

Fertility Decline, Small Families, and Son Selection in the Arab World: The Controversial Convergence of Contraceptive and Repro-genetic Technologies

Marcia C. Inhorn, PhD, MPH

William K. Lanman Jr. Professor of Anthropology and International Affairs Chair, Council on Middle East Studies, Yale University

Abstract

The Arab world has experienced one of the most dramatic fertility declines in modern history, the result of both contraceptive technologies and couples' desires for smaller families. Assisted reproductive and genetic technologies have also become widespread across the region, leading to new practices of in vitro fertilization (IVF) with sex selection. This article examines the desire for small families with sons, and the introduction of the repro-genetic technology of preimplantation genetic screening (PGS) for son selection. Islamic opinions on sex selection are divided, but permissive *fatwas* have fueled practices of son selection in some Arab countries, including the United Arab Emirates, the focus of this study. As shown in this article, the "bioethical aftermath" of these repro-genetic practices may include son preference and daughter discrimination, with future distortions of population sex ratios across the Arab world.

Introduction

Over the past three decades, fertility rates have plummeted across the Arab world—a fertility decline that has been profound, even revolutionary. By 2012, nearly half of the world's top fifteen fertility declines had occurred in Arab nations (United Nations 2012), reflecting both the increased use of contraceptives and married couples' willingness to have fewer children. Yet, this dramatic fertility decline is not the only reproductive revolution taking place in Arab countries. From Morocco to Saudi Arabia, the Arab world has seen the growth of one of the world's largest in vitro fertilization (IVF) sectors, designed to overcome Arab couples' infertility problems. Infertility treatment via assisted reproductive technologies (ARTs) has been encouraged by Islamic religious authorities (Inhorn and Tremayne 2012), with some governments, such as the United Arab Emirates, subsidizing ARTs for their citizens (Inhorn 2015).

But ARTs are not only about treating infertility. One of the ARTs that has quietly gained traction in Arab countries, especially over the past decade, is preimplantation genetic

diagnosis (PGD). Introduced in IVF laboratories in the mid-1990s, PGD was designed to diagnose severe genetic disorders in eight-cell IVF embryos, thereby preventing intrauterine transfer of genetically abnormal embryos, and hence, the birth of IVF offspring with life-threatening heritable diseases (Franklin and Roberts 2006). However, over time, genetic testing via PGD has increasingly morphed into preimplantation genetic screening (PGS), in which IVF embryos can be assessed for both overall “quality” and sex.

Increasingly, PGS is being used as a form of “selective reproduction,” defined by medical anthropologists Ayo Wahlberg and Tine Gammeltoft (Wahlberg and Gammeltoft 2018) in the following way: “Although they often overlap with assisted reproductive technologies (ARTs), what we term selective reproductive technologies (SRTs) are of a more specific nature: Rather than aiming to overcome infertility, they are used to prevent or allow the birth of certain kinds of children” (Gammeltoft and Wahlberg 2018: 201).

In the case of PGS, “selection” is increasingly based on sex. As shown in Rajani Bhatia’s (2017) incisive social history, *Gender Before Birth: Sex Selection in a Transnational Context*, the introduction of PGD-cum-PGS has led to new possibilities for selective reproduction, particularly the use of PGS for “family balancing” (Bhatia 2018). As we shall see in this paper, although Islamic authorities have prohibited the use of PGS to specifically select *against* the birth of girl children—given the early Islamic injunction against female infanticide (Ahmed 1986)—recent *fatwas* emanating from Islamic religious authorities and institutions have allowed the use of PGS for so-called “family balancing.” Thus, couples who already have daughters might turn to IVF-related PGS for the purposes of “son selection.”

This article attempts to trace the connection between two seemingly disparate “reproductive revolutions” in the Arab world. The first is the massive Arab fertility decline, achieved in part through contraceptive technologies, but also by virtue of Arab couples’ own desires for newer, smaller families. The second is the massive infusion of ARTs into the Arab world—an ART revolution that occurred during the same period (i.e., mid-1980s to early 2000s). Contraceptive technologies have helped Arab couples to control their number of births and birth spacing, while ARTs have helped Arab couples to overcome their infertility and involuntary childlessness. However, the development of PGS as an IVF-related SRT has also allowed Arab couples to control the sex of their offspring.

In the first half of this article I will chart the massive fertility decline in the Arab world, as measured through the “total fertility rate” (TFR), or the number of children an average woman can be expected to bear over her lifetime. This decline in TFRs in the Arab world has been facilitated by the rise of contraceptive technologies, as well as new attitudes toward family formation on the part of both men and women. In the second half of the article, I examine the rise of ARTs in the Arab world and specifically the introduction of PGS—initially introduced as a genetic screening tool, but now most commonly used as a form of sex selection. In the final section, I focus on the specific case of the United Arab Emirates (UAE). There, clinics now aggressively advertise PGS for family “balancing” and “enhancement” (Krolökke and Kotsi 2018). However, my ethnographic foray into the world of Emirati IVF clinics shows that PGS is being used primarily for sex selection, and that this PGS-assisted sex selection is almost always in favor of sons, not daughters.

In the conclusion, I attempt to analyze how desires for contraceptive-assisted “small” families have converged with SRT-assisted desires for sons in the Arab world. When the gender composition of the “new Arab family” (Hopkins 2004) is no longer left to chance, the potential for skewed sex ratios becomes real—as has already been demonstrated across many parts of East and Southeast Asia (Bhatia 2018; Croll 2000; Whittaker 2011). Thus, when contraceptives to control family size and repro-genetic technologies to control family gender composition converge, there may be an untoward “bioethical aftermath” (Inhorn and Tremayne 2016), the consequences of which are just beginning to unfold.

The Arab Fertility Decline

To begin, it is important to trace the Arab fertility decline story—a story that entails a “quiet revolution ... hiding in plain sight” (Eberstadt and Shah 2012: 43-44). Although the Arab world is often portrayed in popular media, academic circles, and policy reports as a region of high fertility—attributable to men’s supposed patriarchal control over women’s bodies (Ali 2002) and religiously fueled pronatalism (Inhorn 1996)—this portrayal of male oppression and hyper-fertility is both outdated and inaccurate, as we shall see.

When TFRs were first recorded in Arab countries in the 1975-1980 period, women in seventeen Arab nations had TFRs far exceeding the world average of 3.85 children per woman at that time. Indeed, seven Arab countries—including Algeria, Kuwait, Libya, Oman, Saudi Arabia, Syria, and Yemen—had TFRs greater than 7.0, with the highest recorded TFR of 8.58 in Yemen (United Nations 2018). However, by the year 2010, seven of the world’s top fifteen fertility declines had occurred in Arab nations (United Nations 2012). As shown in Table 1, fertility levels had declined by more than 60 percent in each of these countries, with Libya showing the largest fertility reduction of nearly 70 percent.

Today, the majority of Arab nations have TFRs hovering around the world average of 2.47. Only three Arab countries (Egypt, Jordan, and Yemen) have TFRs above 3.0, and two (Iraq and Sudan) above 4.0. Nine Arab countries (Algeria, Jordan, Libya, Oman, Qatar, Saudi Arabia, Syria, the United Arab Emirates, and Yemen) have TFRs that have declined by nearly four births per woman. For example, an Algerian woman in 1980 would have expected to have more than seven children on average. But an Algerian woman today has only two to three—four to five less than her mother—as shown in Table 2.

What is most impressive about this Arab fertility decline is that it has occurred even in resource-poor Arab nations. As noted by demographers, most Arab countries have fewer resources (i.e., income, education, urbanization, modern contraception) than the “more developed regions with which their fertility levels currently correspond today” (Eberstadt and Shah 2012: 35). Put another way, the Arab world has achieved its reproductive revolution with fewer preexisting resources or advantages. The decline has occurred largely through human agency—namely, the actions of Arab couples wanting fewer children to love and support.

Table 1. Arab Countries in the Top Fifteen for Fertility Decline Over 60 Years

Country	Total Fertility Rate			Percentage Decline
	1975-1980	2005-2010	Difference	
Libya	7.94	2.67	-4.39	69.9
United Arab Emirates	5.66	1.97	-3.69	65.2
Oman	8.10	2.89	-5.21	64.3
Tunisia	5.69	2.05	-3.64	63.9
Qatar	6.11	2.21	-3.90	63.8
Lebanon	4.23	1.58	-2.66	62.8
Algeria	7.18	2.72	-4.45	62.0

Source: United Nations 2012

Table 2. Decline in Arab Fertility Levels Over 30 Years

Country	Population (Millions)		Total Fertility Rate			
	1988	2017	1975-1980	2000-2005	2010-2015	2015-2020
World	5,100	7,550	3.85	2.53	2.45	2.47
Algeria	23.9	41.3	7.18	2.72	2.82	2.65
Bahrain	0.5	1.49	5.23	2.98	2.10	2.00
Egypt	50.3	97.6	5.5	2.98	2.79	3.15
Iraq	17.6	38.3	6.8	4.38	4.06	4.27
Jordan	4.0	9.7	7.38	3.64	3.27	3.26
Kuwait	2.1	4.1	5.89	2.71	2.60	1.97
Lebanon	2.8	6.1	4.23	1.58	1.51	1.7
Libya	4.0	6.4	7.94	2.67	2.38	2.21
Morocco	23.5	35.7	5.90	2.38	2.78	2.42
Oman	1.4	4.6	8.1	2.89	2.91	2.54
Qatar	0.4	2.6	6.11	2.21	2.05	1.88
Saudi Arabia	15.2	32.9	7.28	3.03	2.68	2.48
Sudan	18.9	40.5	6.92	4.83	4.46	4.43
Syria	11.7	18.2	7.32	3.19	3.0	2.84
Tunisia	7.9	11.5	5.69	2.05	2.02	2.15
United Arab Emirates	1.7	9.4	5.66	1.97	1.82	1.73
Yemen	11	28.2	8.58	4.91	4.15	3.84

Sources: United Nations 2012, 2018

The Rise of Contraception and the “New Arab Family”

How did this reproductive revolution happen? The introduction of family planning programs and contraceptives in the Arab world is an important part of this story, along with attitudinal change, or the desire for fewer children on the part of both men and women. New attitudes toward family size and acceptance of contraceptive technologies have led to what

anthropologists have called “the new Arab family” (Hopkins 2004), a small family that is the tangible result of the Arab fertility decline.

Contraception came relatively slowly to the Middle East. Egypt, the first country to accept international family planning aid in the 1960s (Stycos and Sayed 1988), had only achieved a contraceptive prevalence rate of 30 percent by the early 1980s. In a survey of eleven Arab countries conducted in 1982, the mean contraceptive prevalence rate was only 19 percent (Lapham and Mauldin 1985). Even in Lebanon with its low total fertility rate, slightly more than half (53 percent) of Lebanese couples reported using contraceptives. Several Arab countries lacked any form of contraceptive prevalence data, or reported rates that were very low, ranging from 1 to 10 percent (e.g., Algeria, Syria).

By 1985, however, female contraceptive prevalence rates began to increase significantly in several Arab countries, even in the absence of explicit family planning information or country-wide policies (Lapham and Mauldin 1985). In Jordan, for example—a country with no specific fertility policy (to either raise or lower population growth) and without any direct government family planning program—the contraceptive prevalence rate nonetheless rose from an average of 40 percent in 1990 to 60 percent in 2009. By then, 82 percent of ever-married Jordanian women aged 15 to 49 had used contraception at some point in their reproductive lives, with the average Jordanian woman able to describe nine different contraceptive methods (Cetorelli and Leone 2012).

It is fair to say that by the beginning of the new millennium, knowledge of contraceptive methods among Arab women had become widespread (Cetorelli and Leone 2012). Surveys showed that between 90 and 98 percent of married Arab women reported knowing about at least one modern method of contraception. In 2010, a survey of the 22 Member States of the WHO Eastern Mediterranean Region showed that at least one of seven core components of successful family planning programs (e.g., integrated services and delivery, promotion of family planning, evaluation and monitoring) were available in 94 percent of the 18 Member States that responded to the survey (Chikvaidze, Madi, and Mahaini 2012). As shown in Table 3, more than half of Middle Eastern countries responding to the survey had all seven core components of successful family planning programs in place.

In addition, studies conducted in a variety of Arab countries demonstrated men’s strong support of female contraception, as well as men’s advocacy of male-controlled birth control—not with condoms, which were shown to be negatively perceived in a variety of Arab countries (Kulczycki 2004), but rather through the time-tested method of *‘azl* (withdrawal, or coitus interruptus) (Myntti et al. 2002). *‘Azl* has played an important role in the history of Islamic societies (Musallam 1983). Not only does *‘azl* receive support within the Islamic scriptures as a viable means of male-enacted contraception, but Arab men tend to prefer withdrawal as a “safe” method of family planning that is more “natural” than most female-controlled methods (Myntti et al. 2002).

Between the reproductive efforts of both Arab men (*‘azl*) and women (contraceptives), Arab couples brought into being the “new Arab family” (Hopkins 2004) of two to three children on average. This new Arab family has been in place in some countries since the late 1980s, when contraceptive prevalence rates began to grow. For example, in my own research conducted in

Table 3. Number of Essential Components of Successful Family Planning: 18 Countries of the WHO Eastern Mediterranean Region

Countries	No. Essential Components Present (max. = 7)
Afghanistan, Egypt, Iran, Iraq, Jordan, Lebanon, Morocco, Pakistan, Qatar, Syrian Arab Republic, Yemen	7
Oman, Palestine, Saudi Arabia, Sudan	6
Bahrain, Somalia	5
United Arab Emirates	3
Djibouti, Kuwait, Libya, Tunisia	NA

Source: Chikvaidze, Madi, and Mahaini 2012

1988-89 in Alexandria, Egypt, I discovered strong desires on the part of poor urban women to reside in nuclear family households with their husbands and children. Nuclear households allowed poor women some measure of marital privacy and also a space to raise their children free from family (especially in-law) interference. But given small apartment spaces and fragile household economies, women in my study were clear that they and their husbands only wanted two children, no more. They used the Arabic term *usra* to describe this small nuclear family, differentiating it from the larger extended family, or *‘aa’ila*. Already in the late 1980s, the *usra* had become the well-entrenched norm among the urban Egyptian working poor of my study.

Similarly, in my 2003 study in Beirut, Lebanon (Inhorn 2012), I found that Lebanese men of all social classes and religious sects were eager to become fathers. Fatherhood, in their view, was one of life’s most important joys and masculine ambitions. Yet, with very few exceptions, Lebanese men were adamant that having more than three children was unfeasible and unwise in the current political and economic climate. “Two boys and one girl” was often stated as men’s ideal family composition. Yet, some men were insistent that girls were superior to boys in terms of their affection and life-long commitment to their parents. Thus, they intended to stop at two (or three), even if all of their children were daughters. In other words, the “new Arab man,” as I came to call him (Inhorn 2012), also supported this “new Arab family” of two to three children. But, in general, Arab men, like their wives, also maintained strong preferences for *both* sons and daughters. As we shall see, Arab couples’ desires for gender “balance” are leading to emerging patterns of sex selection, the results of which are just now becoming clear.

The Arab ART Revolution and the Rise of PGS

Less than a decade after the birth of the world’s first “test-tube baby,” Louise Brown, in England, the Arab world’s first test-tube baby, Heba Mohammed, was born in Egypt in 1987 (Inhorn 2003). IVF, the ART used to conceive both of these children, rapidly globalized in the 1990s, subsequently spreading to many parts of the Arab world. For example, Egypt was the first country to open an IVF clinic in 1986, followed by Saudi Arabia and Jordan. By the mid-1990s, Egypt was experiencing an IVF “boom period,” with more than 70 IVF clinics eventually opening up in Cairo, Alexandria, and other major cities (Inhorn 2003; International

Federation of Fertility Societies 2019). Other Middle Eastern countries soon followed suit. By the mid-2000s, the Middle East boasted one of the largest and most successful IVF industries in the world (Inhorn and Patrizio 2015). As shown in Table 4, “Middle Eastern Countries Performing the Most ART Cycles Per Capita,” among the 48 countries performing the most ART cycles per million inhabitants, eight Arab nations could be counted.

This Arab ART revolution could not have happened without Islamic support (Inhorn 2003; Serour 2008). Early on, the Grand Shaykh of Egypt’s renowned religious university, Al Azhar, issued the first widely authoritative *fatwa* on assisted reproduction on March 23, 1980—only two years after Louise Brown’s birth in England, but a full six years before the opening of Egypt’s first IVF center. Nearly forty years later, this original Al-Azhar *fatwa* has proved to be quite authoritative and enduring across the Sunni Muslim world (i.e., about 90 percent of the world’s Muslims). It has been reissued many times in Egypt, and subsequently reaffirmed by *fatwa*-granting authorities in other parts of the Sunni Muslim world, from Morocco to Saudi Arabia.

In general terms, Islamic religious authorities have been very permissive in authorizing the use of ARTs among Muslim IVF physicians and their patients. Their *fatwas* on ARTs have allowed not only IVF, but also intracytoplasmic sperm injection (ICSI, a variant of IVF used for male infertility) (Inhorn 2012); cryopreservation (freezing of sperm, eggs, and embryos) (Inhorn et al. 2020); preimplantation genetic diagnosis (PGD) for couples at high risk of genetic disorders in their offspring); and IVF via uterine transplantation, with Saudi Arabia being the first country in the world to attempt this form of organ transplantation (Fageeh et al. 2002). However, Sunni religious authorities have not condoned every ART, and especially not the use of third-party reproductive assistance. Thus, in IVF clinics in Sunni-majority countries, sperm donation, egg donation, embryo donation, and surrogacy are never practiced. This Sunni Islamic prohibition on third-party reproductive assistance has firmly held sway across the Sunni Islamic world since 1980, translating into a clinical ban on third parties in almost every Muslim country (Inhorn and Tremayne 2012).

However, as noted, Islamic religious authorities have been supportive of PGD for couples at high risk of genetic disorders in their offspring. As with IVF, PGD was invented in

Table 4. Arab Countries Performing the Most ART Cycles Per Capita

Country	Rank in Top 48
Lebanon	6
Jordan	8
Tunisia	25
Bahrain	28
Saudi Arabia	31
Egypt	32
Libya	34
United Arab Emirates	35

Source: Adamson 2009

Britain, with the first successful “PGD baby” born in London in 1990 (Bhatia 2018). PGD was a technological byproduct of IVF, designed specifically to identify genetic defects in IVF embryos. Before transferring these embryos back into a woman’s uterus, PGD testing could be performed on each eight-cell embryo to determine whether it carried a genetic defect. Those embryos with defects could be culled and discarded, so that only disease-free embryos would then be transferred as part of an IVF cycle. PGD could also be used to determine the sex of each embryo, with the intent of preventing a number of important X-linked genetic disorders, such as hemophilia and Duchenne muscular dystrophy.

In the Muslim world, Islamic authorities immediately accepted the use of PGD for the prevention of genetic disease, including sex-linked genetic disorders. However, the use of PGS—which, as noted in the introduction, is used for “screening” embryos based on both quality and sex, sometimes for the explicit purpose of sex selection—has not generated the same degree of Islamic consensus. This is because sex selection against girls—including female infanticide—has a long history of moral opprobrium in Islam, with the Prophet Muhammad specifically condemning this pre-Islamic practice (Douki et al. 2003; Zavis 2018). Thus, the notion that Muslim parents should eliminate daughters, either through abortion or other sex-selective technologies, has always been viewed as anathema in the religion.

This issue of technologically assisted sex selection was debated as early as 1983—seven years before PGD’s existence—in a conference organized by the Islamic Organization for Medical Sciences (IOMS) on the general topic of “reproduction in light of Islam.” In his comprehensive review of the conference proceedings, Ayman Shabana (2017) charts three main religious orientations to sex selection, which he describes as “liberal,” “restrictive,” and “intermediary.” Liberal opinions were offered mostly by religious scholars, who identified several normative precedents for technologically assisted sex selection (e.g., the religious merit of discovering the secrets of the universe, which is the explicit goal of science). A more restrictive approach was offered primarily by physicians participating in the conference. They noted that sex-selective technology raises the risk of facilitating modern forms of female infanticide, thus furthering anti-female bias. The third intermediary opinion “urged caution and advised against rushing into premature conclusions” (Shabana 2017: 211), given that the technical means for sex selection had not yet been implemented in human reproduction. Thus, while some participants, mostly religious scholars, argued for the permissibility of sex selection at the individual level to satisfy the need for family “gender balancing,” other participants, mostly physicians, argued for the impermissibility of sex selection, lest this unsettle the “natural gender balance.” At the end of the conference, a statement on sex selection indicated its impermissibility at the collective level for the world’s Muslims.

Such opposition to sex selection was upheld again in November 2007, when the Islamic Fiqh Council of the Muslim World League issued a resolution arguing that methods of sex selection should only be used in cases of medical necessity, to diagnose genetic diseases affecting a particular gender (Shabana 2017). Furthermore, these cases of medical necessity should be evaluated individually by a specialized bioethical committee consisting of a minimum of three physicians. In effect, according to the Islamic Fiqh Council, sex selection for the purposes of family balancing should be assiduously avoided.

However, despite these Islamic bioethical opinions condemning sex selection on a collective level, *fatwas* allowing “gender selection” on an individual level—for example, for a couple with four daughters who want a son—have been issued. Again, Egypt’s Al Azhar University has been decisive in this regard, issuing one of the first *fatwas* allowing Muslim couples to practice gender selection. Although the Egyptian *fatwa* shows clear concern for the society-wide use of sex-selective technologies—cautioning that the “natural balance” of the male-female ratio may be “disturbed”—it nonetheless gives permission for individual couples to use “scientific” technologies to achieve gender selection (Al Azhar Global Fatwa Center 2017). In the case of PGS, this would entail an individual Muslim couple undertaking a full IVF cycle—one accompanied by PGS to “select” the fertilized embryos of one sex (male or female) for transfer into the wife’s uterus.

With this permissive Al Azhar *fatwa*, Egyptian IVF clinics, as well as clinics in other Arab countries such as Jordan, began employing PGS for sex selection by the early 2000s (Kilani and Hassan 2002). By 2008, at least nine Arab countries were performing PGS for sex selection, mostly for the selection of sons. This trend was noted with alarm by Gamal I. Serour (2008), the co-founder of the first Egyptian IVF clinic and a leading scholar and former president of the International Federation of Gynecology and Obstetrics.

The question is: Why son selection? As shown in a recent multi-country survey, the belief that sons are socially mandatory within family life is widespread across the Arab world, and is upheld by traditional patriarchal values (El Feki, Heilman and Barker 2017). Even if Arab parents say they love their daughters and prefer them as lifelong companions (Inhorn 1996, 2012), they still “need” their sons in order to complete their families. Sons ensure the reproduction of the father’s patrilineage, are expected to contribute to family labor and maintain family assets, and are widely regarded as a family’s social safety net, guaranteeing the financial support of their aging parents (Inhorn 2012; Kanaaneh 2002; Obermeyer 1996, 1999; Zavis 2018). Given these social realities, ensuring the birth of at least one son is vitally important to most Arab families. Arab couples wanting to “plan” their small families, while still ensuring the birth of a son, thus face a major predicament, especially when one or more daughters have already been born. PGS-assisted son selection may represent an individual Muslim couple’s solution to this predicament, as well as a Muslim society’s technological tool to enact male-centric norms.

The Rise of Son Selection in the UAE

Of the many Arab countries now performing PGS for son selection in IVF clinics, the United Arab Emirates (UAE) can be counted. PGD for genetic diagnosis was first introduced into the Emirates in 2007, becoming widely available to patients within the first year. By 2010, PGD was formally recognized as one of the legal ART practices in UAE’s federal ART law, which was enacted that year (Inhorn 2015). Initially, PGD was introduced in the UAE for sex-linked genetic diagnosis, which was deemed a medical priority in a nation with one of the highest frequencies of genetic disease in the world (Al-Gazali 2005; Al-Gazali et al. 1997). Yet, as early as 2007, it had become clear that new demand for PGD in the Emirates had little to do with genetic diagnosis per se. In an

ethnographic study I conducted at that time in the UAE's largest IVF clinic, I began to meet Emirati couples who were clearly not infertile, but rather who wanted a son after the birth of one or more daughters. In some cases, PGS-assisted son selection seemed to be occurring as an intentional form of family planning among Emirati professional couples who only wanted to have two children.

Such was the case of Samya and Najib (both pseudonyms), who were high-powered, Emirati professionals. Samya worked as a senior broker in an Emirati investment firm, while Najib was employed as a hydraulic engineer in the government's agricultural ministry. Married for eleven years and parents of a six-year-old daughter, Samya and Najib were careful planners, who wished for only one more child in the context of their busy careers. But in order to ensure the birth of a son, Samya and Najib traveled to the IVF clinic, where I met them on their first IVF cycle. With her shoulder-length, dyed brown hair and stylish glasses, Samya did not look like a "typical" Emirati woman. Nonetheless, she told me that she was deeply embedded in her Emirati community, and that she had specifically chosen to travel to this IVF clinic outside of her home emirate, in order to avoid the possibility of being seen by her friends and family. Samya was most worried about running into several physician relatives, who might learn of her IVF and sex selection, viewing it as morally dubious from an Islamic perspective.

Samya was not alone in her desire for sex-selective secrecy. Virtually all of the Emirati couples in my study were crossing over the emirates in an attempt to avoid their friends and relatives. Once at the clinic, they were taken to the special "VIP room" at the back of the clinic, where they could wait for their appointments in privacy. It was there in the backroom that I also met Huda and Adnan, a "traditional" Emirati couple who had secretly traveled from the distant emirate of Ajman. Huda never removed her black facial veil during the course of our interview, but from behind it, she engaged in jovial banter with both me and Adnan, lightly slapping his knee when the jokes were particularly funny. As I tried my best to follow their particular dialect of Emirati Arabic, Huda and Adnan explained that they already had four daughters, age ten to three. The family of six was living in two rooms of Adnan's family compound, but they were planning to move to their own larger "villa," which was currently under construction next door to his parents' home. Adnan joked that he hoped to fill the villa with many children—including male "quadruplets," with the term *quadruplets* delivered for emphasis in English. When I asked why they needed four sons, Huda answered immediately and with some mischief, "*Laazim!* [I must] have a boy! If no boy, maybe my husband will leave me!" Chuckling at Huda's half-humorous, half-serious remark, Adnan elaborated that he needed sons to carry his family name, to help him with his "showroom," and to inherit the proceeds of his business. Furthermore, he worried about his four daughters, who would need a brother to help them solve life's problems, including any future difficulties with their Emirati husbands. After a brief discussion of the mechanics of PGS, Huda and Adnan left the clinic, and I never saw the couple again.

Ultimately, I never knew if Samya and Najib, or Huda and Adnan, were successful in "selecting" their sought-after Emirati sons. These couples pursued their sex selection in secrecy,

largely to avoid moral scrutiny in their Emirati “local moral worlds” (Kleinman 1992). Yet, my brief encounters with these Emirati “son selectors” made me realize that technologically and legally assisted gender selection “for” sons—if not yet decidedly “against” daughters—had found a new home in the Emirates (Inhorn 2015).

In a follow-up interview I conducted in 2012, one of the UAE’s most well-regarded IVF physicians reported an alarming new trend of son selection, which he had observed among his Emirati patients, as well as among South Asian couples (who constitute the single largest ethnic population in the Emirates, even though they are not granted citizenship rights) (Vora 2013). As this physician explained to me:

“There is a lot of demand among ‘locals’ and Indians, and the Indians more than among the Emiratis. They seem even more interested in getting a boy! [Another IVF physician] offers it to *all* of his patients, and 60 to 70 percent of them do PG[S]. Here, if the couple brings it up, then we have a discussion. The only times I recommend PGD are for recurrent miscarriages, where there could actually be some genetic translocations, and then this is the correct thing to do. Also for repeated, unexplained IVF failures, we offer it then. But some couples ask for sex selection. We’re not doing PGS often, maybe only five to six cycles a month. But [my colleague] is doing 40 to 50 cycles of PGS a month, and then you could really start running into problems of gender imbalance. Ninety percent will want to select for boys, and only 10 percent for girls. Among Arabs and Indians, all will want a boy, I’m afraid.”

This “new” sex selection in the Emirates is no longer a secret. Many Emirati IVF clinics now openly advertise gender selection as part of their services, even if they cast the technology as a form of “family balancing” and “enhancement.” In an article entitled “Pink and Blue: Assemblages of Family Balancing and the Making of Dubai as a Fertility Destination,” Charlotte Kroløkke and Filareti Kotsi (2018) show how Dubai IVF clinics aggressively market PGS to an international clientele of reproductive travelers. Using pink and blue color schemes on their websites, these clinics implicitly direct their clientele toward gender selection, even if the service is cast as “family balancing.” In interviews conducted with more than 20 physicians, CEOs, clinical directors, marketing directors, patient counselors, and embryologists, the authors found clinicians speaking about the “need” for sons as the major determinant of gender selection in the Emirates. Moreover, this need for sons was justified, according to clinicians, because Middle Eastern couples today want a “smaller, yet nevertheless balanced, family” (Kroløkke and Kotsi 2018: 13).

My own ethnographic research in the Emirates suggests exactly this scenario. Without a doubt, PGS in the Emirates is a clear-cut example of selective reproduction in the midst of fertility decline. Yet, as Arab couples now increasingly turn to PGS to build their small families, they are actively contributing to the birth of Arab sons over Arab daughters.

Contraceptive and Reprogenetic Technologies: A Controversial Convergence

As I have argued, the growth of a sex-selective PGS industry has occurred amidst massive Arab fertility declines, facilitated by family planning programs and the influx of contraceptive technologies into the region. Such population control regimes have clearly been effective. Today, most Arab nations are close to achieving “replacement fertility”—or two children for every two parents, as shown in [Table 2](#).

However, this massive decline in Arab fertility levels has brought with it a new demand for sex selection. Indeed, as Rajani Bhatia (2018) has argued in her book, *Gender before Birth: Sex Selection in a Transnational Context*, new demands for sex selection almost always operate within narratives of population control, especially in the global South. She coins the term “populationism” to describe “not only forms of population control directly focused on human numbers, but also the growing preoccupation with ‘quality’ in family composition, precisely as fertility rates continue their downward trend” (Bhatia 2018: 27).

Such is the case in the Arab world, where long-term population control efforts have promoted the notion of “quality” over “quantity” when it comes to the number of children. This is shown in anthropologist Rhoda Kanaaneh’s (2002) award-winning book, *Birthing the Nation: Strategies of Palestinian Women in Israel*, where a rhetoric of “quality” now pervades the reproductive realm. Middle-class Arab families with high aspirations for their children use contraception to control their number of offspring and invest their money and efforts in the education of each individual child. However, as Kanaaneh cautions, these “high-quality” families seem to always include sons, and these son preferences may become exacerbated over time with the development of a local IVF industry.

Unfortunately, the emerging evidence suggests that Kanaaneh is correct. In IVF clinics across the Arab world, PGS has exacerbated son preference—at least among couples who can afford this costly intervention (i.e., one cycle of IVF with PGS can cost anywhere from US\$1,200 to as much as \$12,000) (Inhorn 2015). For those Arab couples who are willing to “invest” in PGS in this way, their gender selection almost always favors sons.

Ultimately then, it is fair to say that the coming of PGS to the Arab world has reinscribed age-old son preferences, which, prior to the advent of this technology, had been shown to be in decline. For example, Demographic and Health Surveys conducted back in the mid-1990s showed that son preference was not pronounced. Equal treatment of boys and girls was found in almost every aspect of child health (Obermeyer and Cardenas 1997), and the impact of son preference on fertility levels was deemed negligible (Obermeyer 1996). Unfortunately, much has changed over the ensuing decades, as SRTs have made their way across the region, fueling renewed son preference along the way.

Although the future is always difficult to predict, it is important to ask about the potential “bioethical aftermath” of PGS—the term that Soraya Tremayne and I have coined to signal the unintended consequences of ARTs across the Muslim world (Inhorn and Tremayne 2016). For example, if the region follows in the same path as Asia, then a number of untoward consequences can be expected to unfold, including increased discrimination against

daughters (Croll 2000), and a “new sex trade” in PGS-facilitated female embryo culling (Whittaker 2011). I would like to conclude by discussing four possible consequences of PGS, which future Islamic bioethics scholars will need to follow.

First, the increased prevalence of PGS-assisted son selection in the Arab world will inevitably exacerbate daughter discrimination, even leading to the endangerment of already born girl children. As anthropologist Elisabeth Croll (2000) has powerfully argued in her book *Endangered Daughters: Discrimination and Development in Asia*, an overarching focus on son preference hides the insidious counter-effect of daughter discrimination, including the fact that millions of girls around the world do not survive into adulthood. Because PGS promotes son selection, it invariably contributes to daughter discrimination, and especially toward higher-order girl children, who are considered superfluous to their parents. In bioethical discussions of PGS and its consequences, these societal increases in sexism and tangible forms of gender discrimination and endangerment are perhaps the most insidious effects of PGS (Klitzman 2016).

Second, if PGS comes to be routinized in prenatal practice, particularly in Arab countries with well-developed IVF infrastructures and large populations of middle-class professionals, we may begin to see the distortion of natural sex ratios at birth—a phenomenon that has already happened quite profoundly and well beyond government control in large swaths of Asia (Hesketh et al. 2011). Where sex-selective technologies and abortion are readily available, such as in China, India, South Korea, and Vietnam (Croll 2000), distorted sex ratios have invariably followed. For example, in parts of rural China, there are now 140 males for every 100 females, leading to large numbers of unmarried men (Hesketh 2011; Hesketh and Zing 2006). These men have been shown to be marginalized, lonely, withdrawn, and prone to psychological problems (Greenhalgh 2015). Thus, in countries where sex selection is widely practiced, men, too, suffer, when marriage partners are “missing” from the general population.

Third, PGS may eventually become promoted as a more “humane” method of sex selection, reducing the incidence of sex-selective abortions. Although ultrasound-guided, sex-selective abortions have not been widely documented within the Middle East’s own illicit abortion landscape (Hessini 2007), sex-selective abortion is widely practiced across most parts of Asia (e.g., Bhatia 2018; Croll 2000; Gammeltoft 2014; Hesketh et al. 2011). Eventually in these countries, PGS may be promoted as a more “acceptable” form of sex selection, one that does not depend upon the destruction of the female fetus. Still, the idea that there are “more” or “less” acceptable forms of sex selection can be viewed as morally repugnant (Van Balen and Inhorn 2003). Sex selection is still sex selection, no matter what reproductive technology is used to enact it. In the coming decades, it will be important to follow the ways in which PGS might supplant abortion as the selective reproductive technology of “choice,” including in parts of the Arab world.

Finally, as a repro-genetic technology, PGS may lead humans down the “slippery slope” of “designer” babies and eugenic removal of the “unfit” (Klitzman 2016). Choosing embryos of only one sex, culling embryos of the other sex, and eliminating all embryos with perceived genetic defects are selective reproductive practices that ensure the births of some children and not others (Gammeltoft and Wahlberg 2014). Muslim societies in general will have to grapple with these conundrums, now that gender selection has been permitted on the individual level.

Ultimately, from an Islamic standpoint, the potential bioethical aftermath of PGS raises troubling questions about the intersection of science, religion, and reproductive technology. If PGS is increasingly used by Muslims for the purposes of son selection, then the result will be a fundamental “imbalance” in human populations, in Arab as well as in other Muslim countries. Indeed, gender balance through PGS is a slippery slope, one with potentially profound implications for sex-ratio imbalances in Arab countries and across the whole Muslim world.

Acknowledgments

Research undertaken in the United Arab Emirates was generously supported by the US Department of Education Fulbright-Hays Faculty Research Abroad Program and the US National Science Foundation Cultural Anthropology Program. Thanks also go to Prof. Ayman Shabana of Georgetown University in Qatar for organizing the conference on “Family Structure in the Wake of Genetic and Reproductive Technologies,” as well as this special issue.

References

- Adamson, G. David (2009) “Global Cultural and Socioeconomic Factors that Influence Access to Assisted Reproductive Technologies.” *Women’s Health* 5: 351-358.
- Ahmed, Leila (2006) “Women and the Advent of Islam.” *Signs* 11: 665-691.
- Al Azhar Fatwa Global Center (2017) “Gender Selection,” November 15, 2017. Retrieved on 14 August 2020. <https://www.facebook.com/fatwacenter.en/posts/gender-selectionquestion-what-is-the-sharia-ruling-on-gender-selectionanswer-the/594475760722607/>
- Ali, Kamran Asdar (2002) *Planning the Egyptian Family: New Bodies, New Selves*. Austin: University of Texas Press.
- Bhatia, Rajani (2018) *Gender before Birth: Sex Selection in a Transnational Context*. Seattle: University of Washington Press.
- Cetorelli, Valeria, and Tiziana Leone (2012) “Is Fertility Stalling in Jordan?” *Demographic Research* 26: 293-318.
- Chikvaidze, P., H.H. Madi, and R.K. Mahaini (2012) “Mapping Family Planning Policy and Programme Best Practices in the WHO Eastern Mediterranean Region: A Step towards Coordinated Scale-up.” *Eastern Mediterranean Health Journal* 18: 1-9.
- Croll, Elisabeth (2000) *Endangered Daughters: Discrimination and Development in Asia*. New York: Routledge.
- Douki, S., F. Nacef, A. Belhadj, A. Bouasker, and R. Ghachem (2003) “Violence Against Women in Arab and Islamic Countries.” *Archives of Women’s Mental Health* 6: 165-171.
- Eberstadt, Nicholas, and Apoorva Shah (2012) “Fertility Decline in the Muslim World: A Demographic Sea Change Goes Largely Unnoticed.” *Policy Review* 173: 29-44.
- El Feki, Shereen, Brian Heilman, and Gary Barker, eds. (2017). *Understanding Masculinities: Results from the International Men and Gender Equality Survey (IMAGES) – Middle East and North Africa*. Cairo and Washington, D.C.: UN Women and Promundo.
- Fageeh, W. H. Raffa, H. Jabbad, and A. Marzouki. et al. (2002) “Transplantation of the Human Uterus.” *International Journal of Gynecology & Obstetrics* 76: 245-251.
- Franklin, Sarah, and Celia Roberts (2006) *Born and Made: An Ethnography of Preimplantation Genetic Diagnosis*. Princeton, NJ: Princeton University Press.

- Gammeltoft, Tine, and Ayo Wahlberg (2014) "Selective Reproductive Technologies." *Annual Review of Anthropology* 43: 201-216.
- Al-Gazali, L.I. (2005) "Attitudes toward Genetic Counseling in the United Arab Emirates." *Community Genetics* 8: 48-51.
- Al-Gazali, L.I., A. Bener, Y.M. Abdulrazzaq, R. Micallef, A.I.Al-Khayat, and T. Gaber (1997) "Consanguineous Marriages in the United Arab Emirates." *Journal of Biosocial Science* 29: 491-497.
- Gammeltoft, Tine (2014) *Haunting Images: A Cultural Account of Selective Reproduction in Vietnam*. Berkeley: University of California Press.
- Greenhalgh, Susan (2015) "'Bare Sticks' and Other Dangers to the Social Body: Assembling Fatherhood in China". In *Globalized Fatherhood*, edited by Marcia C. Inhorn, Wendy Chavkin, and Jose-Alberto Navarro, pp. 359-381. New York: Berghahn.
- Hesketh, Therese (2011) "Selecting Sex: The Effect of Preferring Sons." *Early Human Development* 87: 759-761.
- Hesketh, Therese, Li Lu, and Zhu Wei Zing (2011) "The Consequences of Son Preference and Sex-Selective Abortion in China and Other Asian Countries." *CMAJ* 183: 1374-1377.
- Hesketh, Therese, and Zhu Wei Xing (2006) "Abnormal Sex Ratios in Human Populations: Causes and Consequences." *PNAS: Proceedings of the National Academy of Science of the United States of America* 103: 13271-13275.
- Hessini, Leila (2007) "Abortion and Islam: Policies and Practice in the Middle East and North Africa." *Reproductive Health Matters* 15: 75-84.
- Hopkins, Nicholas S., ed. (2004) *The New Arab Family*. Cairo: American University in Cairo Press.
- Inhorn, Marcia C. (1996) *Infertility and Patriarchy: The Cultural Politics of Gender and Family Life in Egypt*. Philadelphia: University of Pennsylvania Press.
- Inhorn, Marcia C. (2003) *Local Babies, Global Science: Gender, Religion, and In Vitro Fertilization in Egypt*. New York: Routledge.
- Inhorn, Marcia C. (2006) "Fatwas and ARTs: IVF and Gamete Donation in Sunni v. Shi'a Islam." *Journal of Gender, Race & Justice* 9: 291-317.
- Inhorn, Marcia C. (2012) *The New Arab Man: Emergent Masculinities, Technologies, and Islam in the Middle East*. Princeton, NJ: Princeton University Press.
- Inhorn, Marcia C. (2015) *Cosmopolitan Conceptions: IVF Sojourns in Global Dubai*. Durham, NC: Duke University Press.
- Inhorn, Marcia C. (2018) *America's Arab Refugees: Vulnerability and Health on the Margins*. Stanford, CA: Stanford University Press.
- Inhorn, Marcia C. and Pasquale Patrizio (2015) "Infertility around the Globe: New Thinking on Gender, Reproductive Technologies, and Global Movements in the 21st century." *Human Reproduction Update* 21: 411-426.
- Inhorn, Marcia C. and Soraya Tremayne, eds. (2012) *Islam and Assisted Reproductive Technologies: Sunni and Shia Perspectives*. New York: Berghahn.
- Inhorn, Marcia C., and Soraya Tremayne (2016) "Islam, Assisted Reproduction, and the Bioethical Aftermath." *Journal of Religion and Health* 55: 422-430.
- International Federation of Fertility Societies (IFFS). International Federation of Fertility Societies' Surveillance (IFFS) 2019: Global Trends in Reproductive Policy and Practice, 8th Edition. https://journals.lww.com/grh/Fulltext/2019/03000/International_Federation_of_Fertility_Societies__3.aspx
- Kanaaneh, Rhoda Ann (2002) *Birthing the Nation: Strategies of Palestinian Women in Israel*. Berkeley: University of California Press.
- Kilani, Z., and L. Haj Hassan (2002) "Sex Selection and Preimplantation Genetic Diagnosis at The Farah Hospital." *Reproductive BioMedicine Online* 4: 68-70.
- Kleinman, Arthur (1992) "Local Worlds of Suffering: An Interpersonal Focus for Ethnographies of Illness Experience." *Qualitative Health Research* 2: 127-134.
- Klitzman, Robert (2016) "Struggles in Defining and Addressing Requests for 'Family Balancing': Ethical Issues Faced by Providers and Patients." *Journal of Law, Medicine & Ethics* 44: 616-629.

- Kroløkke, Charlotte, and Filareti Kotsi (2018) "Pink and Blue: Assemblages of Family Balancing and the Making of Dubai as a Fertility Destination." *Science, Technology, & Human Values*: 44: 97-117.
- Kulczycki, Andrej (2004) "The Sociocultural Context of Condom Use within Marriage in Rural Lebanon." *Studies in Family Planning* 35: 246-260.
- Lapham, Robert J. and W. Parker Mauldin (1985) "Contraceptive Prevalence: The Influence of Organized Family Planning Programs." *Studies in Family Planning* 16: 117-137.
- Musallam, Basim F. (1983) *Sex and Society in Islam: Birth Control before the Nineteenth Century*. Cambridge, UK: Cambridge University Press.
- Myntti, Cynthia, Abir Ballan, Omar Dewachi, Faysal El-Kak, and Mary E. Deeb (2000) "Challenging the Stereotypes: Men, Withdrawal, and Reproductive Health in Lebanon." *Contraception* 65: 165-170.
- Obermeyer, Carla Makhoul (1996) "Fertility Norms and Son Preference in Morocco and Tunisia: Does Women's Status Matter?" *Journal of Biosocial Science* 28: 57-72.
- Obermeyer, Carla Makhoul (1999) "Fairness and Fertility: The Meaning of Son Preference in Morocco." *Dynamics of Values in Fertility Change*, ed. Richard Leete, 275-92. Oxford, UK: Oxford University Press.
- Obermeyer, Carla Makhoul, and Rosario Cardenas (1997) "Son Preference and Differential Treatment in Morocco and Tunisia." *Studies in Family Planning* 28: 235-244.
- Serour, Gamal I. (2008) "Islamic Perspectives in Human Reproduction." *Reproductive BioMedicine Online* 17: 34-38.
- Shabana, Ayman (2017) "Empowerment of Women Between Law and Science: Role of Biomedical Technology in Enhancing Equitable Gender Relations in the Muslim World." *Hawwa: Journal of Women in the Middle East and the Islamic World* 15: 193-218.
- Stycos, J. Mayone and Hussein Abdel Aziz Sayed (1988) *Community Development and Family Planning: An Egyptian Experiment*. Boulder, CO: Westview Press.
- United Nations (2012) *World Population Prospects: The 2012 Revision*. New York: United Nations.
- United Nations (2018) *World Population Prospects: The 2017 Revision*. New York: United Nations.
- Van Balen, Frank, and Marcia C. Inhorn (2003) "Son Preference, Sex Selection, and the 'New' New Reproductive Technologies." *International Journal of Health Services* 33: 235-252.
- Vora, Neha (2013) *Impossible Citizens: Dubai's Indian Diaspora*. Durham, NC: Duke University Press.
- Wahlberg, Ayo, and Tine Gammeltoft, eds. (2018) *Selective Reproduction in the 21st Century*. London: Palgrave Macmillan.
- Whittaker, Andrea M. (2011) "Reproduction Opportunists in the New Global Sex Trade: PGD and Non-medical Sex Selection." *Reproductive BioMedicine Online* 23: 609-617.
- Zavis, Monika (2018) "The Issue of the Sex of a Conceived Child in Islam: From the Pre-Islamic Conceptions to the Current Methods of Genetic Selection of the Sexes." *Spirituality Studies* 4-2: 8-15.