for this data, and the details, cannot be published as it could arouse controversy.

[xi] We agree with Haaga's definition of "a search for evolutionary explanations of the working of the human mind/brain … as uncovering human, and even primate or mammalian, universals." Unfortunately, he does not make a clear distinction between conscious behavioral and unconscious endocrine and physiological determinants of family size. If, as we read Haaga, his statement "Natural selection cannot operate directly on something so abstract as a fertility rate, or family size" (Haaga, J. G. (2001). Comment: The Pace of Fertility Decline and the Utility of Evolutionary Approaches. Global Fertility Transition. R. Bulatao and J. Casterline. New York, Population Council.

) applies to conscious behavioral predispositions, we agree with him. It does not, however, apply to the hidden physiological mechanisms where hundreds of millions of years of mammalian and primate evolution (including human evolution) have indeed tailored the reproductive rate for women within relatively narrow bounds, but still including the flexibility necessary to reproduce optimally in a variety if environments and a wide range of infant mortality rates. The suppression of ovulation associated with lactation is not only "nature's contraceptive" (Short, R. V. (1984). "Breast Feeding." Scientific American **250**: 35-41.

, but it is a highly reactive mechanism of birth spacing whereby an infant death speeds up the return of fertility but harsh nutritional shortages extend the pregnancy interval.

[xii] "Nearly all classical representation of demographic transition depict the following chronological sequence: a fall in death rates, an ensuing period of rapid natural increase, a lagged decline of birth rates, and an eventual return to population equilibrium" (Cleland, J. (2001). The Effects of Improved Survival on Fertility: A Reassessment. Global Fertility Transition. R. Bulatao and J. Casterline. New York, Population Council**:** 60-92.

(page 60) "All societies, at one time or another, move from a near equilibrium condition of high mortality and high fertility toward a presumed low-fertility and low-mortality equilibrium" (Sinding, S. W. (2001). Foreword. Global Fertility Transition. R. Bulatao and J. Casterline. New York, Population Council**:** x - xii.

(page ix)

[xiii] Zoologists call this type of reproduction *K-reproduction* to distinguish it from *r-reproduction* where large numbers of offspring are produced of which few survive.

[xiv] Cleland's application of innovation-diffusion theory, based on earlier work by Rogers (Rogers, E. (1983). Diffusion of Innovations. Third Edition, The Free Press.

) has appeared to fit these previously unexplained examples of European fertility decline. It did not, however, explain the delay in the completion of the fertility transition in Africa.

[xv] We believe that most women would not often deliberately choose high fertility if they were without constraints in their decision-making, because bearing many children is dangerous, burdensome and costly. Today the dangers are largely limited to countries in the developing world where maternal mortality ratios are hugely higher than in industrialized countries. With respect to perceived burdens and costs, these still would apply in today's modern societies, probably making reproductive decision-making among women not far from inclinations of women in less privileged societies, and leading to some of the European countries' extremely low fertility.

[xvi] A number of terms used in the demographic literature contain an implicit assumption that fertility decline is spurred by change in some exogenous condition. They can obfuscate concepts and subtly, or inadvertently, reinforce the primacy of demand and may have constrained the development of a realistic, parsimonious theoretical explanation for fertility transitions.

Rational process. The use of the term rational process, for example by Bulatao (Bulatao, R. A. (2001). Introduction. Global Fertility Transition. R. Bulatao and J. Casterline. New York, Population Council**:** 1-14.

, tends to infer that family size is an outcome of rational decision-making. However, when the woman is unaware that any safe means of controlling her childbearing is available she is unlikely to make decisions on this subject at all. When women do weigh the perceived costs and benefits of using family planning against those of bearing another child, as described by Easterlin (Easterlin, R. A. (1975). "An economic framework for fertility analysis." Studies in Family Planning **6**: 54.

and Casterline (Casterline, J. B., Z. Sathar, et al. (2001). "Obstacles to contraceptive use in Pakistan: A study in Punjab." Studies in Family Planning **32**(2): 95-110.

, they still must depend on whether the technology and correct information required to achieve their goals are realistically available: all too often they are not.

.

Proximal and *distal* are terms used in anatomy meaning closer to and farther away. In demography, the proximate and distal determinants are used in the sense of a chain of causation, so that fertility regulation methods, which are among the proximate determinants, are viewed as a functional means for carrying out a preference preceding their application. These terms then convey an assumption that a preference for controlling family size is in place before a woman or couple seeks and uses contraception. They are inappropriate when the decisions making sequence is reversed by the power of realistic options to lower family size.

Exogenous in demography refers to factors outside a couple's or woman's own decision-making, such as wealth, urbanization, or family structures which are variously seen as influencing family size preferences. However, policies and the behaviors of health providers are also exogenous to the individual's actions, and for example, decisions not to make certain fertility regulation methods easily obtainable by women or allocating public money for abstinence programs versus contraceptive commodities can also influence family size. From the perspective of the freedom model, policy change easing access to fertility regulation options may more important that economic of social changes even in developed countries (Tsui, A. O. (2001). Population policies, family planning programs, and fertility: The record. Global Fertility Transition. R. Bulatao and J. Casterline. New York, Population Council.

.

The term "costs" has more than one meaning. The common usage refers to money, but in economics and demography it is used more broadly to be synonymous to barriers. Theoretically, the word is not broad enough to encompass the entire range of barriers to fertility regulation, including social constraints and perceived health disadvantages. Nor do costs include some of the most important barriers, such as the sheer unavailability of method options. The term "costs" implies that a person could obtain the technology by paying a higher social or financial price, but this option does not apply to medical restrictions, provider bias, or proscriptions by law – such as not allowing sterilization in Egypt or safe abortion in most of Africa. Nor does "costs" cover the

absence of information, such as the option to use oral contraceptives post-coitally to inhibit pregnancy; or the presence of misinformation, such as a widespread belief that oral contraceptives pills will cause disease or sterility.

Access as used in demographic terminology usually refers to the geographic proximity of contraceptives or services; while in the perspective of the freedom model, access must also include correct information, and the absence of unnecessary legal, medical, clinical and regulatory barriers recognized by the ICPD Programme of Action as noted above.

Culture is most politely seen as a set of local behaviors and beliefs that shape many of a society's decisions and actions while maintaining its cohesiveness and history. It is useful to disaggregate culture into its component parts, by separating the aesthetic factors (food, fashion, music, dance, history) from belief systems (acceptance of certain facts as true), and rules. From the perspective of the freedom model, some commonly accepted beliefs are the source of misinformation, such as regarding menstruation as polluting or women are imbued with insatiable sexually appetites so that in order to control them they must be denied direct access to contraception. In nearly all cultures and religions the rules around sex and reproduction have been written by men, and for reasons deeply rooted in evolutionary biology, they reflect a common male tendency to seek to limit women's reproductive options (Potts, M. and R. Short (1999). Ever since Adam and Eve: The Evolution of Human Sexuality. Cambridge, Cambridge University Press.

, Potts, M. (2005). "Why can't a man be more like a woman? Sex, power, and politics." Obstet Gynecol **106**(5 Pt 1): 1065-70.

.

[xvii] Taussig (1936) estimated one abortion for every birth in Hamburg in 1930, and Peller (1967), in Vienna in 1920-24, estimated an abortion rate of 20-21/1,000 women of reproductive age.