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Oocyte cryopreservation for social reasons: demographic profile and disposal intentions of UK users



Kylie Baldwin ^{a,*}, Lorraine Culley ^a, Nicky Hudson ^a, Helene Mitchell ^a,
Stuart Lavery ^b

^a De Montfort University, Applied Social Sciences, Hawthorn Building, The Gateway, Leicester, Leicestershire LE1 9HB, UK;

^b Hammersmith Hospital, Department of Reproductive Medicine, 3rd Floor Hammersmith House, Du Cane Road, London W12 0HS, UK

* Corresponding author. E-mail address: kbaldwin@dmu.ac.uk (K Baldwin).



Ms Kylie Baldwin received her Masters and Undergraduate degree from Leicester University, UK. She is a Lecturer in Health and Sociology at De Montfort University, Leicester UK, where she is completing her doctoral research which is an exploratory study of 'social' egg freezing. This manuscript is based on her work examining the female users of this technology.

Abstract A small number of studies from the USA and Europe have provided some data on the profile and characteristics of women who have undergone oocyte cryopreservation for what has been termed elective, social or non-medical reasons; however, little is known in a UK context about which women are undergoing oocyte cryopreservation or their reproductive intentions and actions after the procedure. Drawing on data from an exploratory study of 23 UK resident women who had undergone social oocyte cryopreservation, the demographic profile of these women, their reproductive intentions and actions are discussed, as well as their attitudes and intentions towards their cryopreserved oocytes should they never require them in treatment. The study found that, at the time of oocyte cryopreservation, women were on average 36.7 years of age, were university educated, with 65% of the sample holding further postgraduate or professional qualifications. Fifty-seven per cent of the participants were in professional employment. All participants identified as heterosexual and 87% were not in a relationship at the time of cryopreserving their oocytes. Most (88%) participants stated that they would donate unwanted oocytes to research or to other women for use in fertility treatment should they never require them. 

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Introduction

It has been estimated that since the year 2000 around 20 children have been born in the UK from previously cryopreserved eggs (Human Fertilisation and Embryology Authority, 2013, 2014). Oocyte cryopreservation was initially developed as a means to overcome some patients' ethical concerns with embryo cryopreservation, and to provide women with a means by which they could attempt to preserve their fertility when faced with an illness or medical treatment likely to render them infertile (Dondorp and De Wert, 2009). It has, however, increasingly been marketed to women for what has been referred to as 'non-medical' or 'social reasons' (Mertese and Pennings, 2011). This technology has been presented as offering women who are not yet ready to become mothers the option of preserving their fertility until such time as they wish to reproduce, thus providing the potential to enable women to achieve genetic motherhood at older ages (Dondorp and De Wert, 2009; Rybak and Liman, 2009).

Considerable media debate and extensive ethical commentary has taken place on this phenomenon (Dondorp and De Wert, 2009; Goold and Savulescu, 2009); however, little is known about the women who undertake oocyte cryopreservation for 'social' reasons. A recent review (Baldwin et al., 2014) found five peer-reviewed empirical studies of social oocyte cryopreservation (Martin, 2010; Stoop et al., 2011; Hodes-Wertz et al., 2013; Tan et al., 2014; Vallejo et al., 2013) only two of which (Hodes-Wertz et al., 2013; Vallejo et al., 2013) provided data on women who had actually undergone the procedure. These limited data suggest that women who make use of oocyte cryopreservation for 'social' reasons are generally highly educated, in professional employment, single and in their mid-to late 30s (Klein et al., 2006; Knoppman et al., 2008; Nekkebroeck et al., 2010, 2013; Sage et al., 2008).

The use of the term 'social' oocyte cryopreservation has been problematized by authors such as Stoop et al. (2014), who suggest that the use of the term 'social' indicates the absence of a medical indication in the decision to cryopreserve eggs. Instead, they suggest that the decision to cryopreserve oocytes, to protect against age-related fertility decline, should be recognized as a preventative medical treatment and propose the term oocyte cryopreservation for 'anticipated gamete exhaustion', which they suggest better reflects women's motivations for undergoing the procedure. No data, however, are available on the overall numbers of women opting for oocyte cryopreservation for the reason of 'anticipated gamete exhaustion' in the UK, although anecdotal evidence suggests that this treatment is growing in popularity. Moreover, little is known in a UK context about which women are undergoing oocyte cryopreservation or their reproductive intentions or actions after the procedure. In this paper, the demographic profile and disposal intentions of UK resident women who participated in an exploratory study of social egg cryopreservation are discussed.

Materials and methods

Data are drawn from a purposive, non-probability sample of 23 UK resident women who had undergone ($n = 22$), or were about to undergo ($n = 1$), oocyte cryopreservation for social

reasons. Participants were recruited from online fora ($n = 12$), from two British fertility clinics ($n = 7$) and through participant referrals ($n = 4$). All participants self-identified as having undergone oocyte cryopreservation for non-medical reasons. Although this was a qualitative study, sections of the data set were subjected to 'quantitative translation' (Boyatzis, 1998) to give a detailed profile of the sample, and these findings are reported here. Ethical approval was obtained from De Montfort University Human Research Ethics Committee on 1 November 2011 (REF 872).

Results

Demographic profile

At the time of undergoing the process of oocyte cryopreservation, participants were on average 36.7 years of age, with 61% of participants cryopreserving their oocytes between the ages of 36 and 39 years. Just over one-quarter (26%) were 35 years or under and 13% were between 40 and 44 years at the time of undergoing the procedure (Table 1). All participants were heterosexual, 87% were single and 13% were in relationships (Table 2). All were educated to degree level, most participants had postgraduate (39%) or professional (26%) qualifications, and 57% of the participants worked in professional or managerial roles. All were resident in the UK and most ($n = 20$) were of white ethnic origin.

Characteristics of oocyte cryopreservation cycles

Most (57%) participants in this sample underwent, or attempted, just one cycle of oocyte cryopreservation ($n = 13$), over one-quarter underwent a second cycle ($n = 6$) and a small number underwent three ($n = 3$) or four ($n = 1$) rounds of stimulation and oocyte retrieval (Table 3). As shown in Table 4, at the end of treatment, most women had between 11 and 16 oocytes cryopreserved, with the average number of oocytes stored being 13. The number of oocytes successfully collected, after one or several stimulation cycles, ranged from zero, owing to a failed cycle of treatment, to 34. Most women (86%) cryopreserved their oocytes in clinics and hospitals based in the UK, and the remaining three women underwent the procedure abroad (one in South Africa and two in Argentina).

Although the women identified themselves as cryopreserving their oocytes for 'social' reasons, the interviews revealed that, at the time of undergoing oocyte cryopreservation, five of the participants (22%) believed their fertility was threatened by an existing or potential medical condition that could reduce or compromise their ovarian reserve; these conditions included polycystic ovary syndrome, endometriosis, blocked fallopian tubes and the

Table 1 Age at undergoing egg cryopreservation.

Mean age	<35 years (%)	36–39 (%)	40–44 (%)	Range	Standard deviation
36.7	6 (26%)	14 (61%)	3 (13%)	32–44	2.66

Table 2 Participants demographic information.

	n	%
Relationship status at time of oocyte cryopreservation		
Single	20	87
In a relationship	3	13
Educational status		
Undergraduate degree	8	35
Postgraduate degree	9	39
Professional qualification	6	26
Occupational status ^a		
Professional and managerial	13	57
Intermediate	9	39
Self employed	1	4
Ethnicity		
White	20	87
Asian British: Pakistani	1	4
Asian British: Indian	1	4
Asian British: Chinese	1	4
Religious affiliation		
Christian	7	30
Jewish	2	9
Muslim	1	4
Catholic	1	4
No religion	12	52

^aDevised using National Statistics Socio-economic Classification (NS-SEC rebased on the SOC2010)' (Office for National Statistics, 2010): <http://www.ons.gov.uk/ons/guide-method/classifications/current-standard-classifications/soc2010/soc2010-volume-3-ns-sec--rebased-on-soc2010--user-manual/index.html>.

Table 3 Number of cycles of oocyte cryopreservation attempted.

Mean number of cycles	Number of cycles of oocyte cryopreservation attempted			
	One	Two	Three	Four
1.65	n 13 (%) 57	6 26	3 13	1 4

Table 4 Number of eggs frozen by participants.

Number of eggs cryopreserved	Number of participants
0	1
1-5	3
6-10	6
11-16	8
17-21	2
22-26	1
27+	2

awareness of an elevated risk of experiencing premature menopause or developing cancer in the future. These participants reported that the perceived risks to their future fertility associated with these conditions had influenced their decision to cryopreserve their oocytes.

Table 5 Time elapsed between oocyte cryopreservation and interview taking place.

Mean	<1 year n (%)	1-2 n (%)	3-4 n (%)	5 years + n (%)	Range
2.56 years	3 (13)	10 (43)	6 (26)	4 (17)	Less than 1 year to 7 years

Reproductive intentions and actions after oocyte cryopreservation

As shown in **Table 5**, some participants had undergone the process of cryopreserving their eggs several years before being interviewed. Several of these women had begun new relationships in that time and some had begun to pursue motherhood with their new partners. The reported reproductive decisions and intentions of the participants are presented in **Figure 1**.

At the time of the interview, only two women had used their cryopreserved oocytes in IVF treatment and one had successfully conceived a child from this treatment. A further two participants had gone on to have children; one woman conceived twins naturally and the second gave birth after a round of intrauterine insemination using donor sperm shortly after the cryopreservation of her eggs. Two participants who were single at the time of cryopreserving their oocytes had subsequently met new partners and were pregnant at the time of the interview, having conceived naturally. Eight of the participants stated they were still looking for a partner, a further three women were considering using donor sperm to have a child without a partner, and two further participants were in the early stages of pursuing this as a means to conceive. One participant was considering using her cryopreserved eggs to conceive with her partner and two women were intending on trying to conceive naturally with their partners in the near future. The remaining participant was due to complete the process of cryopreserving her eggs in the weeks after the interview.

Attitudes and intentions towards single motherhood via sperm donation

It was evident in all interviews that women felt that parenting should ideally be undertaken within a stable and committed relationship. For most women, despite the passage of time and the absence of a committed partner, this was still the desired outcome being actively sought. Two-thirds ($n = 10$) of those still without partners at the time of interview stated that they would consider using donor sperm to conceive in the future (**Table 6**). Of these 10 participants, one woman had already had a child conceived through donor sperm, two were preparing to begin fresh IVF treatment with donor sperm and three women were actively considering it as an option for the near future. The remaining participants stated that they were either unsure whether they would consider using donor sperm in the future ($n = 2$) or stated they would definitely not want to use donor sperm to conceive ($n = 3$). Various reasons for a reluctance to pursue single motherhood were given, including not wishing to bring up a child alone, not having

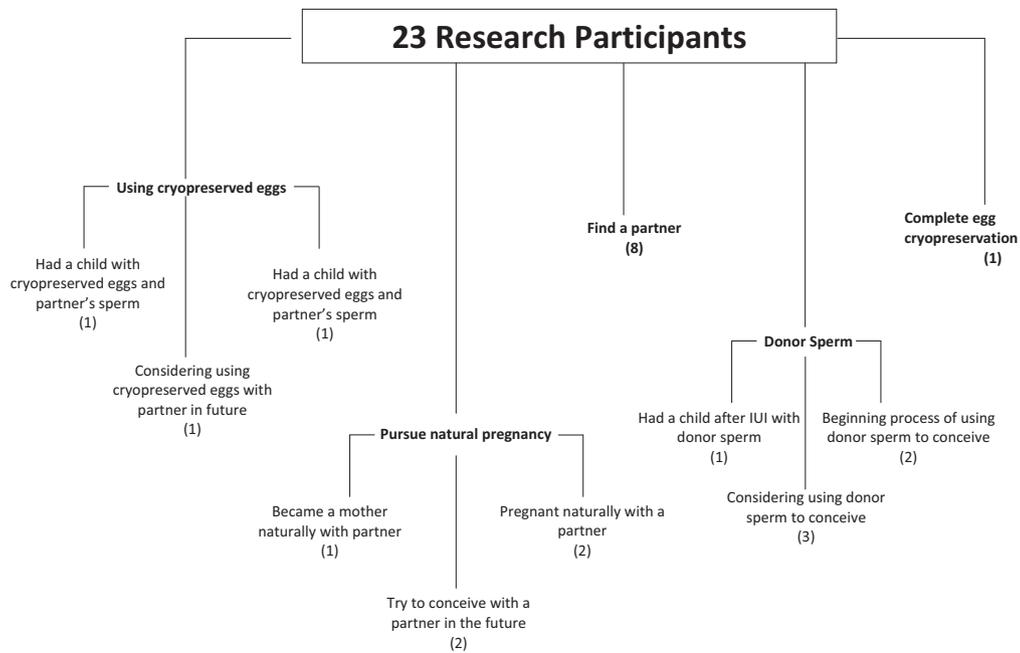


Figure 1 Reproductive decisions and intentions of the 23 research participants. IUI = intrauterine insemination.

Table 6 Would participants who were not yet in relationships consider single motherhood via sperm donation?

	Yes	No	Unsure	Total
n (%)	10 (67)	3 (20)	2 (13)	15

sufficient financial resources to do this and not having enough familial or other social support.

Disposal intentions

In addition to exploring the women’s current and future reproductive intentions, the interviews also sought to identify what women intended to do with their eggs should they never require them. Data were collected on this topic from 16 of the 21 participants who had eggs still cryopreserved for potential use. Of these 16 women, 14 stated (88%) that they would donate their unwanted eggs to research or to other women for use in fertility treatment. Two participants suggested they were unsure about what they would do with the eggs should they never require them (Table 7).

Table 7 Disposal intentions.

Donate to research or use in fertility treatment of others	6
Donate only to use in fertility treatment of others	5
Donate only to research	3
Unsure	2
Total	16

Discussion

Most participants in this study were single, highly educated women predominantly in professional and managerial careers at the time of oocyte cryopreservation. Higher educational qualifications, professional employment and single relationship status have also been found to be characteristics of women undergoing oocyte cryopreservation described elsewhere (Gold et al., 2006; Knoppman et al., 2008; Tsafirir et al., 2012). The age of the women in this sample at the time of their first round of oocyte cryopreservation ranged from 32 to 44 years, with the average age being 36.7 years. Most (61%) participants cryopreserved their eggs at the age of 36 or older, with 13% undergoing the process over the age of 40 years. This reflects findings from US studies and clinical audits that have found that women undergoing oocyte cryopreservation are usually in their mid- to late-30s (Klein et al., 2006; Knoppman et al., 2008; Sage et al., 2008; Hodes-Wertz et al., 2013; Vallejo et al., 2013). Currently it is suggested that the optimum time for women to undergo oocyte cryopreservation is before 35 years of age (Mertese and Pennings, 2011; Vallejo et al., 2013), and research suggests that the likelihood of achieving a live birth is lower for women over 35 years compared with younger women (Pelin et al., 2013). Furthermore, research from Borini et al., (2010), quoted in the guidelines from the American Society for Reproductive Medicine, has indicated that success rates of oocyte cryopreservation seem to be ‘significantly lower for women who cryopreserve or vitrify oocytes over the age of 38’ (ASRM, 2012, 5). It is, therefore, possible that some of the women in this sample, particularly those who underwent the procedure at an older age, may be unsuccessful in securing a live birth from their cryopreserved eggs. Several of the participants reported that, although they were unable to obtain age-specific success rates for oocyte cryopreservation, and were therefore unable to ascertain how successful the procedure was likely to be, they

had been given information by clinics about the possible outcomes of the procedure. Most had been told that more than one cycle may be needed to collect sufficient eggs for cryopreservation, and reported that they had been made aware that the use of cryopreserved eggs in future fertility treatment would not necessarily guarantee a conception or live birth.

Research suggests that the optimum number of fresh oocytes required to maximize a live birth when undergoing IVF is 15 (Sunkara et al., 2011). The participants in the present research had on average 13 oocytes cryopreserved for future use, with most of the women having between 11 and 16. Thirteen women underwent one round of oocyte cryopreservation, and 10 (43%) of the participants underwent multiple cycles of stimulation and retrieval. In their clinic-based interview study of 15 patients from one Belgian clinic, Nekkebroeck et al. (2010) also found that participants were willing to undergo several cycles of oocyte cryopreservation, on average 2.14 (± 0.36) times, to collect a sufficient number of eggs for storage.

Most women had not yet returned to use their cryopreserved eggs in fertility treatment; however, most of the participants had undergone oocyte cryopreservation within the last two years and, as such, were perhaps less likely to have yet considered using them to conceive. When asked about their intentions, all of the women stated that they would try to conceive naturally before using their cryopreserved eggs in fertility treatment. Several participants also stated that they would try to conceive through a fresh cycle of IVF before turning to their cryopreserved oocytes. Similar intentions towards using eggs were identified by Nekkebroeck et al. (2010).

For many of the participants, little had changed regarding their 'readiness' for motherhood in the time that had elapsed between cryopreservation of their eggs and the research interview. For most women, this 'readiness' consisted primarily of being in a stable relationship with a partner who they felt was committed to having a child. Fifteen of the 20 women who were originally single at the time of oocyte cryopreservation had still not found such a partner. Three of these unpartnered women, however, had begun to think about pursuing motherhood alone via sperm donation, two women had started this process of using donor sperm to conceive and one had already become a mother through sperm donation. The average age of these women was 38.5 years, and the demographic profile of these participants reflects the existing literature that has identified single women seeking conception via donor sperm as well-educated, financially secure and career-focused (Zadeh et al., 2013). Single women users of donor sperm have also been shown in other studies to be between 38 and 44 years of age (Murray and Golombok, 2005; Weissenberg et al., 2007; and Zadeh et al., 2013). In addition to the six women in this study who had begun thinking seriously about, or who had completed, the process of conceiving via donor sperm, a further four women indicated that they would consider using donor sperm in the future. For several of these women, conception via donor sperm using their fresh or cryopreserved oocytes was seen as a 'last case scenario', one which they would only consider if they were unable to find a partner with whom they could have a child. Although most participants did not have a specific time frame in mind for when they would consider turning to donor sperm,

several suggested that they would like to become a mother before the end of their forties.

It was not uncommon for the participants to rank the ways in which they would like to achieve motherhood. Conceiving naturally with a partner was the most desired means by which women sought to become a mother, whereas conceiving using donor material was seen as the least preferred method. A number of women commented that they felt they would 'need to' consider donor sperm as it may ultimately become the only option available to them. Murray and Golombok (2005) identified similar findings in their study of 27 single mothers through sperm donation, noting that 70% of the women felt they had 'no choice' but to have a child through donor conception because they were not involved in a relationship. Murray and Golombok (2005) also found that most of their participants reported that they would like to have a male partner in the future and hoped that they would eventually meet and settle down with someone. The women in this research who had either become mothers via sperm donation, or were intending to do so, also expressed similar hopes. Single motherhood was regarded as a temporary and second-best status. Furthermore, the desire to have a child as part of a relationship was the most common reason given by the five women who were opposed to, or unsure about, the use of donor sperm.

In addition to examining the participants' attitudes towards using donor sperm, this study also sought to identify what the participants intended to do with their oocytes should they not require them themselves in the future. Most (88%) stated that they would be keen to donate their unwanted oocytes either to research or to other women for use in fertility treatment. This supports the findings of Hodes-Wertz et al. (2013) that most (74%) of their 183 participants would be willing to donate their oocytes to research (63%) or the fertility treatment of others (11%). Nekkebroeck et al. (2010) found less willingness among their sample of 15 women to donate their eggs for use in the treatment of others (13.3%), but identified a willingness to donate to scientific research (46.7%). The fact that such a high percentage of participants in this study indicated that they would donate their eggs to others may be partially explained by the fact that, during the course of the interview, almost one-half of the participants disclosed awareness of friends, family, or both, who had encountered difficulties conceiving. It may be that this, coupled with their own experience of oocyte cryopreservation, sensitized these women to the emotional pain and suffering of unwanted childlessness and thus made them more inclined to donate their eggs.

Although several women expressed a willingness to donate their unwanted eggs to the fertility treatment of others, the upper age limit as set by the Human Fertilisation and Embryology Authority (2013, 2014b) for such donation is 35 years (<http://www.hfea.gov.uk/egg-donation-and-egg-sharing.html>). Therefore, although 11 women expressed an interest in donating their unwanted eggs, only three of them would be eligible to do so owing to their age at the time of cryopreservation. Although these findings about the donation of eggs are interesting, it is important to note that these are the current intentions of these women. Some women will not be in a position to relinquish their eggs for several years, based on their current intentions, during which time their views and attitudes to donation may change.

Finally, although all of the women who took part in this study identified themselves as undergoing egg cryopreservation for 'social' reasons, five of the participants disclosed that, at the time of cryopreservation, they were aware that their fertility may already be compromised, or may be compromised in the future, by a medical condition such as polycystic ovary syndrome or endometriosis. This suggests that a clear distinction between 'social' and 'medical' reasons for oocyte cryopreservation may be problematic. There may be a range of influences on women's decisions to cryopreserve oocytes and, in some cases, medical concerns are combined with broader social factors.

Limitations and strengths of study

The limitations of this study include the small size of the sample as well as the self-selection of the participants. The women in this study, however, were recruited through a number of different sources and demonstrate a diversity of experiences and timing of undergoing the procedure. Furthermore, as no data are currently available on the number of women opting for oocyte cryopreservation in the UK, the findings of this study should be interpreted as indicative, rather than representative, of the experiences of women undergoing this procedure.

Conclusions

Women are now making use of oocyte cryopreservation treatment across Europe, Oceania, Asia, North America for what has been referred to as non-medical or social reasons, and it is anticipated that demand for this treatment will continue to grow (Bernstein and Wiesmann, 2012). To date, little is known about characteristics of oocyte cryopreservation patients, their experience of oocyte cryopreservation or their future reproductive intentions. In this paper, some initial data from a British perspective has been provided, and it has been shown how oocyte cryopreservation is something that women are engaging in most often when they are single and at a time when their fertility is likely to have already been compromised by their age. The findings also suggest that the distinction between oocyte cryopreservation for 'medical' and 'non-medical' reasons may be difficult to sustain when examining women's motivations for oocyte cryopreservation, and suggest that future research and discussion about oocyte cryopreservation should not use these terms uncritically.

Although the participants sought to become mothers as part of a committed relationship with a male partner, this study found that some women were open to the option of family building through the use of donor sperm but regarded this as a 'last case scenario' that they would only pursue if they were unable to find a partner. Many of the women who underwent oocyte cryopreservation indicated a willingness to donate their cryopreserved oocytes to research or the treatment of others should they never require them themselves. Further clinic studies are needed to develop this emerging profile of 'social' oocyte cryopreservation patients in the UK.

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