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# THE ROUTLEDGE HANDBOOK OF ANTHROPOLOGY AND REPRODUCTION

*Edited by*
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# 13

# INFERTILITY, IN VITRO FERTILIZATION, AND FERTILITY PRESERVATION

## Global perspectives

*Marcia C. Inhorn*

### Introduction

Infertility, or the inability to conceive a desired child, is estimated to affect millions of people around the globe. Approximately 8–12% of the world's women are thought to suffer from female infertility at some point during their reproductive lives. Men, too, can be infertile, with male infertility contributing to more than half of all cases of involuntary childlessness. The introduction of in vitro fertilization (IVF) more than 40 years ago has lifted the social burden of infertility for many couples and has led to the birth of more than eight million IVF babies worldwide (ESHRE 2018). In addition, IVF has served as a "platform" technology for other assisted reproductive technologies (ARTs), including intracytoplasmic sperm injection (ICSI) to overcome male infertility, and oocyte cryopreservation (aka egg freezing), a relatively new form of fertility preservation to prevent age-related female infertility.

This chapter explores the relationship between infertility, IVF and ICSI, and fertility preservation. The focus here is on the gender effects of infertility as a global reproductive health condition, and the ways in which ARTs, both old and new, are serving as gender interventions. The chapter attempts to answer three broad questions: 1) Why is infertility an ongoing global reproductive health challenge, especially for women in non-Western settings? 2) How has the global spread of IVF and ICSI helped to overcome couples' infertility problems, thereby mitigating the gendered suffering of this condition? 3) How have single women facing the threat of age-related infertility been afforded new opportunities for future motherhood through fertility preservation?

### Infertility: An ongoing global reproductive health challenge

Infertility, or the inability to conceive after one or more years of unprotected intercourse, remains a problem of global proportions. Although the total worldwide population of infertile persons has been difficult to estimate, three demographic surveys published between 2004 and 2014 have put the total figure in the millions. The first study, supported by the World Health



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Organization (WHO), utilized data from Demographic and Health Surveys (DHS) among ever-married women of reproductive age (15 to 49 years) in 47 countries (Rutstein and Shah 2004). More than 186 million reproductive-age women were estimated to be infertile, or more than one-quarter of ever-married women. A second study of infertility prevalence and treatment-seeking utilized population surveys from 25 developed and developing countries (Boivin et al. 2007). Based on a total sample of 172,413 women, the study predicted that 72.4 million women were infertile, with 40.5 million of them (56%) seeking medical care, at similar rates in both the developed and developing countries. The most recent study, supported by WHO and the Bill and Melinda Gates Foundation as part of the 2010 Global Burden of Disease Study, provided a global examination of infertility trends based on analysis of 277 reproductive and health surveys available from 190 countries and territories during the 1990–2010 period (Mascarenhas et al. 2012a). This study focused on the inability to have a live birth over a five-year exposure period among couples in stable unions, who were not using contraception, and who desired a child. Using this broader couple-based definition of involuntary childlessness, the study estimated that 48.5 million couples were affected. This number is considerably lower than previous estimates. However, the WHO explained that if the five-year exposure period was reduced to two years (i.e., of trying to become pregnant), then the total number of infertile couples would increase 2.5-fold to 121 million (WHO 2014).

Of the millions of infertile couples trying to have children, the majority live in non-Western and often resource-poor settings. South Asia, with its populous nations of India, Pakistan, and Bangladesh, now tops the list in terms of estimated infertility cases (14.4 million) (Mascarenhas et al. 2012b). Second on the list is sub-Saharan Africa, with its estimated 10 million cases (Mascarenhas et al. 2012b). Africa is often described as having an "infertility belt" around the center of the continent, because of high rates in parts of West, Central, and Southern Africa (Collet et al. 1988; Ericksen and Brunette 1996; Larsen 2000; Lunenfeld and van Steirteghem 2004; Mascarenhas et al. 2012b).

In areas of high infertility prevalence, poorly managed or untreated reproductive tract infections (RTIs) are often the cause of tubal infertility. Untreated RTIs can ascend into a woman's upper reproductive tract, causing pelvic inflammatory disease (PID), irreversible tubal damage, and complete tubal obstruction. In sub-Saharan Africa, more than 85% of infertile women have a diagnosis of infertility attributable to an infection, compared with 33% of women worldwide (Mascarenhas et al. 2012b).

Sub-Saharan African women also suffer from high rates of "secondary infertility"—defined as the inability to conceive following a prior pregnancy, whether or not that pregnancy resulted in a live birth. Secondary infertility occurs most commonly in regions of the world where high rates of unsafe abortion and poor maternity care lead to post-abortive and postpartum infections. Secondary infertility is the most common form of female infertility worldwide, affecting more than 10% of reproductive-aged women (Lunenfeld and van Steirteghem 2004; Nachtigall 2006). Areas of high prevalence include South Asia, East Asia and the Pacific, Central and Eastern Europe, and Central Asia. In the latter two post-Soviet regions, high rates of unsafe abortions are common, and the prevalence of secondary infertility ranges between 16% and 25%, or one in every four to six women (Mascarhenas et al. 2012b). In 14 of 23 sub-Saharan African countries surveyed, the percentage of women with secondary infertility was greater than 25%, with eight countries having rates higher than 30%. In Zimbabwe, for example, the percentage of women aged 25–49 years with secondary infertility was estimated at nearly two-thirds of all reproductive-aged women (Rutstein and Shah 2004).

In Africa, the good news is that rates of secondary infertility seem to be decreasing over time, probably due to the overall reduction in unsafe abortions (Sedgh et al. 2012), as well as the earlier





treatment and prevention of RTIs (Mascarenhas et al. 2012b). Still, the overall high rates of both primary and secondary infertility in Africa represent a regional tragedy, given that most of these cases of infection-caused infertility are preventable (Inhorn and Patrizio 2015; Mascarenhas et al. 2012b). In Africa, the tragedy of infertility is also a social one. Namely, women there live in a situation of "barrenness amid plenty," suffering even more by virtue of living in communities where large families are still the norm (Boerma and Mgalla 2002; Gerrits et al. 2012; Inhorn and van Balen 2002; Ombelet and van Balen 2009). WHO has described the "agony of infertility" for African women, who are expected to be a "mother or nothing" (Cui 2010). Infertile women in Africa may be "rejected by their husbands and ostracized by society, often living as outcasts and perceived as inferior and useless" (Lunenfeld and van Steirteghem 2004: 321).

Around the globe, infertility can lead to social death for women. WHO ranks infertility as the fifth most prevalent global health condition causing moderate or severe disability for women under 60 (WHO 2011). Being infertile may lead to abuse, abandonment, or other life-threatening consequences. Anthropological studies have shown that infertile women are stigmatized and rejected, sometimes by their husbands, but also by their families (especially in-laws) and communities (Bharadwaj 2016; Boerma and Mgalla 2002; Inhorn 1996; Inhorn and van Balen 2002; Feldman-Savelsberg 1999, 2002).

Infertility threatens marriage. In a 47-country DHS survey, women who were married but had never born a child with their husbands were more likely to be divorced or separated—at a rate of 14% overall (Rutstein and Shah 2004). These effects were shown to be most pronounced in Latin America, where more than one-fifth of childless women had been divorced or separated. Overall, the world's infertile women are 13% more likely to have married more than once than women with children. Furthermore, in societies where polygyny is allowed, men may prefer to take a second wife instead of divorcing or separating. For example, in Kenya, Jordan, Nepal, and Yemen, men whose first wives were childless were 15% to 20% more likely to have a second wife (Rutstein and Shah 2004).

Childless women are also more likely to be the victims of domestic violence and may endure various forms of verbal and emotional abuse perpetrated by their husbands or husbands' family members (Inhorn 1996; Nachtigall 2006; Nahar 2010, 2012; Nahar and Richters 2011). Infertile women who are abandoned by their husbands may be forced to turn to prostitution as a form of economic survival. Infertility, then, may be both impoverishing and life-threatening when it places a woman at a significantly higher risk of both violence and STIs, including HIV/AIDS (Lunenfeld and van Steirteghem 2004).

Paradoxically, women are often blamed for infertility, even when it is their husbands who are the infertile partners (Cui 2010; Hörbst 2010; Inhorn 1996, 2002, 2003; Wischmann and Thorn 2013). Male infertility remains a "hidden" condition, even though it contributes to more than half of all cases of involuntary childlessness worldwide (Inhorn and Patrizio 2015; Irvine 1998). Male infertility involves four major problems of spermatozoa: Oligozoospermia (low sperm count), asthenozoospermia (poor sperm motility, or movement), teratozoospermia (abnormal sperm morphology, or shape), and azoospermia (absence of sperm in the ejaculate, either due to obstructions of the seminal vessels or lack of sperm production). Due to the genetic etiology of many of these cases, male infertility is often impossible to prevent and difficult to treat, lasting over the course of a man's lifetime, even if he attempts to have children by changing partners (Devroey et al. 1998; Inhorn 2012a, 2012b; Irvine 1998; Kamischke and Nieschlag 1998; Maduro et al. 2003; Maduro and Lamb 2002).

Although male infertility is a chronic reproductive health condition suffered by millions of men worldwide, its magnitude is rarely recognized (Inhorn and Patrizio 2015). Why? Male infertility is a problem of sperm. But it is routinely mistaken for impotency (i.e., erectile dysfunction).

This "fertility-virility linkage" (Lloyd 1996) means that men who are infertile are assumed to be impotent, even though most are not. This sexual misattribution also makes male infertility one of the most stigmatizing male health conditions (Goldberg 2009; Inhorn 2004), contributing to its hiddenness. The secrecy surrounding male infertility means that fertile wives may be blamed for the infertility problems of their husbands. Many women in this situation suffer in silence, even "protecting" their infertile husbands by claiming the infertility problem as their own (Inhorn 1996, 2003, 2012a).

In summary, infertility continues to be a highly prevalent, stigmatizing, global reproductive health condition, which can affect both men and women and is accompanied by significant untoward gender effects. The good news is that IVF and other ARTs to overcome both female and male infertility problems are making their way around the globe, significantly lightening the heavy social burden of infertility (Inhorn and Patrizio 2015). In a world where 95% of adults still express the desire for children at some point in their reproductive lifetimes (Boivin et al. 2007), the introduction of IVF and other ARTs to overcome otherwise intractable infertility problems has changed the world for the better, as we shall see.

## IVF and ICSI as gender interventions

In 2018, the world's first IVF baby, Louise Brown, celebrated her fortieth birthday. In 1978, Louise's mother, Lesley, traveled with her husband John Brown from their home in Bristol to Oldham, England, to deliver the baby that had been conceived through IVF procedures developed at the University of Cambridge (Elder and Johnson 2015). Due to intense media scrutiny and religious opposition, the delivery of baby Louise by cesarean section on July 25, 1978, was carried out under conditions of utmost secrecy (Brown 2015; Dow 2019). However, for Lesley Brown, the birth of her daughter was nothing short of a miracle. Lesley suffered from tubal infertility, the very condition that IVF was designed to overcome. By removing eggs directly from Lesley's ovaries and fertilizing them with John's sperm in a laboratory petri dish, Lesley's damaged fallopian tubes were bypassed in the procedure. The embryo transferred back to Lesley's womb led to a successful pregnancy, thereby allowing Lesley and John to overcome nine years of heartbreaking involuntary childlessness.

In her path-breaking ethnography of those early years, anthropologist Sarah Franklin (1997) coined the term "hope technology" to refer to the promise of IVF among the first generation of British users. Since then, IVF has brought great hope and joy to millions of infertile couples, with approximately 4% of all children in developed countries born through IVF procedures (ESHRE 2018; Kennedy 2019). Furthermore, as Franklin (2013) has argued more recently, IVF has spawned numerous "biological relatives" and become a platform technology for other second-generation ARTs. These "related" IVF technologies include: 1) intracytoplasmic sperm injection (ICSI) to overcome male infertility; 2) third-party reproductive assistance (with donor eggs, sperm, and embryos) to overcome problems of poor egg, sperm, and embryo quality; 3) gestational surrogacy to help women who are unable to carry a pregnancy in their own uterus, as well as gay men who employ surrogates to become fathers; 4) cryopreservation (freezing) and storage of unused sperm, embryos, eggs, and now ovaries, to preserve fertility for those facing cancer or the threat of age-related fertility decline; 5) mitochondrial transfer from a healthy human egg to the diseased egg of another woman, to prevent the birth of offspring with fatal mitochondrial diseases; 6) preimplantation genetic diagnosis (PGD) of IVF embryos, to prevent the birth of offspring with heritable disorders; 7) preimplantation genetic screening (PGS) to select embryos of a specific quality or sex, or to select embryos that can grow into "savior siblings" through the donation of their umbilical cord blood; 8) human embryonic stem cell





(hESC) research on unused embryos for the purposes of therapeutic intervention; and 9) the future possibility of human reproductive cloning, or asexual, autonomous reproduction, which has already occurred in other mammals (e.g., Dolly the sheep) (Franklin 2007; Waldby 2019).

Of all these ARTs, IVF and ICSI are the most commonly performed in the world today, with ICSI now outstripping IVF in the total number of procedures performed (Inhorn 2015). ICSI was first developed and introduced in Belgium in the early 1990s to overcome the problem of male infertility. As a variant of IVF, ICSI solves the problem of male infertility in a way that IVF cannot. Through manipulation of "weak" sperm (i.e., low numbers, poor movement, or misshapen) under a high-powered microscope, these sperm can be injected directly into human eggs, effectively "forcing" fertilization to occur. With the invention of ICSI, otherwise "sterile" men can now father biogenetic offspring. This includes even azoospermic men, who produce no sperm in their ejaculate and must therefore have their testicles painfully aspirated or biopsied in the search for sperm.

Over time, ICSI has become a "masculine hope technology" (Inhorn 2012a)—one that has led to the "coming out" of male infertility from behind its veil of secrecy. With the spread of ICSI around the globe over the past three decades, men have opened up about their infertility problems—often telling their families and friends that they are the infertile partner and increasingly seeking medical help. Indeed, the coming of ICSI to IVF clinics around the globe has provided a positive example of how medicalization can help to recast a gender problem (i.e., of infertile men's emasculation) into a correctable medical condition (Inhorn 2012a, 2018). Perhaps most significantly, in acknowledging their own male infertility, men have helped to lighten the once heavy load carried by their wives, including the scrutiny from in-laws, the social ostracism, and the threats to marriage.

Today, ICSI is performed in most IVF clinics around the world, and the number of clinics is growing. At the turn of the twenty-first century, IVF clinics were only found in 45 of 191 WHO member states, or about one-quarter (24%) of the world's nations. By 2010, however, more than half of the world's nations had developed, or were on the cusp of developing, IVF services (Jones et al. 2010). In that year, between 4,000 and 4,500 IVF clinics were estimated to exist, with more than one-quarter of these clinics located in just two countries, Japan (606–618 clinics) and India (500 clinics). Other nations with large numbers of IVF clinics included the US (450–480), Italy (360), Spain (177–203), Korea (142), Germany (120–121), and China (102–300), the latter offering the least precise estimate.

By the mid-2000s, both the Middle East and Latin America, too, had shown remarkable development of their IVF sectors, with widespread regional coverage and the existence of many clinics in some countries. Among the 48 countries performing the most ART cycles per million inhabitants by 2010, nine Middle Eastern countries could be counted, with Israel ranking first, but also including Bahrain, Egypt, Lebanon, Libya, Jordan, Saudi Arabia, Tunisia, and the United Arab Emirates (Adamson 2009). Nine Latin American countries also made the top 48 list, including Argentina, Brazil, Chile, Ecuador, Guatemala, Dominican Republic, Mexico, Peru, and Uruguay (Adamson 2009).

Today, according to the International Federation of Fertility Societies' global surveillance project (IFFS 2019), which is carried out every three years, 132 of 195 nations, or exactly two-thirds, offer IVF and ICSI services. As shown in Table 13.1, of the 6,200 IVF clinics estimated to exist in the world today, the vast majority are in Asia. But other regions, including Latin America and the Middle East, also demonstrate robust IVF sectors. Indeed, despite the political instability wrought by the 2011 Arab uprisings, the Middle East continues to be a regional success story, partly because of the strong religious support for ARTs over 40 years (Inhorn and Tremayne 2012). In 1980, the first authoritative *fatwa* permitting assisted

*Table 13.1* The number of IVF clinics: A regional comparison of the top ten countries

| *No.* | *Asia* | *Latin America* | *Middle East* | *Sub-Saharan Africa* |
|---|---|---|---|---|
| 1 | India (1,500) | Brazil (200) | Turkey (154) | Senegal (100) |
| 2 | Japan (574) | Mexico (81) | Egypt (70) | Nigeria (36) |
| 3 | China (400) | Argentina (65) | Iran (60) | South Africa (22) |
| 4 | Korea (154) | Colombia (23) | Saudi Arabia (50) | Ghana (18) |
| 5 | Sri Lanka (110) | Venezuela (22) | Israel (23) | Kenya (9) |
| 6 | Taiwan (78) | Peru (18) | Jordan (22) | Uganda (6) |
| 7 | Thailand (75) | Chile (12) | Oman (14) | Côte d'Ivoire (4) |
| 8 | Hong Kong (42) | Ecuador (12) | Tunisia (13) | Cameroon (3) |
| 9 | Indonesia (32) | Bolivia (10) | United Arab Emirates (10) | Congo (3) |
| 10 | Vietnam (26) | Panama (10) | Iraq (5) | Togo (2) and Zimbabwe (2) |
| Total number per region | 2,991 | 453 | 421 | 205 |

*Source:* International Federation of Fertility Societies (2019).

reproduction was issued by the Grand Shaykh of Al Azhar in Cairo, one of the world's oldest and most important Islamic universities (Inhorn 2003; Serour 1996, 2008). By 1986, IVF clinics had opened in Egypt, Jordan, and Saudi Arabia. A decade later, the Middle East was in an IVF "boom period," with multiple clinics opening in major cities from Casablanca to Cairo to Tehran (Inhorn 2003). Today, the Middle East is home to hundreds of IVF clinics, including 154 in Turkey, 70 in Egypt, 60 in Iran, and 10 to 20 in many smaller countries, as shown in Table 13.1 (IFFS 2019).

Considerable anthropological research emerging over the past two decades from these Middle Eastern nations—including Egypt (Inhorn 1994, 1996, 2003), Iran (Abbasi-Shavazi et al. 2008; Tremayne 2006, 2009, 2012), Lebanon (Clarke, 2006, 2009; Inhorn 2006, 2012a), Turkey (Goknar 2015; Gürtin 2012, 2014, 2016), and the United Arab Emirates (Inhorn 2015)—suggests that the presence and increasing accessibility of IVF and ICSI has had a major salutary effect on infertile marriages. Because marriage is a highly valued Islamic precept, Middle Eastern Muslims are among the "most married" people in the world, with well over 90% of adults marrying at least once in a lifetime and divorcing at rates much lower than in the West (Omran and Roudi 1993; Parker-Pope 2010). Marriage is also a major source of intergenerational wealth transfer in the Middle East (Singerman and Ibrahim 2004). Thus, with both economic and religious incentives to stay together, couples often work hard to maintain their marriages, even under the threat of infertility and childlessness. "Conjugal connectivity," or the deeply felt marital commitments of many infertile couples (Inhorn 1996), has been demonstrated across the region from Egypt (Inhorn 1996, 2003) to Lebanon (Inhorn 2012a) to Turkey (Goknar 2015; Gürtin 2012,





Thus, the coming of IVF and ICSI to the Middle Eastern region has been a major marital asset, promoting conjugal connectivity through couples' hopes of making a "test-tube baby" together (Gürtin 2014; Inhorn 2003).

Perhaps most significantly, the widespread emergence of ICSI as the solution for the Middle Eastern region's highly prevalent male infertility problems has facilitated the development of "emergent masculinities" (Inhorn 2012a; Inhorn and Wentzell 2011). Namely, as ICSI becomes normalized, Middle Eastern men are beginning to openly challenge the victim-blaming of women within childless marriages. In general, the emergence of these technologies has been a positive force in men's more general attempts to overturn patriarchy, challenge negative male stereotypes, and nurture companionate marriages characterized by love, commitment, and fortitude in the face of adversity (Inhorn 2012a).

These positive effects on gender can be seen most clearly in the Middle Eastern nation-states that have made IVF and ICSI most accessible. This includes Algeria, Egypt, Iran, Turkey, and the UAE, all of which offer some form of public financing, either through insurance reimbursement (Algeria and Turkey), or government-sponsored IVF clinics for the poor (Egypt, Iran, UAE) (Inhorn 2015). However, Turkey is exceptional in its commitment to state subsidization (Gürtin 2016). In 2005, Turkey began fully funding two IVF or ICSI cycles for all Turkish citizens, when the Turkish Ministry of Health began to provide IVF health insurance redeemable at both state and private clinics. Since then, the demand for IVF and ICSI in Turkey has dramatically increased, causing a near tripling in the number of IVF clinics in the country—from 66 in 2005 to 131 in 2013 to 154 in 2019, the largest number in any single Middle Eastern country.

As shown by medical sociologist Zeynep Gürtin (2012, 2014, 2016), the ability of Turkish couples of all social classes and backgrounds to access IVF and ICSI has had dramatic and positive effects on demand for these services, especially among poorer segments of the Turkish population. IVF and ICSI are becoming normalized among Turks, especially men, who are remaining in their childless marriages as they seek IVF and ICSI solutions with their wives (Gürtin 2014). The Turkish example provides compelling evidence that low-income infertile couples benefit tremendously when IVF and ICSI services are provided for free or at very low cost.

Unfortunately, the Middle East is an exception in terms of IVF affordability. On a global level, an average IVF cycle costs more than $3,500—a sum that is more than half of an average individual's annual income (Chambers 2009; Collins 2002; Connolly et al. 2010). Thus, many infertile couples who try IVF face "catastrophic expenditure," or out-of-pocket payments that actually threaten their household survival (Dyer et al. 2013; Dyer and Patel 2012). These high IVF costs can be considered a global reproductive health disparity (Jain 2006; King and Davis 2006), meaning that "relatively few of the world's infertile men and women can be said to have complete and equitable access to the complete range of infertility treatments at affordable levels" (Nachtigall 2006: 871).

Sadly, those parts of the world with some of the highest levels of infertility are also the least likely to have access to IVF services (ESHRE Task Force 2009; Vayena et al. 2002, 2009). This is especially true in sub-Saharan Africa, a vast region of the world with a huge unmet need (Inhorn and Patrizio 2015; Kennedy 2019; Ory and Devroey 2013). Of those 63 countries with no identifiable IVF facilities, 28 (45%) are in sub-Saharan Africa (IFFS 2019). These include both large and small African nations—for example, Burundi, Central African Republic, Eritrea, Ethiopia, Gambia, Liberia, Malawi, Mozambique, Sierra Leone, and Somalia. Having said that, some parts of sub-Saharan Africa have made remarkable progress in developing IVF services over the past decade. IFFS reported a nearly ten-fold increase in regional IVF clinics, from only 25 in 2010 to 210 in 2019. Nigeria led the way to IVF in sub-Saharan Africa in 1984, and reported its first IVF birth five years later in 1989 (Giwa-Osagie 2007). As shown in Table 13.1,

Nigeria now has 36 IVF clinics. However, the nation that stands out most is Senegal. With only two IVF clinics in 2010, Senegal now has the largest number—100 IVF clinics—of any country on the continent.

Already, IVF in Africa appears to be having salubrious gender effects. Medical anthropologists Trudie Gerrits and Viola Hörbst have shown how clinics in Ghana, Uganda, Mali, and Togo are serving not only local populations, but also couples traveling from neighboring countries where IVF and ICSI services are not yet available (Gerrits 2016, 2018; Hörbst 2012, 2016; Hörbst and Gerrits 2016). Furthermore, new kinship and gender logics are being created, as African couples contemplate the use of surrogates, donor eggs, and donor sperm to overcome their female and male infertility problems together (Gerrits 2015; Hörbst 2010). As in the Middle East, the development of IVF and ICSI services in these African nations has led to increasing demand (Hörbst and Gerrits 2016). This is especially important given recent research demonstrating an overall 72.6% decrease in mean sperm concentration over the past 50 years among African men, probably due to a combination of epidemic diseases, male genital tract infections, environmental pesticides, and heavy metal toxicity, and men's regular consumption of tobacco and alcohol (Sengupta et al. 2017).

Only time—and more research—will tell whether IVF and ICSI in an increasing number of African nations will produce the kinds of positive gender effects observed in the Middle East. To reiterate, these include: 1) Increased knowledge of both male and female infertility among the general population; 2) normalization of both male and female infertility problems as medical conditions that can be overcome; 3) decreased stigma, blame, and social suffering for both men and women; 4) increased male adoption of ICSI for male infertility problems; and 5) increased marital commitment as husbands and wives seek IVF and ICSI services together. If these gender effects emerge in Africa as in the Middle East, then the coming of IVF to the continent will be a twenty-first-century regional success story.

## Fertility preservation: Preventing age-related infertility

In Africa as in the Middle East, infertility is viewed as a couple's problem, with proof of marriage or a stable heterosexual relationship required to access IVF services in most countries. In the Muslim Middle East, where pregnancy outside of wedlock is considered a major sin, a marriage license must be submitted before IVF and ICSI cycles can be initiated. This is true in approximately 40% of the world's nations, including East Asia, where proof of a stable marital relationship is required by law, statute, or government or professional oversight in China, Hong Kong, Japan, Korea, Singapore, Taiwan, Thailand, and Vietnam (IFFS 2019).

But what about people who are not married, particularly single women in their late thirties who are facing the threat of age-related infertility? As highlighted in the IFFS 2019 report, "one of the most significant recent advancements in assisted reproduction technology" is cryopreservation, which has now allowed human eggs to be successfully frozen for future use.

Through a method of cryopreservation called vitrification developed in the early 2000s (Mertes and Pennings 2012), egg freezing began to be used for cancer patients, who were at risk of losing their future reproductive potential due to the sterilizing effects of chemotherapy (Inhorn et al. 2017, 2018a, 2018b). Given the success of egg freezing in clinical trials with cancer patients, healthy volunteers, particularly women facing age-related fertility decline, also began to enroll in these studies. By October 19, 2012, the American Society for Reproductive Medicine lifted the experimental ban, allowing egg freezing to be performed clinically for both medical and non-medical fertility preservation purposes. Most American IVF centers moved quickly to create their own egg freezing programs, with several commercial egg banks and stand-alone





clinics opening in major urban areas, especially New York City (van de Wiel 2020). The response to egg freezing on the part of American women was almost immediate. In 2013, the first year after clinical acceptance, approximately 5,000 egg freezing cycles were undertaken in the US. Five years later in 2018, that number more than doubled to 11,000 cycles, according to the Society for Assisted Reproductive Technology (SART).

In Europe, the ESHRE Task Force on Ethics and Law (2012) also approved of egg freezing for clinical use in 2012, and several European countries quickly followed suit. By 2015, ESHRE reported that six out of 34 European countries surveyed were employing egg freezing for fertility preservation among otherwise healthy women. These early adopter countries included Bulgaria, Finland, Germany, Italy, Netherlands, and Ukraine; the number steadily increased to include countries such as Belgium, Denmark, Sweden, and the UK.

As shown in the IFFS 2019 report, egg freezing for fertility preservation is quickly spreading around the globe. Of 82 countries reporting, 68 (83%) allow egg freezing for medical fertility preservation, and 56 (68%) also allow egg freezing for non-medical indications. Of the 82 countries, 33 (40%) have no specific regulations, and 18 of 42 (43%) countries report frequent performance of egg freezing cycles in their clinics. According to the IFFS report, preliminary data on the safety of egg freezing is reassuring, with good evidence that fertilization and pregnancy rates are similar with fresh or frozen (and then thawed) eggs. No increases in chromosomal abnormalities, birth defects, or developmental deficits have been noted in the children born from frozen eggs. However, "There are not yet sufficient data to recommend oocyte cryopreservation as a mainstream option to mitigate reproductive aging in healthy women" (IFFS 2019).

Despite this IFFS note of caution, it is clear that women around the world are beginning to turn to egg freezing for exactly this reason—that is, to prevent infertility due to age-related fertility decline. The Middle East again proves instructive. Egypt's Dar Al-Ifta, one of the main *fatwa*-issuing bodies in the Islamic world, first allowed egg freezing only for married women facing fertility-threatening medical treatments, such as cancer chemotherapy. However, in September 2019, in response to a widely circulated Facebook post by an unmarried Egyptian woman who had decided to freeze her eggs, the Dar Al-Ifta issued a *fatwa* declaring that egg freezing among single women is "permissible" if carried out under four conditions, including: 1) Prevention of any damage to the eggs, which might pose a risk to future offspring; 2) safe control over the frozen eggs to prevent intentional or unintentional mixing with other frozen eggs; 3) no donation of frozen eggs to other women; and 4) fertilization of the frozen eggs with a husband's sperm during the course of marriage, with no use of frozen eggs or fertilized embryos following divorce or death of the husband (Alawi 2019).

With this *fatwa* support, egg freezing is now available to single Muslim women who are facing the threat of permanent childlessness due to age-related fertility decline. Given that Islam prioritizes reproduction within the bounds of marriage, egg freezing is a way for single Muslim women to preserve their fertility potential, especially in regions that are plagued by widespread economic and political strife and concomitant marriage delays (Singerman 2020). In such settings, egg freezing constitutes a form of "technological protection" for older single women who are still hoping to become mothers.

Such reasoning is clearly beginning to take hold across the Middle East. The Sunni Muslim–majority countries of Jordan, Kuwait, Morocco, Saudi Arabia, Tunisia, Turkey, and the United Arab Emirates all offer egg-freezing services for single women. Similarly, egg freezing is being practiced in Shia Muslim majority countries of Bahrain, Iran, and Lebanon. Although the Sunni Muslim-majority Southeast Asian country of Malaysia has issued a *fatwa* banning egg freezing for unmarried women, this may be more reflective of bans in neighboring Asian countries (e.g., Singapore, China) than on the moral dictates of Islam itself.

Interestingly, China is one of the countries that still bans egg freezing for single women, along with other resource-rich nations, including Austria, Norway, and Singapore. Some countries, such as Denmark and the UK, have imposed strict storage limits (five and ten years, respectively), which have put intense time pressure on women to "use or lose" their frozen eggs. Perhaps most significantly, no country in the world yet provides state funding for non-medical egg freezing. As egg freezing is expensive—nearly as much as a full IVF cycle, and with annual storage fees that can become prohibitive over time—cost continues to be a major barrier to access.

Most of the media coverage of egg freezing has suggested that those women who are willing to pay for costly egg freezing are doing so to intentionally "delay," "defer," or "postpone" their fertility, especially for educational and career purposes, thereby achieving some form of reproductive autonomy (Argyle et al. 2016; Goldman and Grifo 2016). However, as suggested by the Middle Eastern example, women's turn to egg freezing may reflect other social realities. Recent surveys and ethnographic studies carried out among diverse women in the US (Brown and Patrick 2018; Carroll and Kroløkke 2018; Greenwood et al. 2018; Hodes-Wertz et al. 2014), UK (Baldwin 2017, 2018; Baldwin et al. 2015, 2019; Waldby 2015, 2019), Belgium (Stoop et al. 2015), Australia (Hammarberg et al. 2017; Pritchard et al. 2017), Turkey (Göçmen and Kilic 2018; Kilic and Göçmen 2018), and Korea (Kim et al. 2018) show that "lack of a partner" is cited as the primary reason for egg freezing among more than 80% of women across all studies. In the largest ethnographic study of egg freezing to date—carried out with 150 American and Israeli women who had completed at least one cycle of egg freezing during the 2014–2016 period—85% had turned to egg freezing at an average age of 36 because they were unable to find a committed partner with whom to pursue childbearing (Inhorn et al. 2018c, 2018d).

This dearth of male partners among highly educated women reflects growing educational disparities between men and women, which are leaving highly educated professional women without equally educated partners to marry (Birger 2015; Inhorn et al. 2018c). In other words, egg freezing is not being used primarily for *planned fertility postponement* (i.e., to achieve educational or career goals among women in their twenties or early thirties), but rather for *unplanned fertility preservation* (among women in their late thirties and early forties), who are facing age-related infertility at the end of their reproductive lifespans, but are unable to find stable reproductive partnerships. In this regard, egg freezing among single women represents a significant gender intervention—an attempt to "stop the clock" at a critical biological moment, while still assessing whether finding a partner is a viable goal, particularly with a less-educated man. Egg freezing is now viewed by many women as preferable to either a "desperation" marriage or to single motherhood. Indeed, in one major study carried out in Australia (Hammarberg et al. 2017), the low rate at which women returned for their frozen eggs reflected the fact that most had not found partners, nor did they want to become "single mothers by choice" (Hertz 2018).

Clearly, the increasing uptake of egg freezing by women around the globe speaks to their desires for male reproductive partnerships that are not being met. New scholarship must be conducted to study men's reproductive intentions as well as women's, in order to understand the full story of why *both* men and women are engaging in reproductive delay, and whether such delays are by choice, especially for women (Inhorn and Smith-Hefner 2020).

## Conclusion

In conclusion, IVF, ICSI, and new forms of fertility preservation are helping to overcome the tragedy of infertility for women, men, couples, and now singles. Continuing scholarship in these areas, in settings around the globe, is necessary to make sense of the human subjectivities





desires, motivations, investments, struggles, and joys of women and men on their often tortuous reproductive journeys. It is always important to bear in mind that the goal of IVF, ICSI, and now fertility preservation is to "make parents" (Thompson 2005) out of those whose chances of biological conception are otherwise thwarted. More than 40 years after the "first birth" of Louise Brown, it is still important to remember what is at stake—namely, the babies born, who make these "quests for conception" (Inhorn 1994, 2020) well worth the struggle.

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# 14

# GLOBAL IVF AND LOCAL PRACTICES

## The case of Ghana

*Trudie Gerrits*

### Introduction

The global boom of in vitro fertilization (IVF) has been followed by an explosion of anthropological studies of assisted reproductive technologies (ARTs). Since the birth of the first "IVF baby" in the UK in 1978, over eight million babies worldwide have been born resulting from the use of ARTs (Fauser 2019). In this same period—and in particular since the beginning of the new millennium—an extended and impressive body of ethnographic literature on ARTs has been produced (Inhorn and Birenbaum-Carmelli 2008; Franklin and Inhorn 2016; Inhorn 2020).

An inventory of ethnographic books and journal special issues on ARTs, conducted for the current book chapter, has resulted in an impressive list of 55 ethnographic monographs, 34 edited volumes, and six special issues of journals (see Table 14.1).[1] All together these publications give a fascinating insight into the local variations and similarities of the introduction and use of ARTs in countries worldwide. The list of monographs, however, also shows the uneven global spread of them (34 in Western and 21 in non-Western countries), which only partly reflects the even more unequal spread of IVF clinics worldwide (see Inhorn in this volume).

This unequal spread of IVF clinics and the resulting stratified reproduction (Colen 1995) have become a core point of interest for anthropologists, as they not only reflect, but also contribute to inequalities at global and national levels (Inhorn and Birenbaum-Carmelli 2008; Gerrits 2015; Hampshire and Simpson 2015). In particular, sub-Saharan Africa (SSA) has been known for decades to have high rates of infertility, yet infertility has been neglected as a reproductive health concern as international and national policy makers were mainly concerned about the continuing high fertility and population growth on the continent, and thus mainly invested in family planning to decrease childbearing (Gerrits et al. 2012). Infertility and its devastating consequences for people in SSA—a region where childbearing and parenting are culturally considered crucial or mandatory for women and men—are only recently receiving more attention from international organizations and national public health systems. Programs to prevent (secondary) infertility and to decrease the burden and stigma of infertility receive little attention (Starrs et al. 2018). So far, with a few exceptions, only private clinics in SSA are offering ARTs, which are the only way to overcome the problem of blocked tubes caused by sexually



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