Conquering the Biological Clock: Representations of Social Egg Freezing and Meanings of Oocytes in the Assisted Reproduction Industry

by

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Abstract

"Social egg freezing" (SEF) describes the preventative use of oocyte cryopreservation by healthy women to bank their gametes until they are ready to have children. Existing research has tended to focus on the individual experiences of women who freeze their eggs, masking the assisted reproduction industry's influence on the demand for SEF. Through a qualitative content analysis of the websites of Canadian fertility clinic and North American fertility start-up websites offering SEF, this study examines the key ways in which the industry markets SEF through specific narratives and terminology. First, websites reframed SEF as a treatment for age-related fertility decline, blurring boundaries between "medical" and "social" oocyte cryopreservation. Second, they emphasized buying time faced with a risky future, empowerment through autonomy, and the patient as consumer. Last, websites reflected an intensified technological scrutiny of (in)fertility, in which faith in technological progress, oocytes as protagonists, and fertility optimization featured centrally.

List of Abbreviations Used

ART(s): Assisted reproductive technology(ies)

CARTR: Canadian Assisted Reproductive Technologies Register

EF: Egg freezing

IVF: *In vitro* fertilization

SEF: Social egg freezing

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Chapter One: Introduction

Assisted reproductive technologies (ARTs) make up an ever-increasing category of biotechnological interventions that assist people in conceiving. These interventions both increase the visibility and mobility of oocytes and change the way that women relate to them (Franklin, 1997; Waldby, 2019). Arguably, there has been a shift towards not just restoring but optimizing fertility, so that fertility itself becomes a precarious state. More and more people are being brought under the umbrella of what Lauren Jade Martin (2010) has called "anticipated infertility". As a result, there may be a new obligation to proactively measure and manage plans for parenthood through an array of new technologies.

Section I: Social Egg Freezing

Popularly called "egg freezing" (EF), oocyte cryopreservation is a relatively new ART; it allows a person with ovaries (but in practice, mainly women) to "bank" their gametes until later in life, when they are ready to have children with these "younger" oocytes. Initially, oocyte cryopreservation was imagined as a fertility preservation treatment for women with endometriosis or autoimmune disorders, or those undergoing cancer treatment (Argyle et al., 2016). However, this technology has received considerably more attention and controversy around its use by healthy women who are anticipating a decline in their fertility due to age, a "condition" previously considered to be a normal and unavoidable process. These patients are described as freezing eggs for "social", "elective", or "non-medical" reasons.

News media tends to represent SEF as the cure to the social pressure experienced by young working women to balance career advancement with raising children (Campo-Engelstein et al., 2018). Social science research, however, shows the technology is mainly being used by women who would like to become mothers, but have not yet met a suitable partner and potential father (Inhorn, 2020). In 2014, several authorities in reproductive medicine – including the Canadian Fertility and Andrology Society – stated they now considered SEF to be an established, no longer experimental therapy (CFAS, 2014, p. 1). This likely contributed to the increased use of SEF in Canada, with the number of cycles increasing almost seven-fold between 2013 and 2019 – though these cycles still made up only 2.3% of all ART treatment cycles in Canada in 2019 (Meng et al., 2021).

SEF has clearly been a rich source of inspiration for scholars in the social sciences, notably medical and feminist sociologists. Currently, this body of knowledge tends to take an individualized focus on the experiences and motivations of SEF users, seen, for instance, in the extensive interview-based research with women who have frozen their oocytes (including, although not limited to, Baldwin, 2019a; Brown & Patrick, 2018; Carroll & Krølokke, 2018; Myers, 2017; Waldby, 2019). However, this may mask the role of the broader fertility industry, which has attracted considerable private financing and likely has some vested interest in shaping awareness around fertility decline and demand for this technology (Mayes et al., 2017; van de Wiel, 2020).

Section II: Study Goals and Research Questions

The purpose of this study is to explore representations of SEF and meanings of human oocytes for the ART industry. I approach this question through a content analysis (Krippendorff, 2018) of Canadian ART clinics and North American fertility start-up websites. My research project is inspired by my own experience as a volunteer and research assistant at a Canadian ART clinic that had just begun to offer this treatment, where I observed patients and staff having to navigate a journey that was simultaneously intensely monitored, hopeful, and uncertain.

I have several objectives for this study. First, I aim to contribute to a better understanding of how ART clinics' marketing shapes the meaning of SEF and oocytes, which is currently understudied in the literature. While some studies have examined clinic websites in Canada, they mainly assess the availability of SEF (Liu & Greenblatt, 2012) or evaluate the quality of information present and how it matches up with professional recommendations (Shao et al., 2020), rather than analyzing the narratives and themes of these websites. My second goal is to shed light on the role that fertility start-ups, a relatively new phenomenon, are playing in the commercialization and marketing of oocytes and SEF. My third goal is to attend to the effects of language and terminology used in representations of SEF, which is a source of ongoing ambiguity and debate (Stoop et al., 2014). My final objective is to challenge monolithic representations and statements around biomedicine and instead detail the diversity in how clinics represent SEF and oocytes. Based on these objectives, I posed the following research question:

1) How do Canadian fertility clinic and North American fertility start-up websites market egg freezing and oocytes and which key narratives and terminology do they use in this marketing?

Section III: Thesis Structure

In Chapter Two, I begin by reviewing the literature on social egg freezing, focusing on how the social sciences have characterized the demand for assisted reproductive technologies, and on the meanings of oocytes in the case of SEF. The literature on the demand for ARTs/SEF includes authors questioning how local social, cultural, and moral contexts shape ART use; in-depth studies of women's personal experiences freezing oocytes; boundary-work between acceptable and unacceptable technology-assisted motherhood in the media; the biomedicalization of (in)fertility; and how SEF exemplifies a new feminist paradigm influenced by neoliberal ideology and focus on personal choice. The literature on the meanings of oocytes for SEF has conceptualized oocytes' value and role in the bioeconomy; their increasingly rationalization and manipulation by biotechnology; their centrality in the preservation of genetic relatedness; and their symbolism as a promise of reproduction in the future.

In Chapter Three, I detail my methods and methodology for this qualitative content analysis, including details on my sample characteristics, inclusion and exclusion criteria, data collection and data analysis. I include ethical considerations and limitations to the study here. The purpose of the next two chapters is to report and analyze my findings. Chapter Four addresses website narratives on SEF from a few different angles. It examines terminology used to name the procedure, how medical and social EF are

represented, the reasons websites provide for undergoing treatment, and drawbacks to treatment noted on the websites. It explores three main themes presented by websites: that SEF allows women faced with a risky future of age-related fertility decline to "buy time", that SEF empowers women to choose to transcend their biology to become mothers on their own terms, and that SEF can be more than a medical treatment – a personalized, customizable "journey" provided by a compassionate team. In Chapter Five, I explore the meanings of oocytes as imbricated within the technologization of fertility. In this chapter, I show how websites' narrative of technological progress legitimizes SEF. I also analyse the websites' centering of oocytes as the "protagonists" of SEF: how representations of oocytes as limited and precious, and their power to determine the outcome of SEF, grants urgency to SEF marketing.

Finally, I examine SEF and the optimization of fertility through websites' focus on data, testing, and visualization of oocytes. The final chapter summarizes my findings, the significance of the study, and suggests future directions for research. Ultimately, this thesis argues that ART clinics and fertility start-ups draw on apparently progressive ideas – such as female empowerment and the wonder of technological advancement – to compel potential patients to individually optimize their fertility.

Chapter Two: Literature Review

Section I: Characterizing the Demand for SEF

While biotechnological advances tend to induce anxieties by making naturalized bodily boundaries more permeable and uncertain (Brodwin, 2000; Campbell, 2011; Dickenson, 2007; Franklin & Ragoné, 1998; Melhuus, 2012), many ARTs, such as IVF, have become widely used, and generally normalized (Campbell, 2011; Inhorn, 2020). Similarly, the social sciences have studied ARTs for decades, especially anthropologists (see for instance Franklin, 1997; Franklin & Ragoné, 1998), sociologists, and feminist scholars. SEF may be a relatively new case study, but it is a powerful one. In this chapter, I examine how the demand for ARTs and SEF has been conceptualized in the social science literature. The chapter charts how existing literature explains why people are choosing to use ARTs and SEF, and identifies the key strengths and limitations of these explanations.

ARTs in Local Contexts

Public debates around body-technology boundaries, meanings of parenthood, and the responsibilities of parents, lawmakers, and care providers all feature prominently in discussions around ARTs. Studies of ART policy and regulations, law, and media coverage (both mainstream and scientific) characterize the perception and use of ARTs, including SEF, as embedded in local contexts. Many authors are keen to highlight that broadly, demand and use of ARTs depends on local understandings of the family and of motherhood. ARTs are acceptable when they "help" or "imitate" nature – which is particularly the case of IVF – but not when they challenge its sanctity by enabling post-menopausal motherhood, posthumous reproduction, or children with multiple parents

(Bühler, 2015; Campbell, 2011; Franklin, 1997; Franklin & Ragoné, 1998; Melhuus, 2012).

Reproduction can further be key in belonging to and maintaining a cultural, national, and moral identity (Franklin & Ragoné, 1998); ARTs have also represented political tools to build certain types of desired families (Gammeltoft & Wahlberg, 2014). Inhorn (2020) suggests the concept of "repronational histories" (p. 47) to describe how national events and religious sensibilities mould different approaches to ARTs. For instance, research into EF was enabled in some contexts, notably in Italy, because the technology sidesteps moral debates around egg donation and embryo freezing (Martin, 2010; Waldby, 2019). When the state overtly expresses concerns about falling birth rates, and encourages couples to have children, there may be more comprehensive public coverage for ARTs (Bhatia & Campo-Engelstein, 2018; Cattapan, 2014; Scala, 2014). A Canadian example of a "repronational history" can be seen in the province of Quebec, which in the twentieth century saw the emergence of nationalist politics that targeted fertility and the family for intervention, in order to ensure the "survival" of the French-speaking population (Baillargeon, 2002). Quebec also has a history of generous coverage for ARTs with relatively few restrictions to access (Blancquaert et al., 2014). In an interconnected world, ARTs and their users may cross borders, countries and cultures in their quest for a child, creating a transnational ART economy (Campbell, 2011; Inhorn 2020; Melhuus, 2012; Waldby, 2019). For instance, well-off couples may circumvent restrictions in their own country by engaging in "reproductive tourism", travelling to make surrogacy or other arrangements in countries with less stringent regulations (Inhorn, 2020).

SEF for Untangling Timelines

ART use is a highly intimate experience with individuals making difficult choices according to their own life course goals. The literature that focuses on these aspects of ARTs includes qualitative and in-depth studies of women's experiences with assisted reproduction. Many authors suggest that the need to manage entangled reproductive, romantic, professional, and biological timelines, and to "get back on course" with an expected sequence of life events, are key factors in the decision to freeze oocytes (Brown & Patrick, 2018; Baldwin, 2018, 2019a; Myers, 2017; van de Wiel, 2018; Waldby, 2019). Most women who undergo the procedure do so because they find themselves in the distressing and unexpected state of being *partnerless* (Baldwin, 2018, 2019a; Carroll & Krølokke, 2018). Many have yet to find a suitable partner with whom to experience a particular type of heteronormative love story, one that develops organically and ends in a committed marriage and children (Baldwin, 2018, 2019a; Brown & Patrick, 2018; Carroll & Krølokke, 2018). One point that is rarely mentioned is the potential for SEF to idealize a perfect, healthy child as well as a perfect relationship, and the ableism inherent in this.

Many women who freeze oocytes may also believe that men's less urgent reproductive timelines act as a "drag" on their own fertility (Baldwin, 2019a). Frozen oocytes can even become "reproductive capital" to be deployed in the dating market to avoid accusations of being desperate for children and to signal a willingness to accommodate a partner's reproductive timeline (Baldwin, 2019a; Brown & Patrick, 2018). Mainstream media portrayals of SEF may represent the technology as a kind of gender equalizer which will allow women to be as unstressed about their fertility as men

are presumed to be (Bhatia & Campo-Engelstein, 2018; Campo-Engelstein et al., 2018; Rottenberg, 2018).

Authors point out that the demand for ARTs in general exists because motherhood continues to be seen as the natural culmination of being a woman (Baldwin, 2018; Franklin & Ragoné, 1998; Scala et al., 2014). Myers (2017) as well as Baldwin (2019a, 2019b) find that some women pursuing SEF are driven by an intention to engage in intensive mothering, a parenting style that is child-directed, expert-led, and expensive in time and resources (Hays, 1996, cited in Myers, 2017). For women who intended to completely reorient their lives around their future child, the time afforded by EF was essential to explore their own interests (Myers, 2017), or accumulate the right resources for what they considered to be appropriate parenting, such as a secure income and home (Baldwin, 2018, 2019a). Furthermore, the same women often countered the narrative of risky and stigmatized later-life motherhood by emphasizing their ability to mother with more life experiences and resources (Baldwin, 2019a; Myers, 2017).

Overall, the value of detailing individual experiences, in addition to telling women's stories, is to place these experiences within broader patterns and expectations around modern parenting, motherhood and work. By showing these constraints, these detailed accounts effectively challenge the "choice narrative" present in much of marketing for SEF. However, though we would expect there to be variation in the motivations of women who freeze their eggs, studies overwhelmingly focus on women who went ahead with the procedure. Women who decided *not* to freeze their eggs are mentioned in some studies (Baldwin, 2018, 2019a; Carroll and Krølokke, 2018), but their

reasons for doing so are not expanded on. Along the same lines, this literature is less useful for understanding how the stratification of EF plays out. The homogeneous samples of women in this literature are representative of the mostly elite women who use SEF, but there is little data on other groups, notably LGBTQ+ individuals (Inhorn, 2020). As it is, this literature has reached a saturation point.

Anxieties Around New Mother Categories

Several authors have analyzed media representations of SEF, such as in mainstream news (Bhatia & Campo-Engelstein, 2018; Bühler, 2015; Campbell, 2011; Campo-Engelstein et al., 2018; Martin, 2010; Mayes et al., 2017), professional association statements (Bhatia & Campo-Engelstein, 2018; Campo-Engelstein et al., 2018) or blogs (van de Wiel, 2018), showing how boundaries are drawn between acceptable and irresponsible types of SEF-assisted motherhood. The older or postmenopausal mother (Campbell, 2011; Scala, 2014) and her other forms, such as the "grandmother mother" or "radiant forties mother" (Bühler, 2015), are framed by medical riskiness and the disruption of traditional generational lines of care (Bühler, 2015; Campbell, 2011). Martin (2010) saw the figure of the young woman seeking oncofertility care depicted in mainstream news media as delegitimizing the selfish SEF "lifestyle freezer". However, more recent studies show this may no longer be the case – mainstream media seems more sympathetic to women undergoing egg freezing for social reasons (Bhatia & Campo-Engelstein, 2018; Campo-Engelstein et al., 2018). The authors of these studies advance that media is more sympathetic of SEF users because of the recent emergence of a neoliberal, "*Lean In*" feminism that lauds women who are both prioritizing their careers and aspiring towards achieving motherhood.

Choice and Neoliberal Feminisms

As noted above, feminist scholars have made considerable contributions to the social science literature on ARTs (Brodwin, 2000; Franklin & Ragoné 1998; Scala, 2019) and have come to conflicting conclusions on whether these technologies represent choice and empowerment, or exploitation, medicalization, and stratification. Specifically in Canada, women's groups making arguments in favour of ARTs claimed these technologies would empower women by allowing them to exert reproductive autonomy in choosing how and when to mother (Scala, 2019). Today, research shows that marketing tends to represent SEF as an empowering choice to take back control over fertility (Baldwin, 2018, 2019a; 2019b; Bhatia & Campo-Engelstein, 2018; Campo-Engelstein et al., 2018; Mayes et al., 2017; Rottenberg, 2018). The language used – frozen oocytes as "insurance" or a smart "self-investment" – makes it an individual consumerist project (Baldwin, 2019b, Bhatia & Campo-Engelstein, 2018; Myers, 2017).

Authors argue that in North America and Europe, SEF fits into selective feminist scripts that represent progress towards gender equality solely as women having the freedom to make their own choices (Bhatia & Campo-Engelstein, 2018; Rottenberg, 2018). While critiquing this form of "choice feminism" as overly individualistic, Budgeon (2015) describes it as having four tenets:

> […] that individual women, based upon their personal histories, desires, and individual goals, are best situated to judge what is right for them […] that second wave feminism is responsible for women's choices and that the range of different choices available is evidence of feminism's success […] that women today may choose to act in stereotypically traditional ways because they have sufficient autonomy to transcend constraints associated with the deterministic force of those traditions (Kirkpatrick, 2010); and that feminism should offer equal recognition to the paths that different women follow and not hold these decisions up for critical scrutiny. (p. 6).

Alternatively, Rottenberg (2018) proposes that a new "neoliberal feminism" – which idealizes finding balance between a fulfilling, high powered career, and an intimate family life – has seen unprecedented popularity and is key to the current appeal of SEF. Clinics may claim that work-life balance can be achieved by the young women they market to if they take individual responsibility for carefully planning and sequencing their life events (Baldwin, 2019b; Rottenberg, 2018). Bhatia & Campo-Engelstein (2018) likewise describe a corporate, consumerist "Lean In" feminism that allows the fertility industry and companies that provide EF benefits to employees to market themselves as progressive.

The various feminisms discussed here have, of course, been harshly criticized. For a start, they do not question why different women do not have access to the same choices when it comes to reproduction. The self-investment valued in neoliberal feminism is only available to a minority of elite women and is dependant on care work being displaced onto "a large class of women who are rendered expendable, exploitable, and disposable" (Rottenberg, 2018, p. 103). Neoliberal feminism continues to insidiously assert reproduction and motherhood as normative goals for women (Rottenberg, 2018). Overall, this perspective on SEF sees the technology as buttressed by these new, apolitical feminisms that uphold individual-level solutions to achieving motherhood.

The Biomedicalization of (In)fertility

Finally, other authors have analyzed SEF through the lens of the biomedicalization of infertility. Clinical innovation, health as a moral duty, assessing and treating risks, increased dissemination of health knowledge, co-optation of social movements such as feminism and new "customized" identities at are at the heart of

biomedicalization (Clarke et al., 2003). ARTs more broadly are imbricated in a powerful biotechnology industry and a global tissue economy (van de Wiel, 2020; Waldby, 2019) that benefit from the category of "infertile" being expanded to include more and more women, including many who are perfectly healthy, so that infertility becomes "anticipated" (Martin, 2010) or "speculative" (van de Wiel, 2020). The shift from controlling fertility to transforming and optimizing fertility has led to additional burdens to measure and manage plans for parenthood proactively and through a plethora of new technologies (Baldwin, 2019b; Myers, 2017). However, many feminist scholars argue that increasing knowledge around reproduction and more reproductive options only provide more ways that women's bodies can "fail" at being fertile and conceiving, requiring heightened medical surveillance and intervention (Baldwin, 2019b; Franklin and Ragoné, 1998). When the use of younger oocytes aims to reduce the chances of having a baby with a "disability"[1], optimizing reproduction can also come to embody a kind of "selective reproduction" (Gammeltoft & Wahlberg, 2014) – prioritizing the birth of some types of children over others – or "ableist perfectionism" (Kaposy, 2018) – attempting to ensure children will be not only healthy, but as high-achieving as possible.

Section II: Meanings of Oocytes in the Case of SEF

In this section, I analyze how authors have described the changing meanings of oocytes, particularly the meanings of oocytes in the case of SEF. Oocytes today are

[1] "Disability" is a mainstream term, however, it is important to note that it is a subjective and contested label, and some (disability rights activists, disability scholars) may consider it to be ableist.

increasingly visible in multiple senses of the word, as cells that are both deeply personal – as signifiers of genetic relatedness or future reproduction – and increasingly depersonalized and commodified.

Oocytes in the Bioeconomy

The meanings of oocytes are linked to a broader "bioeconomy", defined by the *Organization for Economic Cooperation and Development* (OECD) as "the aggregate set of economic operations in a society that use the latent value incumbent in biological products and processes to capture new growth and welfare benefits for citizens and nations" (as cited in Birch & Tyfield, 2012, p. 300). Scholars focusing on the overarching commercial, financial, or political aspects of SEF argue that these powerful interests are often left out in studies that have a more individualized focus on individual autonomy and informed consent, the experiences of SEF users, or on patient-physician dynamics (Mayes et al., 2017; Scala, 2019; van de Wiel, 2020). For example, US egg freezing start-ups have become governed by a speculative, future-oriented economic model that has seen start-ups attract considerable private investment, and which as a result prioritizes the generation of profits for financers and shareholders (Mayes et al., 2017; van de Wiel, 2020).

Other authors have made efforts to qualify the "value" of oocytes within the tissue economy. One perspective on this is that oocytes, like other commodities, gain value from the "labour" that goes into their production. Birch and Tyfield (2012) refine the bioeconomy concept to include how the consumption of goods itself and the mobilization of emotional and relational resources makes the consumer or user into an unwaged

labourer. This is relevant to SEF, which often depends on emotional investment: many women come to see their eggs as finite and precious through the process of banking eggs in SEF (Waldby, 2019) or retrieving eggs for in-vitro fertilization (IVF) (Franklin, 1997). Waldby (2019) uses the concept of "singularity value" (p.146) to express how some goods – in this case, oocytes – have a unique personal meaning that is impossible to quantify in terms of exchange or monetary value.

Feminist scholars have also suggested that with the advent of ARTs, women's cells and tissues are being commodified and women themselves are being alienated from their own reproductive labour (Dickenson, 2007; Taylor, 2000; Waldby, 2019). The production of oocytes, for example, demands time and discomfort, from the side effects of high doses of hormones required and egg retrieval surgery to the time off needed to attend consultations. While this investment might contribute to the preciousness of oocytes for the women who freeze for themselves (Baldwin, 2018a; Campo-Engelstein et al., 2018; Dickenson, 2007; Waldby, 2019), it might also constitute a form of invisible labour when women produce oocytes for research or for egg banks used by infertile couples. In countries where oocyte donation is compensated, this dangerous work may risk exploiting poor women (Dickenson, 2007; Kaposy, 2018), while elsewhere it may be framed as gift-giving or self-sacrifice in a way that does not recognize the labor involved. (Dickenson, 2007; Waldby, 2019). Similarly, in the case of SEF, Campo-Engelstein et al. (2018) found that US news media often characterized the side effects of SEF as a challenge that only the strongest and most selfless women could face down. They and others (Dickenson, 2007; Martin, 2010) ultimately argue this is reflective of expectations that mothers will be altruistic and self-sacrificing.

Overall, various authors explain why oocytes have gained new value in the assisted reproduction industry. Oocytes have disparate meanings: they may be precious for the women who pay to store them yet are commodified and separated from the women who donate them.

Biotechnological Meanings

Biotechnological advances for visualizing and manipulating oocytes have also influenced the meanings of oocytes. For example, Bühler (2015), Laqueur (2000), and Waldby (2019) all contrast the role of oocytes in reproduction today with a traditional genealogical model in which the female contribution was passive, if not invisible, wherein motherhood was defined more by gestation and birth. A gendered account of gametes persisted even as genealogy was geneticized (Bühler, 2015): the twentieth century's embrace of molecular biology and genetics in the study of reproduction privileged the heroic journey of the sperm and its contribution of nuclear DNA (Franklin, 1997; Waldby, 2019). Today, in contrast, there is significant biotechnological interest in monitoring, qualifying, and manipulating female gametes:

> [Oocytes] can be externalized, circulated, banked, transacted, and donated. Unlike most biological elements of female fertility – uterine, fallopian, cervical, which remain securely in vivo – oocytes have developed an ex vivo social life, and their significance for women mutates through these varied social locations. (Waldby, 2019, p. 7).

Here, Bühler (2015), Laqueur (2000), and Waldby (2019) contend that female gametes are being "turned into" male gametes, as oocytes become more mobile, detachable from individual bodies, "out in the open", anonymous, and removed from the ticking of the biological clock.

But biotechnological advocates and practitioners also imbue eggs with "hope", "an image that powerfully unites traditional family values with faith in the power of science, technology and medicine to improve the human condition" (Franklin, 1997, p. 326). Hope is indeed key in the process of assisted reproduction when evidence is limited or confusing, success rates are low, and failures pile up (Franklin, 1997; Mayes et al., 2017). Having more ways to monitor and visualize oocytes, such as through smartphone fertility apps and ovarian reserve testing (Baldwin, 2019b) or frozen or fertilized ova photography, allows women them to observe and feel how close they are to achieving a pregnancy (Franklin, 1997; van de Wiel, 2018). Mayes et al. (2017) contend that hope around oocytes is not an individual, psychological phenomenon, but rather a social and political force that can mask commercial interests at play in SEF.

The Promise of Preserving Genetic Reproduction

For bioeconomies, reproductive biotechnology industries, and women who freeze oocytes alike, the meanings of oocytes are also linked to preserving the possibility of having a genetic child in the future. The oocyte comes to symbolize a biological link between mother and child. Waldby (2019) remarks that "all tissue economies [are], necessarily, personified systems. *Ex vivo* tissues are synecdochal. They stand for the body in which they arise, and they are indelibly marked with the biology and biography of their donor [or owner]" (p. 192). The process of undergoing fertility treatment may give women a sense of the preciousness of their oocytes as a main barrier or contributor to their success in conceiving (Bühler, 2015; Carroll & Kroløkke, 2018; Franklin, 1997; Waldby, 2019). However, in what van de Wiel (2018) refers to as the "necropolitics of conception" (p. 13), the value of these frozen oocytes depends on a looming sense of

mortality and finitude of the female body and its fertility. Perhaps because of the factors observed by these authors, many women find it difficult to dissociate themselves from their eggs: either they find they cannot bring themselves to provide oocytes to other women (Ragoné, 1998; Waldby, 2019), or those who do can become concerned with the suitability of the receiving parents and the household they might provide for the future child (Waldby, 2019).

The importance of genetic preservation becomes especially apparent when comparing SEF to other "sources" of oocytes for conception, such as using eggs from a known or unknown donor, or reception of oocytes from partner (ROPA) – a kind of oocyte "sharing" in which the oocyte from one female partner is "donated" to the other, who carries the pregnancy (Machin, 2014). Other authors suggest that the new mobility of oocytes – as they are transferred between different women, locales and even generations – may challenge what is upheld as a natural "unity" of conception, pregnancy and birth happening within a single woman's body (Bühler, 2015; Melhuus, 2012). In other words, by introducing more than one potential mother into the equation through the involvement of surrogates or oocyte donors, some ARTs may threaten "a loss of maternal claim" (Waldby, 2019, p. 117). For example, women using donor oocytes may experience grief or shame, and they may fear their child lacking identification and belonging (Waldby, 2019). In Machin's (2014) study, many lesbian couples opted for ROPA out of concern there would otherwise be an unequal biological relationship to the child, and therefore an unequal "division" of motherhood. In contrast, the freezing of one's own oocytes avoids all the above concerns by "[providing] the perfectly matched

egg donor: oneself" (Martin, 2010, p. 533) – preserving both genetic relatedness and maternal claim.

Women's socially constructed reproductive role is not limited to bearing children: reproduction also means reproducing community, and cultural values and traditions (Gustafson & Porter, 2014). Therefore, the meaning of frozen oocytes is also that they represent "generational time" (Waldby, 2019): they connect women deep into the past with the generations before them and project them far into the future in a virtuous commitment to their still-unborn future children. This reflects norms in which women and mothers are expected to be altruistic and self-sacrificing, responsible, and virtuous – norms shared by both the media (Bhatia & Campo-Engelstein, 2018; Campo-Engelstein et al., 2018; Martin, 2010) and EF users themselves (Baldwin, 2018, 2019a; Myers, 2017). Overall, many women who freeze their oocytes may believe they are giving themselves a better chance of achieving a motherhood that will leave no doubt as to the genetic and generational kinship between mother and child.

Section III: Literature Review Conclusions and Gaps

It is still the case, as when Franklin and Ragoné were writing in 1998, that "the transgressive potential of new techniques is offset by their incorporation of established idioms" (p. 9). In other words, biotechnologies do not bring about social change by themselves. Frozen oocytes instead seem to reify a biological, genetic, and self-sacrificing motherhood. Demand for SEF appears to be driven by a sense of urgency around avoiding an undesired partnerless, childless state. Motherhood remains a mandatory or desired life course stage for most women, and genetic relatedness, ability, and having one mother for one child remain social values. At the same time, assisted

reproductive biotechnologies are having an undeniable impact on the meanings associated with both oocytes and motherhood, with the former being transformed into "protagonists" that represent the key to success or failure of conception.

However, the literature leaves the role of the ART industry in shaping these meanings mostly in shadows. My study proposes to shed some light on the work that the industry does to delineate what assisted reproductive technologies mean, who should (and should not) access them, and why. Based on the literature review, I expect to find that in order to market egg freezing, fertility clinics and start-ups focus on the emotive meanings of oocytes and on individual choice and empowerment in reproductive decisions.

Chapter Three: Methodology and Methods

Section I: Content Analysis

Qualitative content analysis is an exploratory, inferential, and empirically grounded method (Krippendorff, 2018) for systematically analyzing social life through the close reading and coding of texts (Bernard, 2018; Hsieh & Shannon, 2005; Krippendorff, 2018). Beyond merely describing the content, this methodology is ideal for studying how topics are discussed and framed. Krippendorff (2018) argues that researchers should pay attention to who creates texts and the complex contexts in which they will be read. As Bühler (2015) puts it, examining public discourses on assisted reproductive technologies gets at the "utopian and dystopian imaginary futures related to motherhood" (p. 83); I assumed here that content on egg freezing and oocytes on clinic and start-up websites would say something about the broader fertility industry or about public discourses on fertility, reproduction, empowerment, and choice.

Moreover, engaging with the role of computer systems and online networks in creating, modifying, and disseminating huge volumes of digital texts is increasingly important for contemporary content analysis (Krippendorff, 2018). Websites and online content are important sources of information for patients considering SEF (Gürtin & Tiemann, 2021; Liu & Greenblatt, 2012; Shao et al., 2020). Additionally, fertility start-ups in the US have notably pushed to mainstream this preventative fertility preservation through intense social and digital media marketing (van de Wiel, 2020). However, research focused on clinics offering SEF has by and large focused on the quality or accuracy of online information, rather than its main themes or discourses. Examining the messages and positions of reproductive medicine is key, as its practitioners are the

gatekeepers who provide information about SEF and who intervene in assisting motherhood (Bühler, 2015)

I conducted a qualitative content analysis of both text and images found on websites, using the existing substantive literature on SEF to identify keywords to target the analysis. My aim was to examine latent meanings of website content rather than seeing these websites purely as purveyors of manifest information to potential clients. As Krippendorff (2019) warns, the meaning of a text will depend on the reader, but content analysis tends to reinterpret texts into critical narratives familiar to the scholarly community of the analyst. My own project was guided by a constructionist approach in the tradition of science and technology studies that understands the uses and meanings of technologies as embedded in social contexts (Pinch & Bijker, 1987).

Section II: Sample characteristics

This study was based on a text corpus of thirty websites: twenty-six Canadian stand-alone ART clinics or clinic networks and four boutique fertility start-ups. Of the ART clinics, 19 had English-only websites, seven had English/French bilingual websites, and none were French-only. Canada was chosen due to my interest in studying ARTs in my home country and my own volunteer experience at a Canadian fertility clinic. In addition, much of the existing literature on SEF seems to focus on the US, the UK, and Europe. I started by identifying all ART clinics in Canada through a straightforward Google search for “Canadian fertility clinics”. This process was easier for some provinces, such as Nova Scotia, that have only one or two clinics, and more difficult in others, such as Ontario and Quebec, which have many more. However, because

healthcare in Ontario and Quebec covers some costs for people using ARTs, I was able to draw on online clinic lists (Gouvernement du Québec, 2021; Government of Ontario, 2021). In addition to the ART clinics, the study included four fertility start-ups: *Kindbody*, *Prelude Fertility*, and *OVA Egg Freezing*, three clinic networks based in the US, and *Lilia*, an "egg freezing concierge" which is based in Toronto but also serves US clients.

Section III: Sample Inclusion/Exclusion Criteria

The sample includes far fewer ART clinics then there are in Canada due to several inclusion and exclusion criteria. To be included in my sample, the clinic had to have a functioning website, had to offer SEF (not only medical egg freezing), and had to contain content on SEF. For instance, websites who listed the service under their fees list but did not provide any information on SEF were excluded, as this did not meet my goal of exploring narratives and representations. Many clinics are part of a network, containing several locations under the same banner. For example, if a clinic network contained five locations, only one website needed to be analyzed, not five. This sample also excluded assisted reproduction departments in hospitals. The rationale for this was that standalone ART clinics may have more cause to market SEF.

I also analysed the for-profit "boutique" fertility start-up landscape through purposive sampling (Bernard, 2018). I chose start-ups that, qualitatively, seemed to appear most often in Google searches and in online media coverage. My rationale for including these fully privatized and for-profit start-ups was that they might represent a more overt or extreme form of SEF marketing. Other than in an article by van de Wiel

(2020), and a brief mention in Harwood (2017), boutique egg freezing clinics seem to be understudied in the literature.

As previously mentioned, local contexts matter in representations of ARTs and I attempted to compare website narratives of Quebec clinics versus other Canadian clinics. I thought this comparison would be timely, as Quebec tabled a bill in November 2020 to re-instate coverage for in vitro fertilization (CBC News, 2020), and I was interested in knowing whether this pro-family narrative would present somehow in Quebec ART clinics. However, I could not discern any differences between websites from Quebec and those in the rest of Canada, and so decided not to pursue this in my analysis.

Section IV: Data Collection and Analysis

Data collection and analysis took place in May 2021. Web pages on social egg freezing made up the units of analysis (Bernard, 2018) for this study. Based on the terminology used in items from the literature review, keywords for finding content on the websites included combinations of "egg freezing" and "oocyte cryopreservation", with the qualifiers "elective", "social", or "non-medical", as well as "fertility preservation", or other terms and euphemisms I saw being used by clinics. In the end, the content analyzed included informational materials, and also blog posts on SEF, although only if they were written by the clinic and not by outside media or previous patients. The decision to include blog posts came out of the data collection phase upon realizing that these also contained information for prospective patients. Blog posts were often written to be approachable and had rhetoric or narrative "punch", making bolder statements. I also coded images and figures used on clinic and start-up websites. 28 of the 30 websites

included at least one image of some kind and there were 98 images in total. These ranged from color photographs to infographics, pictograms, or diagrams.

I undertook a close reading of websites' text and images and coded the data using *NVivo 12 Pro*. I employed an approach that was neither fully deductive nor fully inductive. While some initial codes came from the reviewed literature, many more emerged inductively during the close reading of the websites. I looked for how websites represent who SEF is for, reasons or contraindications for freezing oocytes, what women freezing oocytes can expect, and how oocytes are qualified or valued. I also noted the different terminology used by each clinic or start-up to refer to social egg freezing. Codes were revisited, renamed, and re-hierarchized based on my evolving understanding of the data. The full list of codes and themes and their descriptions can be found in Appendix A, and the number of websites containing each code can be found in Appendix B. For a list of the webpages coded, consult Appendices C (clinics) and D (start-ups).

Section V: Ethical Considerations

This study did not require ethics approval as it did not involve human participants. All content analyzed on the clinic websites was publicly available: the websites are accessible through an Internet connection and common search engines without creation of an account.

Section VI: Limitations

Although I made every effort to be mindful of any pre-conceived notions with which I might have approached the data, I was the only person to code the websites and my findings are the product of my own interpretation of my findings. Therefore, there is a

lack of intercoder reliability. It is impossible to discern clinics' motivations for presenting the content they do purely on this analysis. In addition, this study cannot provide any insight into the experiences, motivations, or opinions of SEF users themselves, nor can it measure the effect of the websites on potential clients. There is also the potential for online materials to be frequently edited or re-written; my study is not a definitive one and can only represent a snapshot of the online landscape of the assisted reproduction industry in May 2021.

One danger to this type of study based on the analysis of texts is textual determinism (Franklin & Ragoné, 1998), or the idea that representations of a reproductive technology found in certain texts provide insight into reality. For instance, many authors from my literature review seem to observe a plethora of media coverage of SEF and assume that the technology has been "mainstreamed", with less discussion of how SEF is still only accessible to elite women. SEF is a fascinating area of study for sociologists and represents an imaginarium of our fears and hopes around reproduction, but it is important to not overstate the uptake of this technology. As previously mentioned, elective oocyte cryopreservation only made up 2.3% of all egg retrieval cycles in Canada in 2019; far more oocytes were "fresh" ones destined for IVF (Meng et al., 2021). Finally, I wish to be clear that the focus of this project is not to conduct a review or evaluation of the accuracy of information presented on clinic and start-up websites. This is better addressed by other studies, such as the one conducted by Shao et al. (2020). I am more interested in *how* websites choose to frame this information and what effects these framings might have.

Chapter Four: Representations of SEF

This chapter focuses on how Canadian ART clinics and selected North American fertility start-ups make use of certain narratives to market the technology to potential patients. In the first section, I explore the various terminologies deployed by clinics and start-ups to refer to SEF. In the second section, I report my observations of the distinctions made between social egg freezing and medical egg freezing on the websites. I also describe the reasons for undergoing treatment, and its drawbacks, noted on the websites. My goal here is to complement previous sociological research, which has explored these topics from the lenses of news media or women's personal experiences.

In the third section, I analyze three key ways in which clinics and start-ups frame SEF technology. I find that websites suggest that SEF is a way to buy, freeze, or otherwise manipulate biology and time to avoid an unpredictable and risky future of age-related fertility decline. The websites also equate reproductive autonomy with medical informed choice by representing SEF as an empowering way to take control over fertility. Finally, clinics and start-ups represent the patient as a consumer by marketing their services as compassionate, personalized treatment.

Section I: Terminology Use

Anecdotally, I have observed that the social science literature on oocyte cryopreservation tends to prefer the term "social egg freezing" to describe use of oocyte cryopreservation for non-medical reasons. But there is no universally accepted term, which leads to use of many different terms to refer to SEF (Stoop et al., 2014). My own data reflected this, containing multiple different phrasings across the twenty-six websites

analyzed (nine phrases in French, fourteen in English – see Appendix A for the full list). In addition, it was common for websites to use more than one term, or to use several interchangeably. Considering this, it is surprising that research that on "social egg freezing" does not more often examine the question of terminology. In this project, it was clear that language shaped representations of SEF, which prompts me to also clarify my own terminology.

According to Stoop et al. (2014), "social egg freezing" is the best-known way to refer to the procedure of cryopreserving oocytes for reasons other than medical conditions. As these authors highlight, the use of "social" to describe a treatment is unusual and rarely used. Treatments qualified as "social" are generally undertaken based purely on the desire of the patient. As a result, some criticize the use of the term "social egg freezing" because it may suggest that the decision to freeze oocytes is a frivolous personal choice (Baldwin, 2019a; Bühler, 2015; Stoop et al., 2014). This can be hurtful to many SEF users, who feel that deciding to freeze oocytes was not a free choice, but one made due to unexpected and undesired constraints in their lives, such as their age or not having a partner (Baldwin, 2019a). The term "social egg freezing" reinforces a distinction between these women and women who freeze oocytes for "medical" reasons.

Carroll and Kroløkke (2018) state they use "freezing" because it is the "common parlance" (p. 1003) used in media and on clinic websites. Baldwin (2019a) states that she still prefers this term in the spirit of revealing the social construction of SEF and how complex social, cultural, ethical, and even political considerations factor into SEF use. Alternatively, Gürtip and Tiemann (2021) used "elective egg freezing" for their content analysis of UK clinic websites, seeing it as "the most value-neutral, representative and

comprehensive terminology" (p. 57) – though this is, in my opinion, debatable. In my data, six clinics did use "elective" to distinguish SEF from medical EF, including "elective egg freezing" (three clinics), "elective egg banking" (one clinic), "elective fertility preservation" (one clinic), and *préservation élective de la fertilité* (1 clinic).

For this project, I choose to use SEF because, as contended by some of the authors noted in the above section, it is popular in the lay imaginary (news articles, common usage) and conjures what are for me more interesting and rich connotations than the clinical "oocyte cryopreservation". The use of "SEF" also signals how this technology is seen as a solution to social ills, and how it is used by women who have had constraints placed on their family plans by their *social* situation.

Of the thirty websites I analyzed, however, only seven used "social egg freezing" (and one used the French equivalent, *congélation d'ovules pour des raisons sociales*). Instead, nearly every clinic and start-up preferred to simply use "egg freezing" (26 websites). Stoop et al. (2014) argue that so-called "social" and "medical" reasons are not totally distinct from one another, as the purpose of SEF is, ultimately, to avoid a decline in fertility due to ovarian aging – a medical phenomenon. The websites in my project provided plenty of personal and social reasons for freezing oocytes, but they also spend a great deal of space discussing age-related fertility decline and encouraging women to avoid it. This departure from the term "social egg freezing" reframes the technology to fully legitimize it as a medical preventative treatment.

In fact, "egg freezing" was often the title of webpages that combined information about medical oocyte cryopreservation and cryopreservation for other, social reasons. Sometimes there was a clear distinction between medical and social EF, when these were

located in different subsections of the page. At other times, these two categories appeared right alongside each other, sometimes in the same list of bullet points for "reasons" to freeze oocytes. This made social EF seem equally legitimate to medical EF. I also did not find any instances of "non-medical egg freezing", reinforcing the idea that clinics and start-ups represent EF as having a medical justification, even if undertaken for social reasons as well. The same reframing of SEF is evident in a patient information brochure by *Atlantic Assisted Reproductive Therapies* (n.d.), which states that their clinic "offers egg freezing for age-related fertility decline (often referred to as 'social egg freezing')" (p. 2). This clinic acknowledges the existence of "social egg freezing" as a recognizable lay or popular term, but signals that the medical phrasing is preferred.

Similarly, clinics and start-ups referred to the specific scientific name for the procedure rather than the lay one, perhaps to convey clinical and technological expertise. These terms included "oocyte/egg cryopreservation" (9) and "egg vitrification" (3). Sometimes these were immediately followed by a lay "translation", such as on the Pacific Centre for Reproductive Medicine's page: "vitrification (a.k.a. flash freezing) provides the ability to freeze eggs and embryos with a much higher degree of success than the 'slow freezing' method used in the past" (n.d., "FAQ", "What is Vitrification?" section). In terms of naming female gametes, a word frequency query of the data returned 1438 uses of "eggs" and similar words ("egg", "egg's", "eggs'") compared to only 60 uses of "oocyte" or "oocytes". The preference for the lay term "egg" over its scientific equivalent, "oocyte", could be to make the procedure seem more accessible or human, rather than clinical, or because "egg" is simply more recognizable to the average reader.

"Fertility preservation" was the second most-popular term, used by 16 websites. This was often the heading for pages that included information about sperm and embryo freezing alongside egg freezing. This phrasing emphasizes the banking not just of cells but of the potential to preserve the ability to have a family for the future. It conveys the possibility, as I will explore later in the thesis, of freezing the biological clock and buying time. As Martin (2010) puts it, SEF as a technology for "preserving fertility" is really a euphemism for preserving genetic relatedness.

Section II: Clinics and Start-Ups' Information on EF

SEF Versus Medical EF

The distinction between "social" EF and "medical" EF has been a topic of evolving discussion in previous research. In their analyses of news media, Martin (2010), Bühler (2015), Bhatia and Campo-Engelstein (2018), and Campo-Engelstein et al. (2018) all noted the effects of the juxtaposition of two figures: that of the young cancer patient seeking medical EF, and that of the healthy woman seeking SEF. Even though my project focuses on SEF, I excluded clinics that only offered medical egg freezing, and did not set out to analyze any webpages that pertained to this treatment, seventeen websites still mentioned it directly alongside elective egg freezing. It is easy to see how narratives around SEF might include comparisons to medical egg freezing, to legitimize SEF as tried-and-true, or delegitimize it as selfish. Therefore, this became an important theme in the study.

The most cited reason for medical egg freezing by far (mentioned by 14 websites) was cancer or needing to undergo treatments that could be gonadotoxic, that is, harmful

to the sexual organs. That cancer was so prevalent in my data is not surprising, as other authors have shown that the young cancer patient served to justify EF technology initially (Bhatia & Campo-Engelstein, 2018). Martin (2010) identified that news media painted young cancer patients accessing EF as sympathetic and tragic, while healthy women freezing their eggs were either naïve and being exploited (EF was still an experimental technology at the time Martin was writing), or selfish for choosing career over motherhood. Other media represented social freezers as empowered for taking control of their fertility, but this was the least prevalent narrative. For Martin (2010), mainstream media clearly represented the use of EF in healthy women as illegitimate, and SEF users as less worthy candidates for EF than cancer patients. Norwenn Bühler (2015) similarly found, in her interviews with clinicians, that many supported use of EF for those with medical needs, but were resistant to the idea of a medical technology being used as a cure to the "social problem" of women having children later in life.

In the websites I analyzed, clinics often expressed that they would fast-track or reduce the cost of egg freezing for patients with medical conditions, giving a sense that fertility preservation was more urgent for these women than for elective freezers. However, other than this, my data did not really indicate that clinics consider "social freezers" less legitimate than "medical freezers". As previously mentioned, this effectively framed SEF as a preventative medical treatment for age-related fertility decline. These findings also fit with a shift that seems to have occurred in representations of SEF users in the short period of time between Martin and Bühler's studies and the 2018 articles. By the time Bhatia and Campo-Engelstein (2018) carried out their analysis

(of articles published between 2012 and 2015), healthy women were now seen as seeking out work-life balance and as empowered and autonomous, rather than selfish.

Other reasons provided on the websites for medical egg freezing were a lack of sperm from a partner during egg retrieval for an IVF treatment (five websites), polycystic ovary syndrome, early menopause, endometriosis, or genetic mutations that might lead to fertility-affecting conditions. There were also other reasons that could perhaps be seen as problematically medicalized, such as being transgender or gender non-conforming and undergoing gender-affirming treatment (six websites), or "lifestyle" factors (three websites) such as alcohol and tobacco use or lack of exercise/being overweight. Marcia Inhorn (2020) pointed out that while egg freezing has the potential to be "truly revolutionary" (p. 53) for transgender men, there is little social science literature on any use of EF in non-cisgender patients. My data shows that at least some clinics are at least including information about EF for this population, although the quality and safety of these clinics and the services they provide cannot be gleaned from this project.

Reasons for Using SEF, and Treatment Drawbacks

There was considerable diversity in the non-medical reasons cited for considering SEF. To be clear, by reasons, I mean more straightforward fertility-related goals or challenges that were listed in quick succession or bullet points on websites; I do not mean more vague concepts such as "being ready", which I will discuss later in the thesis. I coded thirteen of the former reasons for this project, although some reasons only appeared on one or two sites. Reasons related to a patient's career or workplace were frequently mentioned. 15 websites included career advancement or being focused on career, 10 mentioned completing or furthering education, four included occupational

conditions or hazards that might endanger the ability to have children (for instance being an athlete, a factory worker, or being in the military), and two mentioned tight finances. Being busy accumulating life experiences, such as travelling, were mentioned by two sites. That SEF is for ambitious young working women has been a significant theme in the media (Campo-Engelstein et al., 2018). I found that this was also implied in the information provided by clinics and start-ups, despite career advancement not being a common reason for SEF in the literature, as noted in Chapter Two.

Lack of, or still looking for, the right partner was also mentioned by 15 websites. The literature has established that lacking the right partner and potential father is the most common reason for pursuing SEF, yet this is not always mentioned in media or SEF marketing (Inhorn, 2020). However, the clinics and start-ups in my project appear to have picked up on this information. The idea of waiting for a (suitable) partner was reinforced by websites' inclusion of photographs of happy heterosexual couples. This narrative reflects other findings that have represented SEF use as motivated by an "anticipated coupledom" (Carroll & Krølokke, 2018, p. 999), a committed, idealized heterosexual relationship, which develops organically and not out of desperation, and ends in marriage and genetic children (Baldwin, 2018, 2019a; Brown & Patrick, 2018; Carroll & Krølokke, 2018).

While not frequently mentioned, other couple-focused reasons included SEF being a good option for flexibility for couples wanting additional children (two), or people in a new marriage wanting to ensure they could get their "fresh start" (OVA Egg Freezing, n.d., Thinking Outside of the Stereotypes). In contrast, freezing oocytes to enable less-traditional forms of kinship were barely mentioned: only one site mentioned

that freezing oocytes could be done to become a single mother, and one mentioned freezing to donate to a loved one. Finally, four sites described SEF as a good alternative for those with moral or religious objections to freezing embryos.

Overall, clinic and start-up websites suggested some reasons for SEF, such as workplace risks, education, gender transition, a new marriage, moral or religious beliefs, and travel, that have not featured prominently in previous research that has interviewed women who froze their oocytes. Compared to ART clinics, fertility start-ups did tend to provide many more potential reasons for undergoing SEF, giving the impression that egg freezing was potentially suitable for nearly all women. For example, OVA Egg Freezing (n.d.), under the heading "There is a reason for every woman" in their "About" section, stating: "There are plenty of reasons to freeze your eggs, the biggest question is, why wouldn't you? … the reasons to preserve your options with OVA are endless". For-profit start-ups have a vested interest in broadening their consumer audience to increase revenue. However, the idea that all women could and should freeze oocytes is incongruous with how SEF is unavailable to most women due to cost barriers.

The studies that have analyzed online information on SEF have tended to conclude that clinic websites are not providing information consistent with guidelines from professional associations such as the Human Fertilisation and Embryology Authority (Gürtin & Tiemann, 2021) or the Canadian Fertility and Andrology Society and the Society of Obstetricians and Gynaecologists of Canada (Shao et al., 2020). However, even though the websites in my sample serve to market SEF, many (to their credit) also note the disadvantages of SEF. The most common warning from clinics and start-ups, included in 18 websites, was that there are "no guarantees" provided by this

still relatively new technology. Pages stated there was not enough long-term evidence around the number of oocytes that could be vitrified, oocyte survival rates, or live birth rates from frozen oocytes. Websites also acknowledged that outcomes from SEF could vary for each individual woman. Six sites also included discussions of the side effects of SEF on health, such as mood swings and bloating from hormone injections during the ovarian stimulation phase, or pain after egg retrieval. Six mentioned "risks" of the procedure; this term was used quite broadly and could include major medical risks such as ovarian hyperstimulation syndrome, but also emotional risks such as stress, the time and the financial commitments needed for the procedure, and the risk of not using the oocytes in the end.

In any case, the risks of delaying childbearing were discussed more consistently than the risks of SEF. Twenty-four websites mentioned age-related fertility decline and its consequences, while eight enumerated the risks of advanced maternal age. Clinics presented age as the greatest factor in a patient's chance of success with SEF; they claimed that failure of frozen eggs to result in a pregnancy was determined by the woman's age, how many oocytes could be produced and retrieved, and the quality of these oocytes. This rather lopsided discussion of risks had the effect of recentering the patient as responsible for her own success or failure. While clinics attributed SEF success to the technology or even to their own expertise and experience, the implication was that failure could be attributed to the woman and/or her oocytes. Sometimes, the idea that there were "no guarantees" from the technology was present on the same page or even in the same paragraph as statements about the clinic's expertise and the safety of the technology. This contradicted somewhat the acknowledged downsides of SEF.

Section III: Key SEF Narratives

Buying Time Faced with a Risky Future

The first key narrative I found in ART clinics and fertility start-ups had two parts. First, the website would establish a "risky future" of declining fertility and unpredictable life events that could jeopardize plans to start a family. As previously mentioned, twenty-four websites out of thirty (80%) included content on female fertility decline. Most of these also discussed advanced maternal age as more risky, including greater chances of infertility, miscarriage or birth defects. Five websites further suggested that unpredictable or sudden life events could stand in the way of having a family, such as a person discovering they have infertility. Only two websites stated explicitly that it was the potential for having *biological* children that could be jeopardized by delaying childbearing; however, the focus on women's reproductive tissues and cells becoming less "effective" with time arguably conveys the same message indirectly.

Aggravating this risky future, clinics asserted, was that many women are uninformed about fertility decline. Prelude Fertility (n.d.) warns, "the vast majority of women aren't aware of their fertility fitness until it's too late, and by then, options are limited" ("Age Matters – The truth about your fertility", para. 2). Similarly, a blog post penned by a physician on *OriginElle*'s website reads: "It's also time for [women] to understand fully the risks of postponing motherhood before egg freezing becomes their last viable alternative" (Tan, 2015, "Freezing Your Future Fertility"). This positioned women as not taking their fertility seriously, and clinics and start-ups as the experts who could educate patients. Unsurprisingly, EF start-ups in the US have identified lack of awareness about fertility as a barrier to people using their services, and as a result, they

have prioritized a marketing push to bring fertility preservation into the mainstream (van de Wiel, 2020).

While clinics and start-ups often represented the future as the individual's responsibility, six websites did acknowledge delayed childbearing as a broader social or demographic phenomenon. Of these, four referenced provincial, national or North American birthrate statistics, while the others put the shift in general terms, such as "more and more women and men are postponing childbearing to later in life than was typical in previous generations" (Ottawa Fertility Centre, n.d., "Elective Fertility Preservation"). Bhatia and Campo-Engelstein (2018) previously identified a "statist pronatalist perspective" (p. 865) as a factor in the growing acceptance of SEF. They argued that the potential for SEF to mitigate population decline due to declining birth rates was a powerful incentive in Europe, but not in the United States, where the ART industry is fully for-profit and detached from the state. Therefore, it is interesting to see demographic shift addressed in Canadian websites, because it might indicate more similarity to European perspectives than US ones.

Some of the clinics still attributed the broad trend to delayed childbirth to choices and personal reasons. However, two went further, discussing structural reasons for change in birthrates.

> The consistent decline in births for women under 30 can be explained, in part, by improved fertility education and greater access to contraception. But why are Canadian women waiting to have children? The dominance of women in the workplace and a redefining of familial roles are likely contributing to women having their first child later on. (Tan, 2015, "Women shift priorities" section).

> Many argue that women, especially those in the technology sector, are working in male-dominated, less family-oriented industries, making professional advancement more difficult for women who take time off to have children. (Genesis Fertility Centre, n.d. "What is egg freezing (oocyte cryopreservation)?", para. 2).

These findings are interesting because we might expect fertility clinics to only focus on providing medical information, and yet these explanations for fertility decline are social ones, drawing on feminist ideas. Bhatia and Campo-Engelstein (2018) describe this as:

> […] The beginning of state or public engagement with selective feminist scripts on gender, work, and family formation in support of SEF. These processes raised the acceptability of EF as a biomedical practice designed to address social anxieties and problems rather than exclusively medical ones. (p. 866).

The excerpts above still show women being focused on their careers continuing to preponderate as an explanation for delayed childbirth. I will explore these feminist scripts in the next narrative.

The "risky future" theme established that life is unpredictable, fertility is rapidly declining at a personal and/or population level, and that many women may not be doing enough to mitigate fertility decline. Having framed the problem in this way, the second part of the narrative proposed SEF as a solution to allow women to buy, freeze, or otherwise manipulate their biology and time. The ticking biological clock, noted by other authors to be prevalent in medical marketing for SEF (van de Wiel, 2018; Waldby, 2019), also appeared in my data. Eleven clinics explained that SEF was a way to "freeze fertility potential" by freezing oocytes at an optimal time, when the patient is most fertile. As futurovo (n.d.) claims, "you will therefore have the chance to become pregnant at 40 years of age or more…with eggs from your 20s" ("I Am Ready – Step 3").

While other authors have shown that becoming an older mother through ARTs could draw ire from care providers and the public (Bühler, 2015; Campbell, 2011), here it is being encouraged. However, the caveat to older motherhood is that the futurovo clinic, and others in my data, expect and encourage women to freeze their eggs at a younger age. They still warn that it is ineffective to freeze oocytes at an older age. This is in contrast with the sociological literature, which establishes that most women who freeze their eggs electively are in their late thirties and early forties (Baldwin, 2018, 2019a; Brown & Patrick, 2018; Inhorn, 2020; Myers, 2017).

In SEF, oocytes are removed from the process of normal aging. Five clinics specify that oocytes can be stored for many years, or indeed indefinitely. This reflects van de Wiel's (2018) description of the manipulation of time in egg freezing:

> […] cryopreservation enables the overlapping of fertile and infertile life courses in new ways, resulting in a state of what we may refer to as "postfertility." This is not to say that the categories of fertility and infertility have become obsolete — quite the contrary. Rather, these categories are mobilized in new ways and begin to signify through one another when infertility is lived in the fertile life phase and fertility is positioned as extending beyond pre-existing reproductive age limits. (p. 6)

The overall effect of this narrative is to shift the fertility decline crisis onto individual women, and to offer a self-evident medical treatment to what is represented as a hybrid biological/social problem.

Overall, clinics and start-ups marketed SEF as a way to secure the option to have a family in the future. Twenty websites mentioned the idea of freezing now to facilitate a pregnancy in the future. In addition, many websites contained photos of women with infants, or other images that symbolized the promise of a baby – such as a newborn's feet or a small hand grasping an adult's finger. Another aspect to the theme of buying time

was the idea that frozen eggs could serve as a "backup" to natural conception if women experienced infertility or did not find a partner. That is, five clinics stated they anticipated that a woman who froze her oocytes would want, and try, to conceive "naturally". For instance, Grace Fertility Centre (n.d.) writes:

> We assume that you would attempt to become pregnant in the future with the eggs still in your ovaries, and would use your frozen eggs only if you have decreased ovarian reserve, you no longer have eggs (peri-menopause), or you have infertility" ("Use of eggs in the future" section).

Natural conception – and not technology-assisted reproduction – was positioned as the ideal, in other words. Indeed, OVA Egg Freezing implied that SEF would *enable* natural conception by buying women time to enter the right relationship:

> Turns out, single women who make the decision to freeze their eggs say the experience turned them into better daters. […] When you know you want kids someday, you might be hyper-aware of time ticking as you and your eggs get older. That's a disastrous way to date. […] Knowing that your eggs are safely frozen and cared for by world-class experts allows you to approach dating with an open heart. (Vogel, 2017).

While this narrative was not present on other websites, it was reminiscent of Baldwin's (2019a) concept of "panic partnering", representing SEF as a way to avoid desperation in the dating market (Baldwin, 2019a; Brown & Patrick, 2018; Martin, 2010). Overall, clinics and start-ups represented SEF as the way to attain a desired family structure without having to compromise.

Empowerment Through Autonomy

The second key narrative in fertility clinics and start-ups was the idea of empowerment through autonomy. Clarke et al. (2003) argued as part of their theory of biomedicalization that medicine was adapting to the emergence of social movements, such as feminism, by co-opting them. Several other authors contend that in North

America and Europe, SEF marketing draws on an apolitical corporate feminism that equates women's empowerment with work-life balance and freedom of choice (Bhatia & Campo-Engelstein, 2018; Rottenberg, 2018). In my project, most websites stated that SEF was a way for women to choose to take control of their fertility in the present, to have options for building their family in the future, when they felt ready. For instance, Heartland Fertility (n.d.) claims that "egg freezing can provide: • Choice • Control • Autonomy • Flexibility • Stress Reduction • Empowerment" and that "being able to take active steps now to increase the chance of having biological children later is an empowering option" ("Fertility Preservation Overview" section). Images on clinic websites often pictured women alone, smiling directly at the camera or intently doing research, likely to suggest independence and self-assurance. It was remarkable how many websites included this narrative and how consistent it was across different clinics located in different provinces or written in different languages.

While both clinics and start-ups often used language of empowerment to refer to SEF, the commercial fertility start-ups leaned even more into this empowerment narrative, as the following two excerpts demonstrate:

> Freezing your eggs allows you to take control of your reproductive future and preserve your fertility. At Lilia, we think egg freezing is fantastic because it makes it easier for women to do, well, whatever the hell they want. […] The women we've worked with have ubiquitously said that the procedure was an empowering one that allowed them to take hold of their reproductive future. (Lilia, n.d., "Egg Freezing – The Ultimate Guide")

> Women who've gone through the egg-freezing journey say it boosted their confidence. Why? Taking control of your own fertility feels empowering. Plus, the short process requires you to put yourself first, even amid other responsibilities, such as career or education, a partner, friends, family, etc. Your attention to self-care creates a new appreciation for what you need and want in life—including with your career and love relationships. The more

> empowered you feel, the better your ability to take on the world. (Vogel, 2017, "2) Builds Confidence", OVA)

The quote from OVA describes SEF as self-care, implying that time must be carved out to engage with fertility and motherhood. News media (Grant, 2020; Stone, 2020) has also noted the arrival of boutique fertility clinics offering SEF as "self-care". In the Lilia quote, the medical procedure is reframed as freeing, implying that women are prisoners of their biological clocks. In a blog post, OVA Egg Freezing similarly represented a woman freezing her oocytes as choosing to "liberate" herself from her biology:

> Many women who have chosen to freeze their eggs say the process took the pressure off a ticking "biological clock." In fact, it smashed the whole concept: "Biological clock" is an antiquated term anyway, considering modern women have more choices than ever about their fertility. (Vogel, 2017, "1) Takes the Pressure Off")

This quote rejoins a long history of seeing reproductive technologies as having the potential to allow women to transcend their biology and become empowered (Scala, 2019). Clinics and start-ups in my project showed faith in technology and science to rescue not only fertility, but women's lives overall. Another site, OriginElle (n.d.), enthused: "The good news is that in just the last decade or so, biotechnology has delivered an increasingly attractive alternative for women approaching the end of their childbearing years" ("Freezing Your Future Fertility" section).

In all this material, it is assumed that "empowerment" and "taking control" are desirable, but also, it's assumed that these terms speak for themselves – that readers will be familiar with what they mean. Because of this, I would argue that the start-ups' language is referencing, and has been influenced by, the mainstreaming of neoliberal or "*Lean In"* feminism. Referring to Rottenberg's (2018) understanding of neoliberal feminism, the co-optation of certain elements of feminism glosses existing neoliberal

systems – in this case the privatization and individualization of (in)fertility – under a veneer of progress. In other words, the focus is on the individual's responsibility to be proactive and engage in self-care, rather than improving workplaces, education systems, or housing markets not set up to support young parents. The empowerment narrative in SEF marketing also draws on ideas from choice feminism (Budgeon, 2015) when it holds up women making their own choices as the best way to fulfillment and liberation.

Thirteen websites emphasized the importance of being proactive about fertility through SEF treatment – to act now in order to secure fertility in the future. The assumption here was that it was better to preserve fertility now than to potentially treat infertility later. Websites often recommended that women freeze their oocytes as early as they could:

> In order to maximize your chances, it is possible to preserve your fertility from 18 years of age. The earlier that you think about this; [*sic*] the better the quality of eggs that will be obtained and this increases the chance for a successful pregnancy. (futurovo, n.d., "No Limits", para. 4)
>
> Briefly, the younger the better. The American Society for Reproductive Medicine recommends that the best time to freeze your eggs is when you're in your 20's or early 30's. When we go home for the holidays, we're often telling our younger cousins that they should be considering egg freezing as soon as they can afford it. (Lilia, n.d., "Egg Freezing – The Ultimate Guide")
>
> In general, the younger you are when you choose egg freezing, the better. You can attempt to freeze your eggs at an older age, but women over the age of 37 will need a much more time-consuming process to retrieve healthy eggs. (Newlife Fertility Centre, n.d., "Is There a "Best Age" to Freeze My Eggs?")

Age-related fertility decline is a continuous process from puberty onwards, so it can be used to justify the expansion of fertility preservation to nearly anyone. Clinics' encouragement of more and younger women to take on the responsibility of "being proactive" about their fertility shows how the divide of infertile/fertile has been replaced

by infertile/potentially infertile (Baldwin, 2019b; Martin, 2010; van de Wiel, 2018). What is left out from this framing is that freezing at a younger age is likely less cost-effective than simply using ARTs if infertility does come up (Argyle et al., 2016). This is because people who freeze oocytes at a younger age may not actually need them in the future, and studies suggest that most women who have frozen their oocytes do not return to use them (Argyle et al., 2016; Inhorn, 2020).

"Having options" was another key piece in the empowerment through autonomy narrative, referenced on twenty websites. This included content that represented SEF as providing new options for fertility and family planning in the future, as well as there being options for customization within the SEF process itself. For example, Anova Fertility (n.d.) states that "knowing that eggs are banked allows some hope and additional conception options when the time comes to attempt a pregnancy" (Egg Freezing – Who Should Consider Egg Freezing section). Two websites mentioned SEF provided the option for a woman to be her own oocyte donor through SEF, implying that women would find this a better option that using a known or unknown donor's oocytes. This relates to the idea that autologous frozen oocytes may have more personal value due to their preservation of genetic relatedness, while donor oocytes may be used more reluctantly, as purely the means to an end (Waldby, 2019).

A focus on female empowerment and reproductive autonomy was a theme I expected to find based on my review of the literature, however, one surprising aspect was the conflation of female empowerment with individual "medical empowerment" through the concept of informed choice. Thirteen websites used language around choice, emphasizing that their patients were free to choose when and how to use their oocytes

and therefore choose when and how to become a parent in the future. Sites also saw patients' reasons for using SEF as different and unique to every person. This clearly fits into choice feminism as described by Budgeon (2015), notably the notion that individual women know how to decide what is right for them based on their own experiences and goals, and that these different paths and decisions should be equally respected. One choice that women apparently do not have is whether to become a mother or not – that is assumed to be a given on the websites.

Nine more websites explicitly referred to informed choice, reminding potential patients they needed to have all the right information before deciding. For example, NewLife Fertility Centre (n.d.) tells patients: "Before you commit to this reproductive option, be sure you understand the facts. NewLife Fertility Centre is here to make sure you have all the information" ("Egg Freezing", para. 2); Prelude Fertility (n.d.) declares: "when women understand where they're at today, they can make informed decisions about their options for future pregnancies" ("Age Matters"). The implication here appears to be that women could not actually make good decisions for themselves without the right medical information.

Finally, despite the narrative around options and choice being so prevalent, far fewer websites mentioned that there could be options and choices other than SEF. Eight websites mentioned alternatives to SEF. Of these, two stated it was important for women to be aware of alternatives but did not actually say what these could be. Four more websites mentioned other ARTs as alternatives, such as embryo freezing, use of donor eggs or donor sperm, and only two mentioned adoption. Two discussed what to do if frozen oocytes ended up being unneeded, such as disposing of them, donating to research,

or acting as an unknown or known donor to an infertile person. Only one website out of the thirty (OriginElle) suggested education around fertility decline and changes to society to support women being able to have children at younger ages without affecting their careers. Moreover, this discussion was contained in a blog post, apart from the website's main section on egg freezing.

Overall, clinics and start-ups painted a picture of "empowerment" that, through being proactive, having options, and making informed choices, prioritized individual responsibility and medical knowledge. These websites lauded SEF as a tool for achieving women's goals in family planning and in the workplace. However, the influence of watered-down neoliberal and choice feminisms in these clinics' representations of SEF means they can only offer individual-level approaches to gender equality.

Patient as Consumer: Compassionate Care

I also found there was an overall tendency for clinics and start-ups to market themselves as purveyors of compassionate care and customizable treatment. In this way, the marketing for SEF was de-medicalized and the potential SEF user came to be represented as a consumer and person as well as a patient. Fourteen websites alluded to providing personalized, human services. Here are some examples from ART clinics:

> You'll meet with one of our expert doctor to discuss your needs, go over your medical history, help you understand your options, and give you a sense of what you can expect from the process. After that, we'll start running tests, including blood work and a vaginal ultrasound, which will allow us to properly assess your current fertility potential and develop a personalized fertility treatment plan. (Hannam Fertility, n.d., "Elective Egg Freezing", "Fertility Assessment" section).

> Though the journey may look different for some, we share the same goal: building a family. IVF Canada is here to assist you and will customized [*sic*] the treatment to your particular situation and needs. (IVF Canada, n.d., "Fertility Preservation", para. 4).
>
> [SEF] is performed using a well-coordinated approach, using the clinic location that is most convenient for you for the majority of the visits. We help you preserve your fertility now, and will be there when you want to conceive later. (Ontario Fertility Network, "Egg Freezing", para. 3)
>
> Exploring the methods of how to get pregnant is stressful, but the NewLife Fertility Centre is here to help. We aim to make the process less burdensome and more streamlined to simplify your experience with us. We understand getting pregnant is an emotional process as well as a physical one, so our staff is dedicated to providing the highest quality of care with compassion. (NewLife Fertility Centre, n.d., "Egg Freezing", para. 11).

Clinics emphasized that SEF (like other fertility treatments) was often stressful or overwhelming, and offered customization, flexibility, and support from various health professionals to suit patients' needs, schedules, and lifestyles. This portrayed SEF clinics as able to support each patient and treat them as unique. Moreover, three websites described the process of freezing oocytes as a "journey", making it seem like they were selling not just a medical treatment, but an experience that staff would share together with patients.

Start-ups leaned even further into representing their egg freezing services as a consumer product, compared to ART clinics. For example, Lilia, an "egg-freezing concierge" based in Toronto, marketed themselves as an additional service created for the express purpose of guiding women through their SEF journey: "Our team at Lilia offers a dedicated concierge to help you find the perfect doctor and clinic for your needs and wishes. They know the ins and outs of fertility preservation, streamlining the entire process for you" (n.d., "The Ultimate Guide to Egg Freezing"). Of the four start-up websites analyzed, three marketed a sense of exclusivity through the benefits or discounts

they alone could offer to potential clients. The start-up sites appeared particularly polished and generally included more photos than the clinics, often featuring the boutique setting of their clinics – such as photos of cityscapes or tastefully decorated clinic lobbies. Three of the start-ups also stated they were making SEF more accessible for women who wanted to use the technology. This was reflected in their use of slang and other more approachable language, and detailed information on the steps of the SEF process. However, start-ups also tended to de-emphasize the downsides of their product, such as side effects; Kindbody, Lilia and OVA all made statements to the effect that most women did not find the process uncomfortable, while Prelude Fertility did not discuss side effects at all. The result was to shift the potential SEF user into the role of a consumer, rather than a patient, as they were given full responsibility for evaluating their options, make choices on these options, and of course, bearing the costs of the procedure.

In addition to fertility preservation, clinics and start-ups represented SEF as the opportunity to purchase emotional reassurance and achieve "peace of mind". Nine clinics and start-ups used "peace of mind" as a reason for freezing oocytes, and this phrase featured in several eye-grabbing website taglines or headings, including: "For peace of mind, entrust Fertilys with your eggs" (Fertilys, n.d., "Female Fertility Preservation"); "Peace of mind for the doers" (Lilia, n.d., "Your Egg Freezing Concierge"); and "You Can Put your Mind at Ease: Your Eggs Will Be Ready When You Are" (Olive Fertility Centre, n.d., website tagline). Patients could achieve this peace of mind first through the attentive care of the clinics' staff and second by having oocytes safely stored and ready to use for the future. SEF was represented as providing psychic relief from the pressure of a

biological clock and as granting freedom to pursue career opportunities or meet the right person.

Other authors (Baldwin 2018, 2019a; Mayes et al., 2017) have similarly noted that many women who freeze their oocytes want to feel that they have done all they can to give themselves a chance of a pregnancy in the future. Arguably, however, as we have already seen, clinics and start-ups contribute to the pressure that women might feel to become biological mothers, by framing age-related fertility decline as an imminent crisis and recommending women freeze oocytes as early as possible. The selling of emotional peace through a medical technology emphasizes that these websites are engaging in marketing, rather than providing objective information.

Interestingly, one term I expected to see used in these websites – "hope" – was barely mentioned, despite it being obliquely referred to, as we saw just above. Other authors have found that discourses of hope are central in driving ART use, and yet often mislead and disappoint patients in the end due to highly variable success rates (Mayes et al., 2017; Franklin, 1997). When the term did appear in my data, it tended to describe programs to preserve the fertility of cancer patients, rather than for potential SEF users. Representing SEF as providing "peace of mind" rather than "hope" may allude to taking action, as opposed to blindly hoping: the "peace of mind for the doers" quote from Lilia does give this impression. Perhaps peace of mind has a certainty and confidence to it that hope does not – as hope is required when the situation is uncertain or bleak. Finally, SEF has been criticized for offering up "false hope" to their patients (Baldwin, 2019a), and so clinics and start-ups may be trying to move away from this language.

Chapter Five: Technologizing Fertility and the Meanings of Oocytes

In this chapter, I explore the meanings of oocytes as they relate to an ongoing "technologization" of (in)fertility by clinics and start-ups. In the first section, I consider SEF as a narrative of technological progress, examining how clinics and start-ups balanced the excitement of EF as a cutting-edge technological advancement with their reputation of reliability and expertise. In the second section, I explore how oocytes become protagonists in representations of SEF. I have noted in several places in the project that women often gain a new awareness of their oocytes as a barrier or key to success in assisted reproduction. Clinics and start-ups in my study also centered their narratives around oocytes: on the one hand representing them as precious, fragile cells requiring careful safeguarding by the clinic, and on the other attributing them with the success or failure of SEF. I show that discussions of "egg quality" and the categorization of oocytes into "good eggs" and "abnormal eggs" can be euphemisms for avoiding having a child with a disability.

In the third section, I examine the importance of oocytes in clinics and start-ups' narrative of optimizing fertility: calculating and estimating the probability of achieving a SEF outcome that is as ideal as possible. SEF proliferates into many tests and visualizations that produce an ever-increasing amount of information about ovaries and oocytes, making "fertility" a moving target.

Section I: Technological Progress

The theme of *technological progress* was a popular one across clinics and start-ups. Fourteen websites included narratives of the development of oocyte cryopreservation

technology to paint a picture of the ongoing excitement and success of SEF. This narrative emphasized that the technology had improved dramatically throughout its long inception and development, continually getting better through scientific innovation.

> Back in the days [*sic*], both eggs and embryos were preserved by a slow-freezing technique, with a survival rate of roughly 60%. The eggs' freezing has greatly improved since the development of a vitrification technique (year 2000) which improved egg's [*sic*] survival (90%) and the chances of pregnancy after in vitro fertilization. (Fertilys, n.d., para. 8).
>
> Research in the area of egg storage or egg freezing has been active in the past 20 years […] (Nahal Fertility, n.d., "Our Services", "Egg Bank" section).
>
> Egg freezing has been around for years, but an advancement in technology called "egg vitrification" has dramatically improved success rates. (Bischoff, 2017, para. 10).
>
> Egg freezing first began in 1986. The method used in those days did not lead to good survival of the eggs when thawed. We can now successfully freeze and thaw eggs with the process of vitrification. (RCC Fertility, n.d., para. 4).

Five websites specifically reassured patients that though the technology was sophisticated, it was definitely no longer considered experimental: "When heard out of context, egg freezing sounds like a procedure of the future. However, it is very much possible today" (NewLife Fertility Centre, n.d., para. 2). The warm story recounted by clinics, of EF's march forward, attributed the increasing uptake of EF to innovation, solidifying the technology's legitimacy and building trust in the procedure. By freezing oocytes, patients would not just benefit from technological progress, but could be a part of it.

Many clinic and start-up websites also provided detailed descriptions of the various tests and techniques they used in SEF. Of these advancements, the technique of vitrification was by far the most commonly described – mentioned by 15 websites. According to websites, vitrification is a "flash-freezing" of oocytes achieved by replacing

the water they contain with a cryoprotectant, then plunging the cells into liquid nitrogen so that they enter a "glasslike" state. The technique greatly decreases ice crystal formation inside the oocytes, which improves their chances of survival when they are thawed. Several websites also included simple diagrams of cracked, damaged slow-frozen oocytes versus smooth, vitrified oocytes. The replacement of inefficient slow freezing with vitrification, and the clear superiority of the glasslike oocyte over the ice-laden, damaged oocyte served as a symbol of clinics' improved control over oocytes and reproduction. This information was not merely descriptive, providing another vehicle for conveying the clinic's expertise and how the clinic was sure to keep oocytes safe.

The narrative of technological progress also seemed useful to clinics and start-ups for asserting their own reliability and reputation. Websites conveyed expertise and progress in terms of success rates (oocyte survival, babies born), but also through less tangible descriptors like "state of the art", "industry-leading", "respected", "cutting-edge" and "unmatched". Indeed, they represented SEF as a technology that only a team of the most experienced and skilled physicians, embryologists, and technicians could provide. For example, a blog post from Genesis Fertility Centre states: "Egg freezing is a delicate process and its success rates are highly dependent on method and experience. Thanks to our talented and seasoned team we have managed to achieve high success rates" (Kashyap, 2015, para. 2). Similarly, Olive Fertility Centre (n.d.) writes that "freezing and thawing require a high level of skill and expertise. It is important that the embryologists have experience and advanced training in both the vitrification (flash freezing) and thawing aspects of the egg freezing process" (para. 3). The increased technological management of (in)fertility means restricting management of the reproducing body to

scientific and medical experts (Baldwin, 2019b). These websites take the process further by narrow the range of experts even further, as well as introducing more specialized roles (embryologists, fertility pharmacists, counsellors) to oversee each minute detail of SEF treatment.

Section II: Oocytes as Protagonists

Precious Eggs

Central to the narrative of age-related fertility decline was a focus on oocytes as a limited resource – a dwindling supply of oocytes that could not be replenished, only preserved. A blog post from Kindbody (Westphal, 2020) states that "women are born with all the eggs they will ever have, and hundreds of them are lost each month as part of the normal aging process" (para. 2). Similarly, OriginElle (n.d.) explains: "Unfortunately, human biology limits a woman's ability to continue producing viable eggs. A girl is born with 1 million to 2 million eggs in her ovaries, and she cannot produce more in her lifetime. ("The limits of female physiology" section). Clinics and start-ups used statistics and key chronological ages to further convey the precipitous decline of ova over the lifetime:

> On average, we are born with 1-2 million eggs, and by age 30, that number can drop by at least 90 percent. By the time women reach the age of 40, they can have ten times fewer eggs stored in their ovaries than when they were 25 years old. (OVA, n.d., "Egg Freezing – Ovarian reserve").

Websites reframed oocyte loss as an urgent problem to be dealt with, creating the need for a solution to preserve these precious cells – even though this decline in ovarian reserve is a normal process in women. In other words, clinics and start-ups medicalized oocyte loss. Van de Wiel (2018) similarly argues that the overwhelming focus on "egg

death" allows for overtreatment, increased medical monitoring, and unneeded health and financial risks to patients, among other consequences. The websites' representation of oocytes as finite and precious fully embodies the "necropolitics of reproduction" (van de Wiel, 2018, p. 13), or how the balance of potential life and mourning of ongoing or potential reproductive loss drives oocyte cryopreservation (van de Wiel, 2018).

Having represented oocytes as limited and time-sensitive, clinics and start-ups were then able to step in and represent themselves as having the technological and clinical expertise to safeguard reproductive material.

> Olive offers on site long term egg storage. The safety and security of your frozen eggs is of the utmost importance to us. We have continuously monitored cryotanks with sensors that ensure proper tank temperatures and liquid nitrogen levels. While we have back-up generators, your eggs are safe even in a power failure, as our tanks use liquid nitrogen to maintain the temperature and don't rely on electricity. (Olive Fertility Centre, n.d., "Long-Term Storage", para. 1).
>
> Our storage reservoirs are monitored 24 hours a day, 365 days a year to ensure complete safety for your precious reproductive material. (futurovo, n.d., "No Limits").

If the female body is an imperfect container for oocytes, sensitive to time, injury, and unexpectedness, technology can provide the opposite, suspending oocytes out of time in a standardized, controlled environment. Five websites reassured potential clients that oocytes could be frozen for many years, if not indefinitely. Others were especially keen to rectify any misunderstanding around oocytes frozen through SEF being "removed" or "wasted". For example, the Pacific Centre for Reproductive Medicine (n.d.) explains that "when we remove eggs for freezing, we are removing eggs that would have died anyway – so the process does not 'waste' eggs or lead to earlier menopause" ("Egg Freezing", Frequently Asked Questions section). SEF is represented as able to save these oocytes

and divert them from their otherwise inevitable death and lost potential. Two websites also assured potential clients that eggs remained their property and would only be used when the client gave the go-ahead, suggesting that they could protect oocytes from improper use and commodification.

Contrastingly, clinics also introduced an affective dimension to oocyte freezing by asserting they would not merely store oocytes, but nurture and care for them. Two examples were "While scientists are unsure how many years an egg will remain viable in the deep freeze, we expect that eggs that are properly frozen and cared for could last generations" (OriginElle, n.d.), and "after your egg retrieval, OVA embryologists isolate the mature eggs and nurture them through the process of vitrification" (OVA Egg Freezing, n.d.). Overall, website content suggested that, more than simply engaging in a rational oocyte numbers game, clinics and start-ups understand that these cells are precious to the patient from whom they came. Or, as Waldby (2019) concludes in her chapter on women who had banked their oocytes: "in one light, it [egg freezing] could be framed as a form of instrumental consumer risk calculation […] Such an analysis, however, would ignore the poignant, deeply felt ethos each interviewee brought to the issue" (p. 157).

Quality of Eggs

As previously argued, many websites attributed the success of SEF to the chronological age at which the process would be undertaken. However, many also specified that the "age" of *oocytes* was important, as this affected the quality of oocytes that would be retrieved. In fact, seventeen websites identified this oocyte "quality" as a (if not *the*) determining factor in the success of SEF. "The age of your eggs (not you) is

the number one cause of infertility" (Prelude Fertility, "Freeze Eggs: Options Preserved"). Clinics and start-ups described oocyte quality as continually decreasing over time. This phrasing seemed sympathetic, shifting the "blame" away from women and onto their oocytes. A blog post from the fertility start-up Kindbody illustrates this:

> In a Modern Love column in the New York Times, the author says, "When I froze my eggs, I didn't understand [egg freezing] has only a 2 to 4 percent success rate per thawed egg, according to my clinic, meaning more likely than not, *my eggs would fail me*." The truth is, success rates vary based on a lot of factors, but they vary most dramatically by age. (Westphal, 2020, para. 4, emphasis added).

Oocytes thus become separated from the person they are contained within, becoming visible as protagonists that have the power to thwart women's fertility plans.

Furthermore, the existence of discussions around oocyte quality implies that some oocytes will be of high quality, and others will be of low quality. Websites described high quality oocytes as younger oocytes "in their prime"; low quality oocytes were "older" oocytes described as damaged, "abnormal" or simply less effective. Different quality oocytes were associated with different quality outcomes. For example, CReATe Fertility Centre (n.d.) writes that "better quality eggs are associated with better birth outcomes, including less miscarriages and a lower chance of having a baby born with abnormalities" (lines 6-7). Despite all this, according to several sites (OriginElle, TRIO Fertility) there is no real way to determine the "age", and therefore the quality, of oocytes. Even as technological sophistication increases our awareness and expertise around oocytes, uncertainty increases as well.

Another main concern of fifteen clinics and start-ups when it came to oocyte quality was reassuring potential SEF users of the safety of the technology:

> That said, there seem to be no dramatic differences between pregnancy risks of women who use fresh eggs and women who use frozen eggs. […] The children born from frozen eggs meet developmental milestones, and have comparable weights, heights, and sizes to children born without assisted reproductive therapy. (Lilia, n.d., "The Ultimate Guide to Egg Freezing", "A look at pregnancy-related risks" section).
>
> Studies have shown that eggs are not damaged by this procedure and in fact the success rates for thawed eggs which are fertilized are the same as using fresh eggs. PREGNANCY SUCCESS RATES: A recent study reported similar pregnancy rates between frozen and fresh eggs. (Olive Fertility Centre, n.d., "Egg Freezing (Vitrification) & Storage, para. 2)
>
> Babies created from frozen eggs appear to have the same chance of being normal as babies conceived through IVF at our Ontario infertility clinic. (The Reproductive Care Centre, n.d., "Cryopreservation", para. 8).

As seen in these quotes, information provided on the websites conveyed that frozen oocytes from SEF could lead to a healthy pregnancy and child, no less normal than children born through IVF, or without ARTs altogether. Eight websites provided specific reassurances that SEF would not increase the chance of having an "abnormal" child with a birth defect or a chromosomal irregularity. ART clinics and fertility start-ups' promotion of having "normal" children from SEF assumes and reinforces that potential parents should be very concerned about having a baby with a birth defect or disability.

Gammeltoft and Wahlberg (2014) argue that when health authorities represent decisions around ART use and prenatal screening as in the hands of individual parents, it masks the fact that eugenics is alive and well. Here, websites were able to imply that SEF would avoid the chance of having a child with a disability without stating outright that a disabled child was undesirable. Website authors may be trying to enhance and capitalize on parents' fears of not having a "perfect" baby. Again, because prospective mothers are held morally responsible for their pregnancies, the responsibility for preventing birth defects falls more heavily on them (Gammeltoft & Wahlberg, 2014).

Section III: Optimizing Fertility

According to Clarke et al. (2003)'s understanding of the biomedicalization of society, clinical and biotechnological innovations drive the transformation of bodies in ways that no longer seek to merely restore function, but to optimize or enhance, revealing new potential. Baldwin (2019b) conceives of EF as one of many "fertility monitoring and extension technologies" (p. 272) that "purport to enable users to optimise the timing of motherhood and enable genetic parenthood even after ovarian exhaustion" (p. 273). Clinics' narratives on SEF reflected this quest to go beyond preserving fertility, chasing a peak enhancement of fertility through technology. For example, Prelude Fertility (n.d.) referred to "fertility fitness" ("Freeze Eggs: Options Preserved" section). This conveyed that women should be monitoring and continually improving their reproductive potential, rather than resigning themselves to their natural fertility level.

Of the websites I analyzed for this project, sixteen included content that related to optimization of fertility – of these, six explicitly used terms such as "optimal" or "optimize". Clinics and start-ups presented SEF as a numbers game, attempting to give potential patients a sense of what they could expect based on a dizzying number of metrics, such as age, assessment of hormone levels and ovarian reserve (oocyte number), the financial cost of treatment, the number of SEF cycles, and the quality of eggs banked. Some websites included lengthy cost-benefit analyses to help patients decide on the ideal age to freeze. Others included "fertility calculators", into which patients could input their age to understand how many oocytes they should aim to freeze for a given percentage chance of having a baby. Westphal (2020) writes:

> At Kindbody, we believe that every woman should understand her own fertility as well as her statistical chances of success so she can make her own decisions about how to achieve her reproductive goals. Our patients use our calculators found on the Kindbody Portal to help bring clarity to their personal success rates. (para. 3).

Because clinics often represented success in SEF as variable and dependant on factors unique to each woman, this made success a moving target, producing new forms of uncertainty. Paired again with emphasis on personal responsibility and individual choice, this constant "calculus of conception" (Haimes & Taylor, 2009, cited in Carroll & Krølokke, 2018, p. 996) to estimate odds of a good outcome in fertility can be an emotional and mental burden (Baldwin, 2019b; Carroll & Krølokke, 2018; Clarke et al., 2003).

Other clear examples of SEF and the optimization of fertility was the many tests and the close monitoring clinics and start-ups listed for assessing fertility. Choosing to undergo SEF in fact means choosing to undergo many additional assessments, such as anti-Müllerian hormone (AMH) to assess ovarian reserve before even beginning SEF, as well as daily bloodwork and ultrasounds while ovarian stimulation is ongoing. While these tests can be used to diagnose infertility in patients, in the case of SEF, clinics and start-ups depicted them more as "information-gathering" procedures: "There are so many factors that affect a woman's ability to conceive, but there are three inexpensive tests [luteinizing hormone, follicle-stimulating hormone, AMH] you can ask about to get the conversation going with your OB/GYN" (Prelude Fertility, n.d.). This represents a re-purposing of tests that might previously have been used to determine illness into the preventative treatment of a potential illness, age-related fertility decline. As Clarke et al. (2003) argue, the biomedicalization of society means "we inhabit tenuous and liminal

spaces between illness and health […] it is impossible not to be 'at risk'" (p. 172). The definition of infertility shifts here as well, from the binary state of being able/unable to have a child, to hormone levels and number of oocytes.

Websites sometimes tempered the narrative of optimization by reassuring potential clients that SEF was a treatment that would imitate natural biology. Assisted reproductive technologies, true to their name, are more likely to be culturally accepted when they imitate or assist normal biology than when they are seen as producing "unnatural" effects (Bühler, 2015; Campbell, 2011; Franklin & Ragoné, 1998; Melhuus, 2012). For example, the idea of self-administered hormone injections might be made more approachable by telling readers they were the same hormones that occurred naturally in the body. Kindbody (n.d.) states: "With egg freezing, we are being opportunistic. We have you take the same hormone that is released by your brain to help you fully mature a whole batch of eggs, not just the one" ("Medications" section). Atlantic Assisted Reproductive Therapies (n.d.) also recommends their patients use their oocytes "before age 50, which is the natural age of menopause" (p. 2). So, while optimization of fertility seems futuristic, clinics and start-ups are careful to recommend SEF be used within a reasonable and "natural" time frame.

New technologies that provide visualizations of cells and tissues also produce new awareness and meanings of the body (Brodwin, 2000; Clarke et al., 2003; Franklin & Ragoné, 1998; van de Wiel, 2018). For example, prenatal ultrasound brought the developing fetus into public and public imaginations (Taylor, 2000; van de Wiel, 2018). More recently, novel ways to visualize oocytes, such as frozen ova photography for providing more precision in choosing the best oocytes for fertilization, have received

more attention (van de Wiel, 2018; Waldby, 2019). Many of the websites in my project included photos of EF technology – such as photos of a freezing apparatus with a cloud of liquid nitrogen, of technicians or embryologists using technical equipment, or micrographs of oocytes or dividing cells.

At the intersection of optimization and medical imaging, TRIO Fertility publicizes that it is the first clinic in Canada to offer a technology called Violet for SEF patients:

> Violet™ is non-invasive, AI-based software that assesses and analyzes images of a patient's eggs to predict the chances of each egg to successfully fertilize and reach the blastocyst stage. Patients doing social egg freezing at TRIO will receive a complete report on each of their frozen eggs, along with an analysis of the quality of each egg and its likelihood to become a blastocyst when fertilized. (2020, para. 2)

This feature adds in more precise and customized information for patients to incorporate into their calculus of conception. This represents the continued proliferation of data on oocytes and continues to underline their continued transformation into protagonists with individual quality and potential. Taylor (2000) argued that reproduction has become increasingly about consumption, as technologies allow patients to see and "possess" the fetus through data and images, construing the fetus as both a commodity and a person. A similar duality is present here with Violet and frozen oocytes: the oocyte becomes an item with an individual quality to be assessed, generating another commodity – the oocyte report – while simultaneously retaining its potential to generate life (the likelihood of becoming a blastocyst).

Chapter Six: Conclusion

In this research project, I undertook a qualitative content analysis of Canadian ART clinic and North American fertility start-up websites. I mainly aimed to explore how ART clinics' marketing shapes the meaning of SEF and oocytes, specifically asking what key narratives and terms Canadian fertility clinic and North American fertility start-up websites use to market egg freezing and oocytes. Other aims of this project were to examine the effect of specific terminology used to refer to SEF, to explore the relatively new phenomenon of boutique fertility start-ups, and to detail the diversity in how clinics represented SEF and oocytes.

Section I: Summary of Findings

Chapter Four explored representations of SEF through websites' choice of terminology, the distinctions they made between medical and social EF, and reasons and downsides provided for freezing oocytes. I found that "egg" was used far more often than "oocyte", which was very infrequently. I also found that "egg freezing" and "fertility preservation" were the most used phrasings, far outpacing "social egg freezing", which has been the go-to (although contested) terminology in the social science literature. I suggest this is due to content on the websites that framed EF as a treatment for age-related fertility decline, which had the effect of blurring the boundaries between so-called "medical" versus "social" oocyte cryopreservation.

The most cited and most "urgent" reason for medical egg freezing was cancer. Other consistently mentioned medical reasons were lack of sperm from a partner during IVF treatment and undergoing gender-affirming treatment. "Social" egg freezing was seen as equally legitimate to medical egg freezing in my findings and there was really no

disparagement of people who wish to freeze oocytes for non-medical reasons. I found that career advancement and lack of a partner were the most cited reasons for SEF. Compared to ART clinics, fertility start-ups tended to provide longer, more exhaustive lists of reasons for SEF. In terms of downsides to the technology, nearly two-thirds of the websites warned there were no guarantees to SEF. Because there was such a focus on the patient's age as the greatest factor in success or failure with SEF, the risks of age-related fertility decline were more consistently discussed than the risks of SEF; therefore, downsides to SEF tended to be attributed to women (or her oocytes) and not to the technology itself.

In Chapter 4, I also identified three key narratives or themes that emerged from my close reading of ART clinic and fertility start-up websites. The first was the idea of buying time faced with a risky future. This narrative focused on age-related fertility decline as a personal and public crisis, with both biological and (to a lesser extent) social causes. Clinics positioned SEF as a solution that would to allow women to preserve their prime fertility potential to achieve their desired family structure later in life. Importantly, SEF would not usurp the possibility of conceiving naturally, but would guard against unpredictable life events, including infertility.

In the second narrative, clinics and start-ups represented SEF as a way for women to liberate themselves from their biological clock and to pursue what mattered to them, on their own terms. I suggested clinics were drawing on shared pseudofeminist ideas in the way that they referred to "empowerment" and "taking control". Websites implied there was value in women taking responsibility for their fertility and being proactive – "the younger the better" was a consistent refrain here. This conveyed a need for more women,

to take preventative measures earlier in their lives to mitigate fertility decline. Websites also equated medical empowerment (for instance, becoming educated on fertility decline, working with medical professionals, and making informed choices) with female empowerment. This could suggest medical authority co-opting the rhetoric of a progressive social movement (i.e. feminism) to maintain legitimacy. Despite their focus on choice and having options, few websites explored alternatives to SEF, such as becoming a non-biological parent, or not having a child at all.

The third narrative provided a consumerist twist to medical information provision as clinics and start-ups positioned themselves as purveyors of compassionate care. I found that these websites not only marketed fertility preservation, but emotional reassurance and peace of mind as well. Through this narrative, the SEF process became not "just" a medical procedure, but a journey, an experience, or a gift of self-care that could be customized and personalized for every patient. The idea of "peace of mind" was central to this narrative and was preferred over terms like "hope", possibly due to the preference of websites for representing women freezing oocytes as confident and taking action. The appeal of gaining peace of mind was enhanced by the work the websites had already done to establish fertility decline as a problem. All three narratives were even more bold and upfront on the start-up websites compared to the ART clinics, and this was particularly the case with painting the patient as consumer. Start-ups engaged in a marketing balancing act, emphasizing their provision of exclusivity through their perks and boutique setting, while simultaneously claiming they were making SEF more user-friendly.

Together, these three narratives operated on two levels to sell a faith in SEF technology for bettering women's reproductive autonomy. SEF would bring mental relief from the personal problem of conflicting timelines, and render service to society by educating women on, and offering a solution to, age-related fertility decline.

In Chapter 5, I examined the meanings of oocytes and their relationship to clinics' and start-ups' ongoing technologization of (in)fertility. A key narrative here was the technological progress that had led to SEF and that would continue to refine it in the future. Framing SEF as cutting-edge was balanced with content that emphasized the clinic's reputation and expertise to convey that SEF was safe and not experimental. This narrative acted to generate a sense of excitement around SEF, while also reinforcing a sense of increasing control over oocytes (and therefore biology).

Related to this, the chapter also detailed how oocytes are protagonists on clinic and start-up websites: how they become not merely objects to be acted upon or manipulated by physicians or technicians but key actors that can improve or thwart the chance of a good outcome. Websites represented oocytes as a finite resource that would be lost and wasted with the progression of time and fertility decline. Therefore, oocytes needed to not only be preserved through SEF, but nurtured – by a clinic with the resources and expertise to guarantee their safety. Clinics also drew attention to the importance of having youthful and non-damaged oocytes frozen. I found that by both attributing success – and shifting blame – to oocytes, clinics separated these cells from the person who makes and contains them. While clinics reassured that EF technology itself would not decrease the odds of having a healthy baby, low-quality oocytes would. I

found that the discussion of having a healthy, normal child was a coded way to reassure clients they would not have a child with a disability.

The final section in Chapter 5 dealt with SEF and the optimization of fertility. From ideal age to freeze cost-benefit analyses, to "fertility calculator" tools and success rate tables, websites provided potential clients with plenty of information for trying to ballpark their fertility. Yet statements to the effect that every woman is unique and that there are no guarantees to SEF made "success" a moving and uncertain target. Fertility could be enhanced through the a proliferation of fertility assessments available before, during and after SEF, and through the repurposing of infertility diagnostic tests for use in ostensibly healthy patients. As a result, the "fertility/infertility" divide shifts to include a category of "anticipated infertility" defined by the number and quality of oocytes. Clinics and start-ups worked to fit fertility optimization within the boundaries of normal reproduction by representing SEF as a backup (not an impediment) to normal conception, or representing it as imitating normal biology.

Section II: Significance of the Study

The first contribution of this thesis is a practical one: it offers a more updated picture of the Canadian EF landscape in 2021. The most recent published data on this appears to be Liu & Greenblatt's (2012) survey of Canadian ART clinics, which found that 16 clinics offered oocyte cryopreservation and only 9 offered SEF. My sampling of ART clinics in Canada updates these findings, showing that there are 30 clinic websites now providing information about oocyte cryopreservation and 26 providing information on SEF. The other practical contribution of this project is to be the first (to my knowledge) to examine Canadian ART clinics' narratives on SEF, thus helping to fill a

gap in knowledge. Furthermore, most studies that do address EF in Canada appear to be published in biomedical journals; my project brings a sociological perspective to the topic. The content analysis undertaken for this project showed how ART clinics and start-ups, far from merely providing information to potential clients, drew from scripts on neoliberal feminism, technological progress, and ableism to market both SEF and more intangible services such as empowerment or peace of mind. The study also showed the power of the age-related fertility decline crisis narrative, which suggests that women will only be made more aware of their fertility, and at younger ages, in the coming years.

My study begins to explore the phenomenon of boutique fertility start-ups, a relatively new and unstudied development in reproductive medical marketing. While most start-ups are based out of the US, the existence of Lilia shows there is some demand in Canada for this type of personalized, exclusive service. The study also contributes to the conversation around EF terminology (social egg freezing, oocyte cryopreservation) and shows the importance of considering our own use of language in defining our concepts.

Furthermore, I aimed from the start to interrogate rather than demonize biomedicine's messages on SEF and I think that, as a result, I have uncovered some interesting and surprising findings. The clinics and start-ups who have produced these websites emphasize that there are no guarantees to SEF, that "social" egg freezers are deserving of as much care and support as "medical" ones, and that there are social and structural explanations for fertility decline or delayed childbearing.

Section III: Future Directions

While this project has contributed some insights on clinical narratives surrounding SEF in Canada, the topic would benefit from further investigation and use of additional methods, such as analysis of medical journal articles or fertility conference proceedings, and/or from surveying or conducting interviews with the healthcare teams at Canadian ART clinics offering SEF. Future research could pay particular attention to representations of age-related fertility decline, as it was such a dominant theme in the justification of SEF and so emblematic of the necropolitics of conception. Elsewhere, scholars in disability studies may also be interested in analyzing the euphemistic reassurances that SEF will lead to a "healthy" pregnancy and that the technology can be used to avoid having an "abnormal" pregnancy or child.

There is a need more broadly for research on SEF in Canada; my findings represent a snapshot of the industry in 2021, however, much has changed in SEF even in the past ten years. SEF is more readily available than ever before and my findings show that the narratives surrounding the procedure have evolved since the publication of key studies in the field (i.e. Martin, 2010). So, while it was beyond the scope of this study to explain this difference or to examine Canada's "repronational history" (Inhorn, 2020, p. 47) of SEF, other authors could pick up on this by following the uptake of SEF as a technology in the country, or by comparing marketing over time. Connecting the dots between SEF and the fertility industry in Canada (which not as profit-driven as the boutique clinics in the US, but not state-subsidized either) would be an important contribution to our understanding of SEF in particular and ARTs in general. While it is also important to explore how women experience fertility preservation – especially by

following up with those who have already gone ahead with it – it is clear that scholars need to attend to the fertility industry as well. This project shows that North American fertility clinics and start-ups, the public imaginary, and individual women's decision-making influence each other to construct egg freezing's image.

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Appendix A: Codebook

Code 1: Buying time (SEF used to "buy", "freeze" or otherwise manipulate time)

a. Backup to natural conception (eggs can be used if natural conception does not/cannot happen)
b. Being ready (not currently ready for a family; SEF can be used to have family when you're ready)
c. Freeze fertility potential (SEF makes “younger” eggs available for use later in life, preserving fertility potential from the age at which they were frozen)
d. Freeze now family later (how SEF can be used for reproduction sometime in the future)
e. Incompatible timelines (childbearing is incompatible with current goals)

Code 2: Downsides to SEF (reasons to be cautious about SEF or to not undergo the procedure)

a. No guarantees (no guarantee that SEF will result in a pregnancy or live birth)
b. Risks of SEF (medical risks from SEF such as ovarian hyperstimulation syndrome. Other risks such as emotional distress, oocytes not surviving the thaw, never returning to use one’s eggs)
c. Side effects (side effects from SEF medications and procedures, such as mood swings or discomfort)
d. Time commitment (SEF requires a time commitment or investment)

Code 3: Eggs (the role of oocytes in the SEF process)

a. Abnormal eggs (eggs become "abnormal" when they are damaged by risk factors, decreasing fertility or leading to adverse pregnancy outcomes)
b. Eggs are numbered (women produce only a limited number of eggs in their lifetime)
c. Eggs are your property (eggs belong to the woman, not to the clinic)
d. Eggs frozen indefinitely (eggs can be kept frozen for a long time)
e. Precious eggs (eggs will be kept safe by the clinic)
f. Quality of eggs ("Quality" of eggs as a determining factor in success of SEF)

Code 4: Empathy (content that aims to reassure potential clients they are supported throughout the SEF process)

a. Exclusivity (clinic offers exclusive benefits and discounts to customers
b. Making EF accessible (clinic aims to make SEF easier to understand for a non-medical audience)
c. Peace of mind (freezing eggs reduces stress and pressure on you)
d. Personalized service (people who freeze eggs at the clinic will have access to a customized treatment from a supportive team)
e. Your journey (references to SEF being a “journey”, an experience, or an exploration)

Code 5: Empowerment through autonomy (SEF allows women to take control of their fertility and their life)

a. Being proactive (it is a good idea to plan ahead for the future by taking action now; more women should be proactive about their fertility)
b. Being your own egg donor (SEF allows women to use their own eggs for conception)
c. Choice (references to women's choices; women can choose what is right for them)
    i. Informed choice (clinic will provide women with all the information they need to make their choice; women should understand this information before deciding)
d. Having options (SEF opens up new options for fertility/family planning; there are options within the SEF treatment itself)
e. On her own terms (reference to building a family "on your own terms")

Code 6: Reasons for EF (discrete, straightforward reasons for freezing eggs)

a. Also better for father and child (invokes benefits for people other than the user)
b. Career advancement (focusing on career; putting career first)
c. Education (finishing studies or gaining advanced education)
d. Freeze for donation (donation to family member or unknown recipient, or donation to research)
e. Life experiences (travel or other instances of "experiencing life" before having children)
f. Lifestyle (tobacco or alcohol use, being overweight, lack of exercise)
g. Medical egg freezing (egg freezing offered for reasons described as "medical"; can be done more "urgently" than SEF)
    i. Cancer (undergo EF before cancer or cancer treatment affects fertility)
    ii. Gender transition (freeze eggs to preserve fertility before undergoing gender reaffirming treatment)
    iii. No sperm from partner (no sperm available when oocytes were retrieved for an IVF cycle)
h. Morally against extra embryos (freezing oocytes may be more acceptable to a patient/couple who does not want to freeze embryos due to moral or religious beliefs)
i. No partner (patient has not yet found the right partner)
j. Not women's fault (circumstances leading to need for SEF are not women's fault)
k. Personal (reasons for SEF are unique/personal/different for each patient)
l. Single mother by choice (using frozen eggs with donor sperm to become single mother by choice)
m. Tight finances (wanting to become financially stable before having a family)
n. Workplace risks (concern that workplace conditions or hazards might endanger ability to have children [for example athletes, factory workers, firefighters, military])

Code 7: Risky future (thinking about SEF in terms of a uncertain, risky future which must be prepared for or mitigated

a. Age-related fertility decline (age affects/predicts fertility, as age increases fertility decreases)
b. Biological children (the chance of having biological children can be jeopardized by waiting too long)
c. Demographic shift (reference to the sociodemographic trend of women waiting longer to have children than before)
d. Life is unpredictable (life can put unpredictable obstacles in the way of having children, including infertility)
e. Risks of advanced maternal age (having children later in life is associated with many medical risks (infertility, miscarriage, pregnancy complications, c-section, low birth weight etc)

Code 8: Technology (the uses and possibilities of EF as a technology for fertility)

a. Avoiding abnormalities (freezing oocytes is a good option to avoid abnormalities [birth defects, disabilities, etc.] in the future child
b. Clinic expertise (the clinic is made up of experienced experts with advanced training; clinic is reputable and at the cutting edge of tech and research)
c. EF leads to healthy pregnancy (pregnancy rates from EF are similar to fresh eggs; children born from EF are healthy and "normal")
d. Imitating biology (technology replicates nature or normal biology)
e. No longer experimental (SEF seems futuristic but is not considered an experimental technology)
f. Optimizing fertility (how to get/calculate ideal outcomes and the best chance of a pregnancy from SEF)
g. Popularity of SEF (EF is becoming more popular)
h. Technological progress (SEF has improved compared to the past; SEF is an exciting and successful technological development; SEF is continually improving)
i. Testing and techniques (descriptions of specific tests or techniques)

Code 9: Other (content that does not fit under other codes)

a. Alternatives to SEF (other medical and non-medical options if SEF does not work or is not right for the patient)
b. Freeze with other women (mention of the opportunity to freeze oocytes with other women)
c. Misc (miscellaneous content)

Code 10: Terminology (terminology used by websites to name the procedure)

a. Congélation des oeufs
b. Congélation d'ovules
c. Congélation d'ovules pour des raisons sociales
d. Cryoconservation des ovocytes

e. Cryopreservation
f. Egg banking
g. Egg freezing
h. Egg preservation
i. Egg storage
j. Egg vitrification
k. Elective egg banking
l. Elective egg freezing
m. Elective fertility preservation
n. Fertility preservation
o. Mettre en banque les ovules
p. Oocyte cryopreservation
q. Oocyte freezing
r. Oocyte vitrification
s. Préservation de la fertilité
t. Préservation d'ovocytes
u. Préservation élective de la fertilité
v. Social egg freezing
w. Vitrification des ovules

Appendix B: Frequency of Themes and Codes

Theme/code name	Number of websites	Percentage of websites
Buying time	28	93%
Freeze now family later	20	67%
Being ready	17	57%
Freeze fertility potential	11	37%
Incompatible timelines	9	30%
Backup to natural conception	5	17%
Downsides to SEF	18	60%
No guarantees	18	60%
Risks of SEF	6	20%
Side effects	6	20%
Time commitment	1	3%
Eggs	21	70%
Quality of eggs	17	57%
Precious eggs	6	20%
Eggs frozen indefinitely	5	17%
Abnormal eggs	3	10%
Eggs are your property	3	10%
Eggs are numbered	2	7%
Empathy	18	60%
Personalized service	14	47%
Peace of mind	9	30%
Your journey	4	13%
Exclusivity	2	7%
Making EF accessible	2	7%
Empowerment through autonomy	26	87%
Having options	20	67%
Being proactive	13	43%
Choice	13	43%
Informed choice	9	30%
Being your own egg donor	2	7%
On her own terms	2	7%
Reasons for EF	26	87%
Medical egg freezing	17	57%
No partner	16	53%
Career advancement	15	50%
Cancer	14	47%
Education	10	33%
Gender transition	6	20%
No sperm from partner	4	13%
Morally against extra embryos	4	13%
Workplace risks	4	13%

Lifestyle	3	10%
Also better for father and child	2	7%
Freeze for donation	2	7%
Life experiences	2	7%
Not women's fault	2	7%
Personal	2	7%
Tight finances	2	7%
Single mother by choice	1	3%
Risky future	29	97%
Age-related fertility decline	24	80%
Risks of advanced maternal age	8	27%
Demographic shift	6	20%
Life is unpredictable	5	17%
Biological children	2	7%
Technology	26	87%
Optimizing fertility	16	53%
EF leads to healthy pregnancy	15	50%
Technological progress	14	47%
Testing and techniques	12	40%
Avoiding abnormalities	8	27%
Clinic expertise	8	27%
No longer experimental	5	17%
Popularity of SEF	5	17%
Imitating biology	3	10%
Other	13	43%
Alternatives to SEF	8	27%
Misc	5	17%
Freeze with other women	1	3%

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