

Assisted Conception, including Fertility Preservation, Surrogate Motherhood, Gamete / Embryo Donation, and in Vitro Fertilization

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Most people across the world expect, and want, to become parents at some stage in their life (Lampic et al., 2006). However, 48 million couples experience infertility due to medical reasons (Mascarenhas et al., 2012), and these rates are rising. The rise in infertility (or involuntary childlessness) is also due in part to global changes in lifestyle factors, such as delayed childbearing (Mathews & Hamilton, 2016), same-sex partnerships, and women and men deciding to become solo parents (van den Akker, 2017a). (add para on psych effects here) this comes later, I did biological challenges first, ok? These medical and lifestyle factors present biological challenges that can be treated with assisted conception (AC), including fertility preservation, surrogate motherhood, gamete or embryo donation, and in vitro fertilization (IVF). This chapter will explore the processes involved in overcoming barriers to parenthood and the psychological effects associated with these. The contexts in which the medical and lifestyle factors associated with involuntary childlessness occur, and overcoming these barriers, are also discussed from within the wider sociocultural, family and work environments.

Whatever the underlying reasons, involuntary childlessness is often associated with feelings of personal failure because parenthood continues to be considered by many to be a necessary part of individuals' life time trajectories into adulthood (van den Akker, 2012). The impact of failing to complete this expected major life goal has been described as a life crisis (Ussher et al, 2018) that leaves the mental health of about 10% of the population seeking AC worldwide in crisis (Eugster & Vingerhoets, 1999; Benyamini et al., 2009; Payne et al.,

2017). A recent systematic review and meta-analysis of the long-term mental health of infertile patients who failed to become parents has found that their individual needs and their relationships improved over time and that many individuals who were able to accept their childlessness and make meaning of their life by pursuing new goals tended to adjust better than those who did not (Gameiro & Finnigan, 2017). There is therefore a real need for appropriately tailored psychosocial support for those who receive a diagnosis of infertility and for individuals who relinquish their parenthood goals but do not adjust.

Fertility Treatment Availability

Most developed countries consider infertility a medical condition and have national health policies to cover some or all infertility treatment, including IVF (e.g., Australia, Austria, Denmark, Finland, France, Germany, Iceland, The Netherlands, Norway, Sweden, the UK; Hughes & Giacomini, 2001), whereas other countries (e.g., the US) consider fertility treatment a socially constructed need (van den Akker, 2012) or a luxury to be financed by patients with the means to afford it. The uncertainties about costs, insurance, unclear cause(s) of infertility, treatment length, and outcomes can cause substantial amounts of stress. Distress, anxiety, and depression are associated with the chances of a successful outcome (Purewal et al., 2018). This suggests that there is a circularity of broadly psychological and physiological factors impacting the AC process, which leave many people on a never ending treadmill of treatment distress followed by treatment failure followed by further distress and failure.

It has been estimated that less than one half of infertile women are able to pursue treatment; those who can tend to be White, older, heterosexual and married, and with middle- to high-incomes (Datta et al., 2016). The others cannot afford private treatment, or are excluded from treatment – ie same sex attracted or trans individuals; single women. Different policies have therefore led to inequities in access to AC, particularly third- party treatment, as costs can be prohibitive. However, even those who are able to pursue privately funded treatment face hardship. Moving house or getting into serious debt to fund the treatment have been reported (Cook, 2015), whilst others are known to feel caught in a job to secure the income necessary to pay the costs of treatment (van den Akker et al,

2017b) or end up making a decision about the costs and benefits of their ‘desire’ for a child versus the ‘worth’ of a child (Klitzman, 2017).

Schmidt et al. (1995) and Boivin et al. (2007) reported that the proportion of couples from the developed world seeking treatment to overcome their infertility averages just over 47% and 50%, respectively, but less than one half of them actually receive treatment. Some of this discrepancy may be because of unavailability of health care resources as described above, but there are potentially also large numbers of additional people who desire parenthood but do not seek treatment, including many LGBT couples and single women and men, because not all countries treat their parenthood needs equally. The fate of those who do not seek treatment is less studied (Schmidt et al., 1995), but is likely to be of substantial additional concern as they appear to be less well educated and affluent than their treatment-seeking counterparts.

Assisted Conception

Despite the discrepancy in treatment availability and the disparity within populations who access treatment, increasing infertility rates and more people reporting problems conceiving (Dhalwani et al., 2013) have led to increasing demands for AC worldwide (Farquhar et al., 2015). The latest statistics from the UK, for example (HFEA, 2016), show that in 2014, 52,288 women had 67,708 cycles of In Vitro Fertilization (IVF) or Intra Cytoplasmic Sperm Injection (ICSI) a rise on previous years with no sign of abating. In addition to IVF/ICSI and related treatments involving a couple’s own gametes, a large number of treatments involve donor gametes (Kupka et al., 2016), and surrogacy arrangements also have seen a rise in popularity (Crawshaw et al., 2012). Use of third-party input, such as gametes, embryos, and genetic or gestational surrogates in AC, although common, is proportionally less frequent (only 10% of fertility treatment cycles in Europe; Kupka et al., 2016) than use of IVF and associated techniques that use a couple’s own gametes. The lack of frequency is partly because patients are dependent upon the supply of donors or surrogates, but is also because most patients prefer a full genetic link (Hendriks et al., 2017; van den Akker, 2000). Consequently, psychosocial and medical factors are again important in terms of AC treatment options.

Furthermore, AC is expensive and only sometimes funded by national health policies or insurance, but treatment with donated gametes and embryos add even more to those IVF/ICSI costs with (commercial) surrogacy the most expensive. The reproductive landscape is therefore shifting (Cohen, 2015) from the relatively young heterosexual two-parent family with genetically related and gestated offspring produced at no cost to include families that consist of one or more (often older) women or men, and babies conceived in test tubes and genetically or gestationally related to other individuals at high costs and against biological and medical odds. These shifts from tradition have implications for families of the future and for society at large (van den Akker, 2016a). In addition, there are psychological costs associated with the physical and social effects of AC treatments which are increasingly complex and varied, as is shown below

Assisted Reproductive Technologies

Intra Uterine Insemination (IUI) and IVF / ICSI

Assisted reproductive technologies (known as ART or AC) can involve numerous different techniques, which vary in complexity and intensity of treatment, including IUI, IVF, and IVF with ICSI. In IUI, no conception outside the uterus is necessary, whereas in IVF, not only does conception take place in vitro (i.e., outside the uterus), it involves the removal of gametes from the female and male parents to create the desired embryo in a test tube. Finally, in ICSI, when the sperm is unable to penetrate the oocyte, it is injected directly into the oocyte in the hope of producing a viable embryo. Only about 70% of treatments for infertility are successful (Troude et al., 2016), which leaves the remaining 30% to try again (and again), or to give up hope of ever becoming a genetic parent.

Additional Third-party AC Treatments

AC not only circumvents obstacles to fertility, but it can replace mitochondria or gametes from third-party donors to bypass genetic conditions. Social needs of involuntarily childless single individuals and same-sex couples also require the involvement of a third party, such as donated gametes (oocytes or sperm), embryos, surrogates, or a combination of these, which is legal in some (e.g., the UK) but not all (e.g., Italy) countries. Solo individuals, LGBT individuals or couples, and heterosexual couples with ovarian or sperm failures or absence of the uterus (e.g., previously treated

cancer patients, women unable to sustain a pregnancy or born without a uterus) can use third-party assisted conception. Third-party assisted conception therefore fulfils a need for individuals who cannot produce a child without the assistance of the third-party donor or surrogate for medical or lifestyle reasons.

Unlike IVF, which is state funded for heterosexual couples in some countries (e.g., the UK), (unlimited) third-party AC is rarely fully supported by national health services (Israel exceptionally provides financial support to all), which leaves most of those in need of the more complex interventions to fund these themselves. This has created a further imbalance in solo/same-sex third-party AC routes to parenting compared to the majority of heterosexual IVF routes to parenting. In addition to these inequalities in access, there are further gestational and genetic link complexities associated with third-party assisted conception, including different amounts of genetic, gestational, and epigenetic contributions from the third-party affect the parent status of individuals who use third-party treatment to conceive. Questions about who the child's parent, grandparent, uncle, niece, and other extended family are tend to be based on social not genetic roles, and can have far reaching psychological effects on members of these recipient and donor families (Blyth et al., 2017; Frith et al., 2017).

Surrogate Motherhood

In genetic surrogacy, the third-party contribution is the greatest contribution to the development and makeup of the child. The surrogate mother bears the child for another person, and has contributed her own oocyte to this baby. A female recipient does not contribute the oocyte or the gestational epigenetic environment to this baby, although a male recipient may have contributed his sperm (or a donor sperm can be used) (van den Akker, 2017a). Gestational surrogacy, on the other hand, refers to a surrogate who carries an embryo from a heterosexual couple, a donated embryo from yet another source, or an embryo created

from the commissioning woman's oocyte and sperm from her partner or a donor. Either way, the surrogate does not contribute the oocyte, although the gestational and epigenetic influences are again contributed by her (van den Akker, 2017a). Within the genetic/gestational routes, there are also differences in the manner in which surrogacy is offered in different countries, such as altruistic versus commercial, which makes cross-border surrogacy particularly complex (van den Akker, 2017a). In commercial surrogacy, the recipient or commissioning parent(s) pay for a surrogate, a clinic, and embryos or gametes. This has been interpreted as 'baby buying.' In altruistic surrogacy, a surrogate tends to receive expenses for her part in conceiving, carrying, birthing, and relinquishing the baby. The former model is accepted across many countries that legalise or do not object to surrogacy as a commercial business practice including India and some American states, whereas the latter model is legalised in for example, the UK and Australia. In addition to these distinctions, commercial surrogacy is often anonymous, whereas altruistic surrogacy rarely is. The psychosocial outcomes for both families (surrogate and recipient) in altruistic and commercial surrogacy have been shown to be relatively problem free (van den Akker, 2005, 2007, 2017a), although accurate record keeping and accuracy of genetic information is critical, particularly for the welfare and human rights perspectives of the child (Crawshaw et al., 2012, 2016; UN CRC, 1989). Research on couples or individuals commissioning surrogacy overseas and of surrogates in such arrangements has shown both parties have coped well in some studies whereas others have reported numerous problems, including stigma, issues with legal parentage and passports (for a fuller discussion see van den Akker, 2017a).

In embryo donation, a woman receives an embryo from another source, often from another infertile couple who had surplus embryos following their own successful treatment, and provides the epigenetic gestational environment herself. Embryo donation is not to a

popular option for donors because it means relinquishing a fully genetically related child, or full sibling to their existing children (de Lacey, 2005, 2007), but less is known about recipients of donated embryos. Australia reported its first successful embryo donation in the early 1980s (Trounson et al., 1983), which was, as in most countries, practiced under the laws of anonymity, with few exceptions (International Federation of Fertility Societies, 2016). Recent research on the relationships and boundaries proposed between embryo providers and their recipients (Frith et al., 2017) shows that early contact between donor and recipient families is favoured by both parties and allows for more open interpretations of parenthood and family belonging. This contact is based upon trust (similar to surrogacy), and, when broken, can lead to significant harm to the child(ren) concerned and the donors (*New Daily*, 2017).

Oocyte and sperm donation are much more common than surrogacy or embryo donation. Sperm donation is a relatively old technique as it does not need to involve technology. Oocyte or egg donation, on the other hand, involves all of the processes of IVF, as the oocytes are retrieved from the woman following follicular stimulation with hormones. This process can be painful, and the hormonal stimulation can have additional physical and psychological effects on the women who undergo this process. Once a sufficient number of adequate oocytes have been retrieved, they are either frozen (as in fertility preservation for the treatment of serious disease such as cancer or for age-related reasons) or fertilised in vitro for subsequent implantation in a recipient woman. Individuals who donate, or think about donating, gametes interpret a gamete differently than an embryo (Purewal & van den Akker, 2009) with less emphasis on a 'life' or a baby.

Nevertheless, donors and donor-conceived adults value knowing something about their true genetic relatives and origins, as evidenced by the increasing interest in ancestry

profile building and in obtaining genetic health information. Research on donors has shown that they often want to find out the result of their donations (Blyth et al., 2017) and, like donor-conceived adult offspring (Frith et al., 2018), they have numerous reasons for contacting DNA-based linking registers to obtain information about their genetic children or siblings. Searches for donors by offspring (van den Akker et al., 2015) and searches for offspring by donors (Crawshaw et al., 2016) are becoming increasingly better understood; not finding those for whom they searched can have a significant impact on identity and lead to other psychological conflict, respectively (Crawshaw, 2017). As a consequence, anonymous donations are now increasingly no longer acceptable in many countries, although there are still some countries where the welfare of the child is put behind that of the prospective parents, with some parents still preferring to hide the fact that fertility treatment, and treatment with donor gametes in particular, were used in the child's conception

Mitochondrial donation involves routine IVF with the addition that a family's affected mitochondria (mitochondrial disease) are replaced with a donor's healthy mitochondria, so that the parents have the chance to give birth to a healthy child. Here, prior to the IVF, the DNA of a woman's oocyte that contains the faulty mitochondria are transferred to a donor egg with healthy mitochondria. In the UK, it is estimated that 1 in 200 children are born with faulty mitochondrial DNA, and a proportion of these develop more serious mitochondria-related disorders (Wellcome Trust, 2018). Mitochondrial disease can occur in young people and lead to disability and mortality because no treatment is currently available. The British Parliament was the first in the world to vote in support of mitochondrial donation in 2015. Since then, the technique has been licensed and regulated by the Human Fertilisation and Embryology Authority for clinical use (HFEA, 2017 -Guidance note 33.modification of Section 31ZA,2A). Although progressive, the HFEA failed to agree that mitochondrial donors, like gamete and embryo

donors, should be identifiable to the children born from these techniques and noted instead that mitochondrial donors would be anonymous, as the amount of genetic contribution was small, although aged 16, they can find out if mitochondrial donation was used in their conception (Guidance note 33.modification of Section 31ZA).

Fertility Preservation

Children, adolescents, and young adults who are preparing to receive treatment for serious disease (e.g., cancer) have the option to preserve their potential fertility by gamete cryopreservation (or freezing). Similarly, individuals who are at risk of late childbearing for lifestyle reasons such as prioritising careers, education or not being in a stable relationship and transgender individuals who are transitioning through hormonal intervention also have the opportunity to preserve their gametes for use at a later date, even one that is well beyond their natural reproductive capacity (Charter et al., 2018). Although sperm, oocyte, and embryo cryopreservation are standard practices and widely available, research with children and adolescents with cancer has considered the specific guideline needs for health care providers because of the sensitive nature of fertility preservation in these vulnerable populations (Loren et al., 2013).

In 2006, an American expert panel carried out a systematic review and reported that only a few randomized controlled trials existed on the impact of fertility preservation in cancer patients (Lee et al., 2006). Recommendations for guidelines included improving and providing informed consent before cancer therapy and providing education about the possibility of subsequent infertility and the fertility preservation options. An updated review concluded that no substantive revisions to the 2006 American Society of Clinical Oncology recommendations were necessary (Loren et al., 2013). However, additional recommendations were made, which included emphasizing the possibility of infertility with all patients treated during their reproductive years because their initial focus may be on the cancer diagnosis and they might not think about this issue if it were not raised by their health care providers.

However, more recent research has shown that guidelines are not always followed in practice (Ussher et al, 2018; Logan et al, 2018).

Although, in some countries, access to supportive services for people undergoing fertility preservation prior to treatment for diseases such as cancer are now well established in some (Atkin et al., 2014) but not all cases (Ussher et al, 2019; Logan et al, 2018), these services are less established within other contexts, such as the transgender community (Riggs & Due, 2017; Charter et al, 2018). There is some evidence that research and practice are beginning to recognize the importance of fertility preservation beyond oncology patients (Wallace et al., 2014). With guidelines developed specifically for people who wish to modify their bodies and appearance in regard to sex traits; these guidelines extend to recommendations about fertility preservation (Hembree et al., 2009; WPATH, 2011). However, although all non-heterosexual family-building individuals requiring third-party AC are faced with a significant dilemma, assisted reproduction with fresh or frozen gametes does not always result in a successful outcome. Transgender individuals have the additional experience of high levels of distress when undergoing fertility preservation. In addition to experiencing gender dysphoria to a greater or lesser extent (discomfort or distress that is caused by a discrepancy between persons' gender identity and their sex assigned at birth, the associated gender role, and/or primary and secondary sex characteristics), healthcare needs to be tailored to each individual's needs (Charter et al, 2018).

Psychological Effects of Fertility Preservation and Treatment

For each individual seeking treatment to build a family, the physically and psychologically taxing experiences of many of the treatments are compounded by the financial demands on the state or on the individual bearing that economic burden. Many of the physical and psychological effects are more pronounced in women because, although both women and men undergoing treatment have been found to experience high levels of

psychological distress, women reportedly experience more distress than men do (Ying et al., 2016). Women undergo the most intrusive investigations and treatments, bear the brunt of failed pregnancies with the arrival of unwanted monthly menstrual periods, and anticipate another cycle of the same hormonal preparation, monitoring, and embryo transfer (ET) once their body is ready. Unfortunately, the psychological stress experienced by women during treatment may in itself negatively affect treatment outcomes (Matthisen et al., 2011; Purewal et al., 2017, 2018), although the exact mechanisms are not known (Homan et al., 2007).

Other meta-analytic research and a critical review provide further evidence that psychological support or psychological treatment during ART (i.e., tailored to remove or reduce the psychological distress) may improve treatment outcomes (Frederiksen et al., 2017; Hämmerli et al., 2009). However, this is seldom offered routinely as part of the treatment process (Payne et al., 2017), particularly in the longer term when third-party treatment is used (Crawshaw et al., 2016). Women undergoing fertility treatment whether successfully (Toscano & Montgomery, 2009) or unsuccessfully (Gameiro & Finnigan, 2017) are known to report psychological distress, and their support needs are well known (Boivin et al., 2005). However, those who never succeed in becoming parents and relinquish their parenthood goals have continuing psychological needs (Gameiro & Finnigan, 2017) which tend to be ignored in research.

LGBT and Solo Family Building

Psychological distress and lack of additional psychological support are also issues that affect most fertile couples in same-sex relationships and solo individuals attempting to build a family. Research on same-sex, bisexual, solo, and transgender family building is increasing, posing additional complexities, although some of the third-party interventions and genetic link options also apply to heterosexual couples who cannot use their own gametes or uterus. Research on heterosexual couples has largely focused on the psychosocial welfare of the

parents, whereas research on LGB individuals tends to be focused on child welfare and parent-child interactions. Reports of Lesbian families using sperm donation have generally shown good parent/child relationships, good parenting, and good child adjustment (e.g., Golombok et al., 2003). Research on the welfare of gay men and their families created with surrogate mothers (their preferred route to parenthood; Blake et al., 2017) also shows good psychosocial adjustment in the parents and their surrogate children, and a greater closeness with their families of origin and improved self-esteem (Bergman et al., 2010). Most gay fathers have a relationship with their surrogate, although not with an egg donor, and disclose the conception to their children (Carone et al., 2018).

Research on the specific fertility needs of bisexual individuals and couples has shown that improvements in tailored, or at least non-heteronormative, services are necessary (Yager et al., 2010). Similarly, Ross and Epstein (2006) studied the experiences of lesbian and bisexual women and reported that additional support needs were necessary regarding donor insemination services. Recommendations for improvements in services include providing cues that the service is positive about lesbian and bisexual parenting, that specific infertility support is necessary for lesbian and bisexual couples, that opportunities are created for women to make informed choices about interventions that match their known fertility status, and that accessible services are offered to known sperm donors, including gay men.

Solo parenting is somewhat more complex as here only one parent takes on full responsibility for the chil(ren), which presents those parents with a burden they cannot share; they do not include a father (solo women) or mother (solo men) figure in the new family. Solo men, like women, tend to prefer a child with a genetic link, and often choose surrogacy to achieve this (Carone et al., 2017). According to Golombok et al. (1997), children raised in

fatherless families are no different from those in other families; solo parents experienced greater warmth and interaction and children were more securely attached to their mother, although they did feel less cognitively and physically competent than their peers from families where a father was present compared to heterosexual and same sex two parent families.

Transgender individuals can choose to preserve their fertility prior to hormone therapy to change their gender, and this option ensures that their own gametes (from their original gender) can be used in fertility treatment to build a family, as removing testes or ovaries and hormonal treatment will make it impossible to have genetically related children later on. Counselling transgender individuals when they request body modifications about fertility preservation options is therefore crucially important. Counselling is also important in relation to the unconventional outcomes of fertility preservation and trans gendering, as transgender men and women use their own ova and sperm, respectively, to function as a mother or father according to their gametic contribution, but function socially in reversed parental identities (Murphy, 2012). Research is therefore beginning to show the needs of heterosexual and LGBT individuals and couples for psychological and social support before, during, and following their treatment – regardless of the outcomes, and policies and practices are being developed to implement changes (see, for example, the UK HFEA, 2017).

The Wider Sociocultural Context

AC treatment does not take place in a social vacuum. It affects women and men who are in contact with others around them, including family, friends, the communities in which they live, and their colleagues and employers. Fertility is associated with femininity and masculinity across different cultures world-wide, and not being able to reproduce has been stigmatized (Inhorn, 2003; Hawkey et al, 2018) with appalling consequences in some countries (van den Akker, 2017a). A person's social milieu also dictates ethical concerns. For example, Collins and Chan (2017) reported that women in the US were concerned about treatment if it increased twinning rates (54%) and involved third-party

input (48–51%), although IVF (30%) and partner insemination (14%) were also ethically problematic to some. A number of sociocultural determinants (e.g, being Black) were associated with greater treatment concerns, whereas being Hispanic was associated with concerns about donor eggs, and religiosity predicted concerns about IVF and all third-party AC. Catholics and other Christians had additional concerns regarding IUI. These results suggest that ethical concerns about fertility treatments are prevalent, tend to be specific to the treatment option, and may explain some of the differences in help-seeking behaviors and treatment choices made. In addition to socioculturally determined ethical concerns, media framing is also likely to contribute to a population's attributions of stigma regarding AC options (see, e.g., van den Akker et al., 2016b, 2016c), in addition to limitations in resources to access funding.

The Family Environment

Given that a child with a full genetic link is preferred universally, and this is possible via IVF using own gametes and via gestational surrogacy (Freeman et al, 2014; van den Akker, 2000), it continues to be the desired choice for most couples undergoing fertility treatment (Hendriks et al., 2017). But, as many individuals seeking treatment do not succeed in conceiving a baby genetically related to one or both of them, they then need to make a choice that does not only affect the couple and the child, but also the immediate and extended family, as one half (or neither side) of the family has a continuation of their 'blood line' (i.e., the genetic link). Donors' (or genetic surrogates') extended families too are facing a continuation of their 'blood line' within another family, where parents, grandparents, and siblings have no means of contact with a full or partial genetic child elsewhere. These losses are generally under investigated. For recipient families where this lack of a genetic link represents an issue, secrecy and deception about the child's genetic origins are prevalent. These parents cannot bear the stigma they believe is associated with third- party AC. Deception about origins is also at the expense of the human rights of the child (UNCRC, 1989). Family, friends, and communities tend to find out or reveal the secrets surrounding the child, often with unhappy consequences (Crawshaw, 2017; Frith, 2018).

The Work Environment

A recent large-scale survey of people considering or going through AC in the UK showed that, in addition to absences for clinic appointments, physical and emotional problems resulted in more absences from work (Payne et al., in preparation) than was previously reported in the Netherlands (Bouwman et al., 2008). Taking time off from employment for treatment with no guarantee of success is potentially risky in a number of ways. First, if treatment cycles fail, they may be repeated, increasing the time off work. This in turn leads to the need to disclose to an employer, manager, or colleagues that they are having fertility treatment, which is known to be associated with stigma for both women and men (Inhorn, 2003). Because AC treatment to conceive is such a personal matter, and experiencing failures of treatment compound the already vulnerable position of those undergoing it, having to disclose this (often repeatedly) is intrusive, particularly if the person is single or LGBT and did not intend to share that information at work (van den Akker, 2017b).

An interesting cross-European study showed that 24% of women believed that work interfered with treatment (Domar et al., 2012), whereas in Britain, Payne et al. (submitted) found that women experienced bi-directional conflict or interference between the demands of work and the time and the emotional demands of treatment. This was influenced by the extent to which they shifted their identity and priorities away from career to becoming a mother during treatment, a finding that confirms Walker's (2017) research. Career concerns may therefore be linked to attempts to conform to (gendered) ideal worker norms, although emotional and physical problems (e.g., side effects or complications associated with treatment) are also important and are likely to be relevant to work absenteeism. The stress associated with balancing these worker/potential parent concerns and conflicts may affect treatment outcomes (Matthiesen et al., 2011; Purewal et al., 2017), and, in extreme cases, may lead some prospective parents to give up on their career. Alternatively, the uncertainty associated with the treatment may encourage others to focus more on their career in case of treatment failure.

Conclusion

AC in all its forms presents many psychosocial as well as medical opportunities, challenges, and risks. Clearly AC involves rapid scientific and technological developments, and the future will no doubt continue to show more innovation in the creation and nurturing of embryos. Although the

psychological, familial, social, cultural, and workplace environmental impacts of infertility and treatment success or failure apply to all people, individuals with specific ill health, or with gender or sexual or relationship fluidity, may experience additional issues when attempting to become parents, as they do when they are existing parents moving from one sexual or romantic preference or identity to another. The evidence so far has shown that, with increasing uses of technology and innovation to assist individuals to achieve the goal of parenthood, accurate record keeping, monitoring, and human rights need to be at the forefront of these interventions. Perhaps most important, individuals who opt for AC need to be sure they are cognitively consonant with their behaviors' and allow the resultant children their basic human right to accurate birth and genetic information. The experience of fertility, infertility (or involuntary childlessness), and treatment success and/or failures therefore straddle psychological, behavioral, sociocultural, physical, and medical domains. Each of these domains should therefore be weighted proportionally in research, policy, and practice.

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