Egg freezing and egg banking: empowerment and alienation in assisted reproduction

John A. Robertson*

Vinson & Elkins Chair in Law, University of Texas School of Law, 727 East Dean Keeton Street, Austin, TX 78703.

Corresponding author. E-mail: jrobertson@law.utexas.edu; Tel: +512-232-1307

ABSTRACT

With the development of rapid freezing of human oocytes, many programs have reported IVF success rates comparable to those achieved with fresh eggs and thawed frozen embryos. Egg freezing is now gaining professional and regulatory acceptance as a safe and effective technique for women who wish to avoid discarding excess embryos, who face fertility-threatening medical treatments, or who want to preserve their eggs for use when they are better situated to have a family. This article focuses on the uses of and justification for egg freezing, the path to professional acceptance, the variability in success rates, and the controversy over freezing eggs for social rather than medical reasons. It also addresses the emergence of egg banking as a separate sector in the infertility industry, the regulatory issues that it poses, and its effect on egg donation. Key here is the legal control of stored eggs by banking women and their options when they wish to dispose of those eggs. The analysis is framed around empowerment and alienation. Egg freezing is generally empowering for women, but the donation or sale of unused eggs to infertile women, egg bankers, and researchers also raises issues of alienation.

* John A. Robertson holds the Vinson & Elkins Chair at The University of Texas School of Law at Austin. He is the author of two books in bioethics—The Rights of the Critically Ill (1983) and Children of Choice: Freedom and the New Reproductive Technologies (1994)—and numerous articles on reproductive rights, assisted reproduction, embryo screening, organ transplantation, and other bioethical issues. He is a Fellow of the Hastings Center and served as Chair of the Ethics Committee of the American Society for Reproductive Medicine. The author thanks Cary Franklin, Glenn Cohen, and two reviewers for comments on an earlier draft, and Casey Duncan and Joe Noel for research assistance.

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INTRODUCTION

Mastery of the human reproductive process took another step forward in January 2013 when the American Society of Reproductive Medicine (ASRM) announced that oocyte cryopreservation was no longer experimental.\(^1\) Several clinics in Europe and the United States had reported births since 2000, and many programs were offering it without reliable evidence of efficacy. Until January 2013 the ASRM had called the practice ‘experimental’ because the birth rate after thawing and insemination of frozen eggs was not as high as the birth rate from fresh or frozen embryos.\(^2\)

Professional recognition of the non-experimental status of oocyte cryopreservation is a noteworthy step in the history of assisted reproduction.\(^3\) With an already existing matrix of laws and practices for assisted reproductive technologies (ART), egg freezing will raise novel questions of ownership and disposition of stored eggs.\(^4\) The technology will also expand reproductive freedom in several important ways, particularly for women facing cancer treatment, wanting an egg donor, or seeking to preserve fertility against the ravages of time. Those who argue that the field is under regulated will find a counterexample of sorts. If nothing else, it offers freezer parity for male and female gametes.

Empowerment through reproductive technology is usually a double-edged sword. Egg freezing is no exception. While it empowers women in some respects, it creates unwanted pressure and alienation in others. Those who gain the most may be the egg sellers and entrepreneurs who have emerged to fill—and create—the market demand for egg freezing. To illustrate these points, this article maps the developments in egg freezing, and shows how this evolving field is affected by and in turn may affect reproductive practices. As such, it may guide practice and policy for egg freezing and future reproductive innovations.

Part I explores the history of egg freezing technology. Part II discusses the moral, medical, and social options that egg freezing offers to women. Part III examines how a market in frozen eggs might develop, though originally intended for personal use only. Part IV looks at the effect of egg freezing on egg donation for infertility and research. Part V comments on the problem of moving innovative therapies into a regulatory setting, usually through professional society guidelines. Part VI concludes by showing

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1. Practice Committees American Society of Reproductive Medicine (ASRM) and the Society for Assisted Reproductive Technology, *Mature Oocyte Cryopreservation: A Guideline*, 99 Fertil. Steril. 37 (2013). The ASRM is the professional organization of fertility providers.

2. In the United Kingdom the Human Fertilisation and Embryology Authority (HFEA) had first licensed a clinic to do egg freezing in 2001. By 2013 over 40 clinics were licensed, but the HFEA patient information sheet on egg freezing noted that ‘egg freezing is still a very new and experimental technique.’ Only 15–20 babies have been born in the UK of the 900 births reported worldwide.

3. The sentinel events in the history of assisted reproduction were the 1978 birth of Louise Brown and the development of embryo freezing in the mid-1980s. Howard W. Jones, Jr. & Roger G. Gosden, *Obituary, Professor Sir Robert Edwards, 1925–2013*, 99 Fertil. Steril. 1799 (2013).

4. Muireann Quigley, *Property in Human Biomaterials—Separating Persons and Things?*, 32 OJLS 659 (2012) (her argument for a property interest in sperm would extend logically to a woman’s property interest in her eggs, until voluntarily relinquished to another).
how new reproductive technologies are shaping the meaning of reproduction even as existing attitudes and sex roles influence those uses.

THE FREEZING ART: MOVING EGG FREEZING INTO THE MAINSTREAM

To understand the importance of egg freezing, one must first recall the problems with getting eggs, the difficulty in freezing and thawing them, and the variable success rates of clinics engaged in the practice. The role that the ASRM has played in this story is deferred to the end.

A brief history of egg freezing

Getting eggs, unlike sperm, has always posed special problem because of their relative scarcity and location in the body. Although a woman is born with the maximum number of eggs that she will ever have, they are lost as she ages. The ability to hyperstimulate ovaries and then surgically retrieve multiple mature oocytes has been a driving force in the take-off of IVF and assisted reproduction. It has also made egg donation to infertile women and gestational surrogacy viable, as well as donation to researchers, and eventually for clinical use in regenerative medicine.5

Sperm and embryos have long been frozen, often for lengthy periods, and then after thawing used successfully to initiate pregnancy.6 Because of their larger size and volume of fluid, oocytes were not easily frozen and thawed. A slow freezing technique was tried first in the laboratory, and then with women who lacked other healthy embryos, but success was mixed compared to use of fresh or frozen-thawed embryos. Crystals would form and interfere with meiotic spindle segregation in metaphase 2 of the oocyte development.

A few ART programs in Italy (where legal constraints on discarding or freezing embryos gave incentives for investigation of egg freezing) eventually developed vitrification, a method of flash freezing to −270 F with a glycol cryoprotectant, which prevented the crystallization and meiotic disruption that had made slow freezing so unreliable.7 When the eggs were warmed and then a single sperm injected into cytoplasm

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5 Donation for research has taken on new importance with the possibility of creating patient-tailored stem cells or replacement tissue by somatic cell nuclear transfer from the patient to enucleated human oocytes. Masahito Tachibana et al., Human Embryonic Stem Cells Derived by Somatic Cell Nuclear Transfer, 153 Cell 1228 (2013).

6 Freezing sperm first took hold in the cattle breeding industry in the early 20th century. Although experimentation with human sperm began in the 1930s, the first children conceived with frozen and thawed sperm were born in 1953. Those efforts grew out of the need for men to freeze their own sperm as protection against future illness, and only later for male factor infertility. Kenneth R. Daniels, The Semen Providers, in DONOR INSEMINATION: INTERNATIONAL SOCIAL SCIENCE PERSPECTIVES 76–104 (Kenneth R. Daniels & Erica Haimes eds., 1998). See also, WALTER E. DUKA & ALAN H. DeCHERNEY, FROM THE BEGINNING: A HISTORY OF THE AMERICAN FERTILITY SOCIETY 1944–1994 (1995). See also Andras Z. Szell et. al, Live Births from Frozen Human Sperm Stored for 40 Years, 30 J. Assist. Reprod. Gen. 743 (2013).

7 The law banned embryo discard, fertilizing more than three eggs, and freezing embryos, thus requiring that all fertilized eggs be placed in the uterus. Egg freezing would enable women to comply with the law without having to undergo another cycle of IVF. John A. Robertson, Protecting Embryos and Burdening Women and Infertile Couples: Assisted Reproduction in Italy, 19 Hum. Reprod. 1693 (2004). In 2009, the Italian Constitutional Court ruled that these limitations interfered with the woman’s right to the safest and most effective infertility treatment. Paolo Emanuele L. Setti & Pasquale Patrizio, The Italian Experience of A Restrictive IVF Law: A Review, 2 J. Fertiliz. In Vitro e109 (2012); Giovanni B. La Sala et al., The 2004 Italian Legislation on the Application of Assisted Reproductive Technology: Epilogue, 161 Eur. J. Obstet. Gynaecol. Reprod. Biol. 187 (2012).
Egg freezing and egg banking

(intracytoplasmic sperm injection (ICSI)), higher success rates occurred. The technique soon spread to the United States and Europe. With mounting data on live-births after vitrification, the ASRM announced that egg freezing and thawing are no longer experimental in younger, highly selected populations for particular purposes.\(^8\)

The variability of skill in egg freezing

Despite the ASRM’s pronouncement that oocyte cryopreservation is no longer ‘experimental’ for several uses, programs vary in their skill and success rate in the art of freezing. The larger and more experienced programs will have success rates comparable to the use of fresh or frozen embryos, said to be 30–50% per frozen-thawed egg, but few programs without considerable experience score that high. Indeed, of the 50% of the U.S. ART programs that report offering oocyte cryopreservation, over 50% of them have never thawed and inseminated frozen eggs and had live births thereafter.\(^9\)

As with other medical technologies, it is easy for practitioners to claim comparable expertise without showing comparable results. The careful consumer will closely parse the numbers and pick only programs with well-established success rates. Until more programs become adept at vitrification and thawing oocytes, caveat frigidaire.

PART II. MORAL, MEDICAL, AND SOCIAL USES OF EGG FREEZING

The ASRM’s pronouncement of non-experimental status for egg freezing empowers women in various ways, but it also risks selling them an ineffective service, particularly if they are in their mid-thirties or older, when their eggs will have already aged considerably. It may also distance them from the meaning of producing the female germ cells so necessary for reproduction by breaking the bond that exists between women as producers and consumers of their body’s reproductive inputs, thus raising the commodification issues that weave though the ethics of assisted reproduction.\(^10\) In addition, The ASRM’s approval of egg freezing empowers fertility programs and independent egg freezing firms with a new profit center and incentives to market that service. This section and the one following addresses these uses and comments on how egg freezing links empowerment and alienation in women producing eggs for freezing.

Freezing eggs when moral objection to freezing embryos

Egg freezing is a clear advantage for those couples undergoing IVF who have qualms about freezing embryos but few about freezing eggs. The ‘qualms’ might be specifically moral, or they may reflect a more general concern about not having too many embryos left in the freezer.\(^11\) For either group egg freezing is empowering. They will be able to avoid the risk of reduced efficiency from an IVF cycle due to their reluctance to discard embryos or to have too many leftover. Instead of limiting the number of eggs inseminated to those that they would transfer to the uterus (discarding the extra eggs or not retrieving them at all), now they may retrieve all eggs, inseminate only the number

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\(^8\) Practice Committees, supra note 1. Its blessing, however, did not extend to freezing for social reasons. See infra notes 91–8 and accompanying text.

\(^9\) This is due in part to lack of requests by the women thawing eggs to do so.

\(^10\) I. G. Cohen presents a useful overview of these issues. I. Glenn Cohen, Note, The Price of Everything, The Value of Nothing: Reframing the Commodification Debate, 117 Harv. L. Rev. 689 (2003).

\(^11\) As one reproductive endocrinologist put it, the husband of a patient ‘didn’t want a lot of embryos left laying around in the freezer.’ Personal communication with the author.
that can be safely transferred, and freeze surplus eggs for later thawing and use.\textsuperscript{12} If the stored eggs were no longer needed, they could be discarded without the ethical frisson of discarding frozen embryos.\textsuperscript{13}

The catch in this approach is that there is no guarantee that the eggs chosen to be thawed and inseminated will yield the desired number for safe transfer and pregnancy, thus not providing the safety net they sought. The attraction to egg freezing is that if the first transfer is unsuccessful, they will not have to undergo another stimulation and retrieval cycle to obtain more eggs. They can simply thaw and inseminate the number they wish to transfer. There would be the additional cost in freezing and thawing eggs, but if a comparable success rate will be achieved, the price to the patient would be worth it.

While empowering IVF patients with strong moral compunctions about embryo discard, egg freezing also opens the door to state disempowerment of patients with no such compunction. As right to life groups become more aware of ART practices with fertilized eggs and embryos, which under their ethos are new persons who must be protected, they may support laws similar to those passed in Italy that limit the number of embryos that can be created at one time and require that all embryos be transferred to the uterus. With extra eggs frozen and available for later thawing and insemination, such laws would limit the number of discarded embryos while, if the technique is effective, they would present no substantial interference with the efforts of an infertile couple to have a family.

Without the Vatican in the vicinity, the political clout or inspiration to pass such disempowering laws in the United States may be absent.\textsuperscript{14} Many people will view IVF as too far removed from abortion to spur legislation, particularly legislation that limits the ability of infertile couples to have families. Nor would such limitations automatically follow from the state personhood amendments which periodically threaten but have not yet been passed. Despite popular belief, merely defining the fertilized egg as a person under state law would not directly say what must be done with embryos outside of the body.\textsuperscript{15}

To carry the discussion of constitutional issues a bit further, assume, however, that the state legislated directly to limit the number of eggs fertilized to the two or three

\textsuperscript{12} The number of eggs they fertilized might be limited to the number that could be safely transferred to the uterus to prevent multiple births. Practice Committees, Society for Assisted Reproductive Technology & American Society for Reproductive Medicine, Elective Single Embryo Transfer, 97 Fertil. Steril. 835 (2012).

\textsuperscript{13} This option has special importance in countries that limit the number of embryos that can be transferred at one time, and prohibit freezing to prevent discard of unwanted embryos. Germany has finessed this limit by allowing the freezing of inseminated eggs at the pronuclear stage (before syngamy or the merging of the haploid genomes of sperm and egg has occurred). John A. Robertson, Assisted Reproductive Technology in German and the United States: A Comparative Essay in Law and Bioethics, 43 Colum. J. Transnat’l L. 187 (2004). For the Italian experience see supra note 7.

\textsuperscript{14} Whether Pope Francis retrenchment on abortion and other social issues will temper a drive among Catholics to save every embryo remains to be seen. L. Goodstein & J. Yardley, Pope Says Church Is ‘Obsessed’ With Gays, Abortion and Birth Control, New York Times, 20 September 2013, at A1.

\textsuperscript{15} Personhood for the embryo/fetus would not automatically limit abortion or embryo discard, because the personhood interests of the fetus/person would have to be reconciled with the personhood and liberty interests of infertile or pregnant women. Judith J. Thomson, The Problem of Abortion, 1 Philos. Public Aff. 47 (1971). In this case it would not automatically determine which egg fertilization practices were acceptable or whether, given the risks to health and children of multiple births, that all IVF embryos should be transferred to the woman’s uterus.
that could be safely transferred to the uterus at one time, and required that all fertilized eggs be placed in the uterus.\textsuperscript{16} The purpose of such a law would be to reduce the chance that more embryos would be created and frozen, thus leading to their eventual death by discard or removal from storage. This justification would draw on the recognition in \textit{Roe v. Wade} (and \textit{Casey} and \textit{Gonzalez} thereafter) that the state may protect prenatal life and potential personhood prior to viability as long as it did not substantially burden the core right to abortion.\textsuperscript{17} Since the embryos are not in the body, embryo protection laws would not fall under the abortion right recognized in \textit{Roe}.\textsuperscript{18}

But such laws could limit the safety, efficacy, and cost of IVF to such an extent that it interfered with a woman’s right to use IVF to have a family. While not yet recognized as such by the Supreme Court, many scholars would argue that that right is founded in a more general privacy or liberty right to have a family, and not a right to terminate a pregnancy as such.\textsuperscript{19} On this view a law limiting the number of eggs fertilized, requiring that all be transferred to the uterus, and prohibiting freezing embryos would appear to be a substantial burden on that right.\textsuperscript{20} Yet if egg freezing is no longer experimental, the state could argue that eggs not fertilized could be frozen and inseminated at a later time, without having to go through another hyperstimulation and retrieval cycle does not burden or infringe the right at all.

As we will see in Part IV, the ‘non-experimental’ label is a misnomer of sorts. Yes, some programs have very good success rates after thawing and insemination, while others have had limited or no experience with egg freezing even though they offer it. Favorable success rates have usually occurred with younger, healthier women and not older women or those whose fertility problems are related to egg quality. Given the uncertainties of whether the—two or three eggs inseminated will cleave and reach the stage appropriate for transfer, limiting the number of eggs inseminated with no option to inseminate more and freeze the extra embryos might mean that a woman ends up without enough viable embryos from that cycle to achieve pregnancy. She would then have to go through another costly and burdensome stimulation and retrieval cycle. Until egg freezing were a comparable effective substitute for embryo freezing, such a policy would arguably so burden the woman’s freedom to reproduce as to be unconstitutional.

This argument assumes that close or substantial comparability of efficacy would be required for a law limiting the number of eggs inseminated to be constitutional.

\textsuperscript{16} While there is a strong movement to single embryo transfer to cut down on the number of multiple births, ASRM guidelines permit a maximum of three for women over 37 or those with special indications. Practice Committee, Society for Assisted Reproductive Technology and American Society for Reproductive Medicine, \textit{supra} note 12.

\textsuperscript{17} \textit{Roe v. Wade}, 410 U.S. 113 (1973); Planned Parenthood of Southeastern. Pa. v. Casey, 505 U.S. 833 (1992); \textit{Gonzales v. Carhart}, 550 U.S. 124 (2007).

\textsuperscript{18} With the Supreme Court’s recognition of a right to avoid reproduction by use of contraceptives (\textit{Griswold v. Connecticut}, 381 U.S. 479 (1965)), and a right not to reproduce once pregnant (\textit{Roe v. Wade}), one could argue that a right not to have one’s embryos or gametes used against one’s will would also follow. In that case, a right to discard embryos to avoid genetic reproduction \textit{tut court} would follow regardless of their location outside of the woman. \textit{See John A. Robertson, Children of Choice: Freedom and the New Reproductive Technologies} (1994); I. Glenn Cohen, \textit{The Right Not to Be a Genetic Parent}, 81 S. Cal. L. Rev. 1115 (2008).

\textsuperscript{19} See Robertson and Cohen, \textit{supra} note 18, and Radhika Rao, \textit{Equal Liberty: Assisted Reproductive Technology and Reproductive Equality}, 76 Geo. Wash. L. Rev. 1457 (2008).

\textsuperscript{20} John A. Robertson, \textit{Assisting Reproduction, Choosing Genes, and the Scope of Reproductive Freedom}, 76 Geo. Wash. L. Rev. 1237 (2008).
Egg freezing and abortion restrictions

Recent circuit court cases on abortion restrictions, such as the constitutionality of hospital privileges requirements and following the FDA label for medical abortions, indicate otherwise. The 5th Circuit in a recent Texas case refused to uphold the preliminary injunction issued by the district court simply because the law at issue made abortion more expensive or harder to access, on them ground that the situations before and after the new restrictive law.\(^1\) If the Supreme Court applies this more lenient standard to abortion laws, it is likely to do so for laws that interfere with infertile couples having children by restricting the number of eggs inseminated or embryos transferred.

Egg freezing also enhances freedom for women undergoing cancer treatment who want to preserve their fertility. If they had a spouse or partner, they could undergo a stimulation and retrieval cycle, create embryos, and freeze them for later use. They could do the same without an available partner, if they were willing to use donor sperm to create embryos. This would ensure them genetic offspring, but with an absent sperm donor father. If they lack a partner and willingness to use a sperm donor, egg freezing would be empowering because it both protects their fertility and gives them choice over the genetic father of their post-treatment children.\(^2\) A similar need might arise with women with genetic diseases or other conditions, such as premature ovarian failure, who had not yet found a partner but wanted to ensure they had healthy eggs at a later point in their life for reproduction.

None of these choices, however, are simple or easy. Offering egg freezing to cancer patients involves the disadvantage of needing a controlled stimulation cycle to harvest eggs, which delays chemotherapy and may lead to high patient estrogen levels. While exposure to more estrogen is generally not a good idea for estrogen sensitive breast cancers, the amount of exposure during one retrieval cycle might not be so great as to counterindicate it.\(^3\) With the time interval between diagnosis and the start of treatment varying among malignancies, not all patients will be able to choose this option. The controversy among clinicians, especially oncologists, about the risk of high estrogen levels might lead some clinicians and patients to attempt single egg retrieval in a natural cycle or immature oocyte retrieval with in vitro maturation of early stage oocytes.\(^4\)

Information is sparse about whether women who have used this option have been able to successfully preserve their fertility, mainly because so few have attempted pregnancy with thawed eggs after treatment. But a few babies have been born, and as long as treatment is not unduly delayed and ovarian stimulation is not contraindicated, few

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21 These holdings grow out of Gonzales v. Carhart, 550 U.S. (2007). See Planned Parenthood of Greater Texas Surgical Health Services v. Abbott, 734 F.3d 406 (5th Cir. 2013); Planned Parenthood of Greater Texas Surgical Health Services v. Abbott, 571 U.S. … (2013) (Application to Vacate Stay Denied).

22 It would also avert post-divorce or death controversies over custody or dispositional control over un inseminated frozen eggs. If married the husband might have a claim to them as part of the estate, but in other cases it would depend on the terms of a will or intestacy statute. The right of a father to make a gift to his lover of frozen sperm at death was upheld despite the objections of two living children. See Hecht v. Super. Ct., 20 Cal. Rptr. 2d 275 (Ct. App. 1993).

23 Anna Cobo et al., Is Vitrification of Oocytes Useful for Fertility Preservation for Age-Related Fertility Decline and in Cancer Patients?, 99 Fertil. Steril. 1485 (2013). However, the time and amount of exposure may be too limited—one cycle—to make this a nonviable option for women with estrogen sensitive cancers.

24 Id.
would argue against this option. The risk that it might lead to children whose mother dies from a recurrence of the cancer is not a sufficient ground not to proceed.\textsuperscript{25}

**Social uses: egg freezing as in-kind insurance against later infertility**

Egg freezing has also been touted as a way to provide women who are still fertile with insurance against their biological clock. Women in their twenties or early thirties will be able to devote themselves to career without losing reproductive potency. By freezing eggs they will still have healthy eggs available for when they are ready to start a family. Rescheduling motherhood in this way does sound empowering, but again nothing is as simple as it sounds.

Imogen Goold and Julian Savelescu and others have articulated the general case for non-medical or social egg freezing.\textsuperscript{26} Most important for them is that ‘egg insurance’ against future infertility will enable equal participation in employment, allow women time to find a compatible partner, and enable them to postpone pregnancy until they are emotionally and psychologically ready to have a child. Assuming safety and efficacy, they view the benefits as outweighing whatever costs there are.\textsuperscript{27}

Their arguments are generally persuasive but need to be broken down into the differing perspectives that different age groups of women will bring to egg freezing. The equal participation in employment argument emphasizes the importance of enabling women to obtain an education and invest in career without losing the opportunity to have children. A more desirable approach to this dilemma, of course, would be to change traditional employment models so that women do not face restrictions from time off for child-bearing and rearing. Egg freezing is no substitute for those efforts, but it may provide some women with reassurance that they can commit themselves to education and work without losing their fertility.\textsuperscript{28}

Many women will find egg freezing empowering beyond matters of education and the workplace. With marriage and children such a dominant cultural narrative for women, they may be more concerned about their relational status, their ability to find a suitable mate, and whether they are emotionally and psychologically ready for children. This pressure weighs even heavier if they are at risk for premature ovarian failure or other medical conditions that will limit their supply of healthy eggs.

\textsuperscript{25} See John A. Robertson, *Cancer and Fertility: Ethical and Legal Challenges*, 34 J. Nat’l Cancer Inst. Monograph 104 (2005).

\textsuperscript{26} Imogen Goold & Julian Savelescu, *In Favor of Freezing Eggs for Non-Medical Reasons*, 23 Bioethics 47 (2009); Imogen Goold & Julian Savelescu, *Freezing Eggs for Lifestyle Reasons*, 8 Amer. J. Bioethics 32 (2008); Gillian M. Lockwood, *Social Egg Freezing: the Prospect of Reproductive ‘Immortality’ or a Dangerous Delusion*, 23 Reprod. Biomed. Online 334 (2011); W. J. Dondorp and G. M. W. R. De Wert, *Fertility Preservation for Healthy Women: Ethical Aspects*, 24 Hum. Reprod. 1779 (2009); ESHRE Task Force on Law and Ethics, *Oocyte Preservation for Age-Related Fertility Loss*, 27 Hum. Reprod. 1231 (2012).

\textsuperscript{27} Goold and Savelescu, Bioethics, supra note 26. They assert that ‘high rates of defects and low rates of conception are no longer a basis for preventing access to egg freezing,’ but theirs is a blanket statement and is not calibrated to the benefits and risks for particular age groups, as the ASRM apparently has. Another advantage in using previously frozen younger eggs is reduction of the chromosomal anomalies which increase with age. There may also be some degree of moral hazard. Women might think that they can be complacent about declining fertility until their 30s when it would be wiser to freeze in their 20s and in any case avoid other threats to fertility.

\textsuperscript{28} Goold and Savelescu frame it as a form of ‘reproductive affirmative action’ to ensure that more women attain positions of accomplishment and authority, pending these other changes. Id. at 49.
Age group differences will arise with both careerist and relational concerns. To ensure the greatest fertility, it would be best for women to freeze their eggs in their early or late 20s. At this point many women—but not all—would usually have completed their education and started a career. If they have not yet had children, and have no partner or immediate plans to do so, banking eggs would appear to enable them to live their lives without the biologic clock ticking so loudly in their ears. Also, since health insurance is not likely to cover egg freezing until its efficacy is much better established, some of them might have the resources to cover the costs of thawing, insemination, and caring for a child. Yet the optimism bias of the relatively young may make the risk of future infertility seem quite distant. Surely, they say to themselves, they will find a man and settle down in the next few years, so why undergo the intrusion and cost of egg freezing? Only the most risk averse or those with a yen for the latest technological fix, may be willing to take the hormones and pay out cash for the ‘egg insurance’ that they may never need to cash in.

The early twenties’ perspective on ‘egg insurance’ may start to shift in their 30s. Women in this cohort may become acutely aware of the loss that they will experience if they postpone conception too long. If they are not in a relationship conducive to having children, a cold look at the facts may lead them to stock the egg freezer. As they slip into their late 30s, the internal pressure to freeze eggs will grow. At this point egg freezing may still their anxiety and allow them to get their workplace, relational, or psychological states in order. Yet freezing post-35 may not give them the fertility they hope for, if only because the viability of their eggs will also have diminished.

Preferences here will vary with the importance of having children with their own eggs versus that of a donor and the varying degrees of reliability of actually producing children with different techniques. Egg freezing for teenagers and those in their 20s is the most likely to be successful but the least likely to be needed (stimulation and retrieval, not to mention cost, is hardly trivial). For women in their late 20s or early 30s, one alternative would be to do a retrieval cycle, freeze some of their eggs, and inseminate some with donor sperm and then freeze those embryos. When they are ready to reproduce with a partner, they can thaw the frozen eggs and try with those. If that doesn’t work and donor sperm is acceptable to them, they can use the previously frozen donor sperm inseminated embryos. Or they could use a donor egg and their partner sperm, and if no partner, an egg and sperm donor (or already created embryo). The same would go for women who freeze after 35—freeze some eggs and create embryos with donor or partner sperm, and then when ready for children, use the frozen eggs and then

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29 The maximum age for fertility would be in their teens, but this may be too early for young women, who may be barely mature themselves, to make this decision. Also, it risks being unnecessary since some of them will have had children before the 30s when age-related fertility sets in.

30 This will depend on costs, insurance coverage, and their personal resources at that time in their life. This will vary widely depending on insurance coverage bought under the Affordable Care Act. The minimum coverage required does not cover infertility services, though some exchange-based and employer-based plans might cover some aspects of assisted reproduction, even if they do not directly cover IVF cycles, egg donation, or egg freezing and other novel techniques whose safety, efficacy and moral acceptability may still be in doubt. Kenan Omurtag & G. David Adamson, *The Affordable Care Act’s Impact on Fertility Care*, 99 Fertil. Steril. 3 (2013).

31 The relevant number here would be to compare the fertility (in terms of having children) of those in the mid and late 20s with those in their mid and late 30s.

32 See I. Glenn Cohen and Eli Adashi, NEJM and John A. Robertson
frozen embryos. If none of those work, then they still have the option of using donor eggs with partner or donor sperm (or buying an already created frozen embryo).

Sarah Elizabeth Richards, a strong proponent of freezing eggs, ignores in her fervency the lower success rate with freezing eggs after 35 or these other options for motherhood. Her 2013 book ‘Motherhood Rescheduled: The New Frontier of Egg Freezing’ and other writings present egg freezing as a ‘culture narrative shift’ that allows women to ‘reschedule’ their motherhood through technology. One is struck, however, by how she oversells the technology as relief from the angst of finding the right mate and having children.

Richards begins one op ed (‘Why I Froze My Eggs (and You Should, Too’) recounting how between the ages of 36–38 she spent $50,000 of her savings to freeze 70 eggs in the hope that they would help her have a family in her mid-40s when she would be ready with a mate. For Richards it was ‘the best investment she ever made, because it stopped the deep sadness that without a reliable partner she was losing her dream of being able to have children.’ Egg freezing snapped away the ‘punishing pressure to seek a new mate’ before she was ready. It was ‘the most powerful gender equalizer of all—the ability to control when to have children.’ Just as men in their 40s (or even later) could have children, she could too.

Here’s the rub. $50,000 for egg freezing at 37 is an expensive and probably ineffective way to quiet the ticking fertility clock. If a woman is listening carefully, this move will only lessen the thrum, not quiet it altogether because the viability of late-30s eggs is much less than that of eggs frozen in one’s 20s or even early 30s. (They can also buy solace at a lesser price than Richards paid). None should think this form of insurance will cash out with the child that they want. With or without egg freezing they will be able to bear and rear children, though perhaps not with the genetic tie that egg freezing provides.

The rescheduling motherhood narrative, so empowering for some, might be disempowering for others. Rather than ‘you may choose to freeze,’ ‘some might read the message sent as ‘you must freeze’ for the sake of workplace and career efficiency. This aspect leapt to the fore when a report gurgled up from the internet about a top law firm that offered egg freezing to new associates. Some saw here exploitive law firms wanting to feast on the energy of lower paid lawyers by reassuring them that devotion to the firm would not wreck their family plans. No worries, they could simply put them off with egg freezing.

S. E. Richards, Why I Froze My Eggs (And You Should, Too), WALL STREET JOURNAL, 4 May 2013, at C1; Talk of the Nation: No Longer Experimental, Egg Freezing May Appeal to More Women (NPR radio broadcast 9 May 2013), available at http://www.npr.org/programs/talk-of-the-nation/2013/05/09/182313974/?showDate=2013-05-09 (accessed 21 February 2014) (radio broadcast).

Richards, supra note 33.

Id.

Id.

The genetic tie, in addition to gestating and rearing, appears to be key for women freezing their eggs. Otherwise why incur the cost of intrusion of freezing eggs of questionable quality after 35 if egg or embryo donation will allow them to gestate and rear a child?

Elie Mystal, Should Egg Freezing Be A Fringe Benefit Offered By Your Firm?, Above the Law (22 April 2013) http://abovethelaw.com/2013/04/should-egg-freezing-be-a-fringe-benefit-offered-by-your-firm/ (accessed 20 February 2014).
Whatever this hypothetical firm’s agenda, it will be important that egg freezing be structured as an opportunity not a requirement (though the two may be difficult to separate). Young women wanting to start families earlier rather than later should be protected in that choice, and not pressured to think they must defer children because of the demands of launching a career. Indeed, if their employer or medical insurance is paying, it may create even more pressure to do so, even if the firm is simply trying to stay competitive. And entrepreneurial ART programs or egg banks will market this service to the relevant age groups. Expect broadcast, print, or internet advertisements that play on infertility fears and offer freezer discounts. Egg freezing and other reproductive technologies are only empowering if they allow women (and men) the choice to use them. Egg freezing fails that test if it is read as a prescription that all women entering the workforce or reaching a certain age should store their eggs. Indeed, the chance to use it will also require the $10,000 to go through a stimulation and retrieval cycle to freeze eggs and pay ongoing egg storage costs as well as a tolerance for the medical intrusion involved. And a perception that egg or embryo donation, which lacks the genetic connection of using one’s own eggs, will not fill the gap. Finally, it will require the ability to separate out skilled providers from poseurs.

PART III. EGG FREEZING BEYOND PERSONAL USE: A MARKET IN EGGS STORED FOR FERTILITY INSURANCE?

As more women freeze eggs for social reasons, the question of what they will do with their eggs when no longer wanted will arise. Will they discard them? Donate or sell them to other women, to egg banks, or to researchers? Similar dispositional questions will arise with eggs frozen by women not wanting to create more embryos than can be transferred, or by women facing cancer or other health issues.

Ownership of frozen eggs

Here egg freezing empowers women to assert ownership and control over the eggs they have produced. This follows from the structure of property or ownership rights in one’s gametes. Women banking eggs are the owners of them, and will have ultimate dispositional control over them until they choose to transfer that control to another. How they will or should exercise that control is the question.

Egg freezing will thus be a legal as much as a medical or psychosocial transaction. The women involved will sign a contract with the bank about their rights to remove their eggs at any time and how they should be disposed of in the case of death, failure

39 High end law firms or other employers, including those at the cutting edge of information technology, such as Google and Microsoft, might include the costs in their health care package.
40 Regulation of these ads might be limited to not making untrue statements and listing some side-effects, as now occurs with television advertising of prescription drugs.
41 One is reminded of the offers to pregnant women to bank the umbilical cord blood of their child in case its blood-producing stem cells are later needed. In this case the umbilical cords are collected, and no intrusion on the woman is necessary, though whether they will ever be needed is another question.
42 See infra notes 46–9 and accompanying text.
43 Their eggs may be less desirable for reproductive use because of the health problems (infertility or cancer) that they face, but might be of interest to researchers or others.
44 Unlike Moore v. Regents of the University of California, 793 P.2d 479 gametes are more than mere tissue or a group of cells that can be used in research. Sperm has been recognized in California and the UK as desirable by will, and there is no reason why frozen eggs should not be as well. See supra note 4 and infra note 45.
to pay storage fees, or other contingencies. Presumably they may write a ‘check’ on their egg account, designating themselves or another as payee.

Egg banking thus raises the possibility that egg storers will ‘sell’ their eggs to other women or researchers who are in the market for egg donors and find those eggs cheaper or desirable for other reasons. The National Organ Transplantation Act allows buying and selling eggs and sperm, though a few states have a ban. Unlike eggs stored at a later age when women are going through infertility or stored for cancer treatment, eggs stored by women in their 20s or earlier 30s may be as good as healthy donor eggs and now available at a better price.

If they are of an entrepreneurial bent or simply want to recover some of the costs they have invested in egg freezing, one can expect some women who freeze their eggs to participate in the market for donor eggs. Of course, with so many eggs available from storage, the price of eggs may drop or rise depending on the fertility, health, and genetic desirability of the woman offering the eggs. Speculation in eggs may also arise. Laboratory and biobank regulations to ensure health and safety of storage facilities beyond existing FDA regulations are likely to follow, as well as ‘liquidity’ and other banking controls.

### Alienation and the marketing of eggs frozen for personal use

As women come to view storing eggs as a banking transaction, with the possibility of accruing interest (in the form of rising prices) or independent sale, a sense of alienation or commodification might accompany egg freezing. Although their goal at time of freezing

In the case of death control of frozen eggs should pass by will to a named devisee or to designated heirs under intestacy statutes. See Hecht v. Super. Ct., 20 Cal. Rptr. 2d 275 (Ct. App. 1993) (frozen sperm passes to a named designee in will). The same result should apply to frozen eggs and embryos. However, it does not follow that children born after posthumous conception with frozen gametes or embryos would be recognized as heirs.

Antitrust laws may also bar certain group transactions by egg freezers or those who buy their eggs. Kamakahi vs. Am. Soc’y. Reprod. Med., Case No. 3:11-CV-1781 SBA (N.D. Cal. 2011).

National Organ Transplantation Act, 42 U.S.C. §247e(a) (2006). Louisiana bans compensation of oocyte donors for any purpose. LA. REV. STAT. ANN. § 9:122 (LEXIS through 2013 regular session). Indiana allows payments but caps the amount at $1000. IND. CODE ANN. § 35–46–5–3 (West Year). Massachusetts bans payment for research but not infertility. MASS. GEN. LAWS ANN. ch. 111L, § 8 (West, WESTLAW through ch. 177 of 2013 1st Annual Session). New York has changed its law prohibiting compensation to research egg donors. See infra note 79, at 18.

Of course, the desirability of their eggs in a secondary market will depend on their having had medical, genetic, and infectious disease screening at the time of storage.

Surprisingly a market in men’s sperm has not developed in this way. Most voluntary storage has been of men with cancer or other problems, so they not as healthy and have not been screened for genetic or infectious disease. Members of the armed forces who bank sperm before deployment may be healthy but also have not been screened. If there were not an adequate supply of sperm from commercial sperm banks, then these sources might be of interest.

FDA regulations for Human Cells, Tissue, and Cellular and Tissue Based Products apply to gametes not originating in the couple treated. 21 C.F.R. § 1271.55 (2013) (record keeping); 21 C.F.R. § 1271.80 (2013) (general requirements for donor testing); 21 C.F.R. § 1271.90 (2013) (exceptions from requirements to determine donor eligibility). California and New York regulations for tissue banks and laboratories would also probably apply to egg freezing that involved egg donation. CAL. HEALTH & SAFETY § 1639 et seq. (West 2007); N.Y. COMP. CODES R. & REGS. tit. 10, § 51–2 (2013).

Liquidity issues assume that eggs are fungible and they clearly are not. A woman who has banked her eggs will not be fully satisfied if she is given other eggs at the time of withdrawal, even though they may have an equivalent or even higher cash value due to their infectious disease and genetic status.
is to reserve their own fertility, they will also have to think of their eggs as possible future commodities that are transferred to others, either on grounds of altruism or profit. The forms they will be asked to sign for future disposition of stored eggs will remind them of this contingency as well as the infectious disease and other FDA screening that will then have to be done to prepare for or done at a later time for those contingencies. At some point women freezing their eggs may come to see them as another commodity on the reproductive market/that arose from their non-market efforts to preserve their fertility. Only later are do they become marketeers, either as entrepreneurs or sellers in their own right, but that possibility hovers from the inception. Empowerment occurs but at the price of (later) alienation. Of course, freezing eggs solely for infertility purposes and then selling them later may be less alienating than if sale is intended from the start (eg going through a retrieval cycle for the purpose of selling eggs).

A greater degree of alienation may also enter the already partially alienated practice of egg donation. As the next section shows, the gift frame that largely surrounds paid egg donation for both donors and recipients will shift toward a more commercial frame, akin to the frame that now surrounds sperm donation. This is not harmful in itself, but frame shifting will necessarily require adjustment in the social and psychological valence that eggs now carry. The woman freezing eggs is now a producer, potentially for profit. The work she has undergone is no longer for herself alone, once she decides to sell them. As eggs become a commodity on the market, gender may be less important than it previously was.  

Fungibility will also be a challenge. Because of the genetic tie and its meaning for women banking their eggs, egg are not fungible. They will also vary in other genetic endowments, eg, mutational load for common and rarer disease and the age and viability of the eggs. Except for the family tie, eggs from women of comparable ages and health may be fungible but of little interest to others because they are older and not that much less expensive than egg donors recruited for that purpose.

The rise of commerical egg banks

Egg freezing empowers women by giving them a way to preserve oocytes against the threat of age or disease. It also empowers the doctors and firms that provide those services, opening additional ways to sell ART services and egg banking itself. A particular aspect of that empowerment is the creation of a novel kind of biobank, with a set of issues different from those that arise in tissue, DNA, and sperm banks.

To store eggs a woman must undergo ovarian stimulation and retrieval. To use those eggs for reproduction, she will need a specialist in thawing and inseminating those eggs, and then placing them in her uterus. Egg freezing will thus increase demand for ART services, some of which would not otherwise have been requested. The specialists providing ART may add egg banking to their portfolio of services, contract it out, or refer to established banks. Since eggs will need to be frozen after retrieval, the ART programs are likely to do that themselves. They will also prefer to thaw, inseminate, and implant embryos because of the additional charges generated.  

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52 See Cohen, supra note 10.
53 Query whether something akin to the Volker rule concerning banks and investment should apply to ART programs or egg and embryo banks.
be at the clinic site or contracted or referred off-premises, as increasingly occurs with frozen embryos.\textsuperscript{54}

As egg freezing proliferates, a system of egg banking will develop. First, the banks will be located in programs that offer egg freezing. Independent banks might emerge to handle administration of deposits, storage fees, and sending frozen eggs per depositor instruction to a site or program where thawing and insemination or other disposition will occur. Regulations to ensure proper storage, accounting, and response to depositor instructions may be needed. Legal protection for loss of stored eggs should also be provided, perhaps based on the cost of production.\textsuperscript{55}

In the early stages of egg freezing there will be few depositors and few non-clinic egg banks. As the practice grows and ART clinics get out of the longterm storage business, the number of off-premise egg banks will grow. The use of frozen eggs from paid egg donors will also give a boost to expansion of this sector. At some point ‘full service’ reproductive banks might develop, with one entity banking eggs, sperm, and embryos, or eggs and embryos.\textsuperscript{56} When thawing and use is desired, stored gametes or embryos may then be transferred to the ART programs that specialize in thawing, insemination, and implantation.\textsuperscript{57}

Reproductive biobanks serve different purposes than the many biobanks that now exist for tissue, DNA, and other samples, but common issues arise. All biobanks have to face issues of who may deposit, the conditions of deposit, who may withdraw samples, legal protection for the privacy and quality of the sample, and how rights or claims in products that arise from the banking (less important for reproductive banks) are allocated. Egg banking focuses attention on the choice of the depositor because she must invest money and body to obtain the banked entity. Her physical, monetary, and emotional investment in the deposit may be greater than someone giving a sample of DNA or tissue from an operation for research. Her ability to have her genetic child may ride on the deposit, which itself may have an alienating aspect from her embodiment that other biobanking does not.

Other banks may focus more on research into prevention or treatment of health and disease, potentially affecting thousands, if not millions of persons. DNA biobanks to uncover gene associations with common or rare diseases, such as the 1000 Genome Project in the United States or the UK Biobank, have great research significance.\textsuperscript{58} Other biobanks may amass tissue that could be used in treatment, such as the embryonic stem cell bank proposed for racial and ethnic variety.\textsuperscript{59} Some banks may be more

\textsuperscript{54} An ART clinic may transfer frozen embryos to a separate entity which then has all responsibility for storage and disposition according to the wishes of the embryo owners.

\textsuperscript{55} Some recovery for lost sperm, eggs, or embryos should be provided but the amount may not be adequate to sustain legal action. See Quigley, supra note 4.

\textsuperscript{56} Sperm banking has developed separately and is now well-established. Since obtaining sperm to be frozen requires no ART expertise, there may be less pressure to consolidate them with egg and embryo banks.

\textsuperscript{57} The bank operators may also have a separate ART business, which is legally separate even if located down the corridor or close by.

\textsuperscript{58} See Coriell Institute for Medical Research, Biobank Catalogue (2013), http://www.coriell.org/research-services/cell-culture/biobank-catalog (accessed 20 February 2014); Medical Research Council, UK Biobank (2013), http://www.mrc.ac.uk/Ourresearch/Ethicsresearchguidance/Biobank/index.htm (accessed 21 February 2014).

\textsuperscript{59} Ruth R. Faden et al., Public Stem Cell Banks: Considerations of Justice in Stem Cell Research and Therapy, 33 Hastings Center Re. 13 (2003).
concerned than are gamete or embryo banks about intellectual property rights in resulting discoveries or the need to contact depositors about later annotations or calls on variations of unknown significance.\textsuperscript{60} Each instance of banking will have its own set of challenges that depend on the precise use at issue. Only reproductive banks will enable an infertile woman or couple to have a child, and need to be regulated accordingly.

**IMPACT OF EGG FREEZING ON EGG DONATION FOR INFERTILITY AND RESEARCH**

Egg freezing will also empower the participants in the current system of paid egg donation, though less the egg donors themselves than the entrepreneurs and commercial providers. These effects, however, may make finding egg donors easier or more efficient, thus empowering recipients who lack eggs to have families. It may also facilitate finding eggs for use in research. An additional benefit is that it will increase the supply of donor eggs sufficiently so that professional guidelines calling for informing or not using egg donors who have been through six donation cycles might not so drive up the price of eggs that they become out of reach for some women or lead to harmful effects on repeat donors.\textsuperscript{61}

**Egg donation for infertility**

The ASRM’s 2013 statement cited better coordination between egg donor and recipient as a reason for finding egg freezing non-experimental.\textsuperscript{62} No longer would it be necessary to have the donor and recipient’s cycle synchronized so that retrieval, fertilization, and embryo transfer take place at the same time and place.\textsuperscript{63} Now the donor eggs could be retrieved and then frozen, and thawed and inseminated at the most convenient time and place for the recipient without fretting about donor compliance for synchrony with the recipient’s uterus.

Egg freezing, however, may facilitate more far-reaching changes in the egg donation system. That system increasingly relies on brokers to identify donors, match them up with recipients, and then have the stimulation, retrieval, insemination, and transfer done by the recipient’s physician.\textsuperscript{64} With the increasing reliability of egg freezing, especially from younger women, egg bank entrepreneurs may recruit several donors of differing ethnicity for egg production, have their eggs retrieved, genetically screened, and then freeze them for later sale as demand for eggs of women with that donor profile arise.\textsuperscript{65} The egg bank (which might be run by a fertility doctor with experience in egg freezing and egg donation) will pay the donor’s fee and retrieval costs up front for an initial supply of eggs. Since one donor could produce 10–25 eggs, it would be possible

\textsuperscript{60} Ellen Clayton Les Biesecker et al.

\textsuperscript{61} The ASRM Practice Committee has proposed to its membership that while there are no well-documented long-term risks associated with egg donation \textit{and} as such, no definitive data upon which to base absolute recommendations, because of possible health risks \textit{...} it is prudent to limit the number of stimulated cycles for a given oocyte donor to approximately six.‘Forthcoming in Fertil. Steril. (2014).

\textsuperscript{62} See ASRM Practice Committee, supra note 1.

\textsuperscript{63} Extra eggs and embryos would of course be frozen for later use.

\textsuperscript{64} Some IVF programs continue to recruit their own egg donors, and then match them as needed with recipient patients.

\textsuperscript{65} Some may even fertilize some of those eggs with donor sperm and sell the resulting embryos. See I. Glenn Cohen & Eli Y. Adashi, \textit{Made-to-Order Embryos for Sale—A Brave New World?} 368 New Eng. J. Med. 2517 (2013).
Egg freezing and egg banking

128 • Egg freezing and egg banking

to ‘sell’ frozen eggs in batches of 4–6 to women seeking them at a cheaper price than if recipients had hired the egg donor and her entire output themselves. The thawing and insemination could occur at the frozen egg bank (and its associated doctors) or could be shipped to affiliated programs which are trained in the bank’s thawing techniques. The upfront investment in egg production might lead to greater number of sales of eggs per donor, thus increasing the egg entrepreneur’s profits.

*My Egg Bank* in Atlanta shows how the field might develop. An Atlanta IVF program had tried for many years to develop safe and effective egg freezing. As vitrification techniques emerged, it developed a modification which worked well. The program owners then decided to start a commercial egg bank that would recruit egg donors and sell batches of six eggs to couples/women for half the price of a recruited egg donor. Its costs of recruitment, retrieval, and donor fees, which would roughly be the cost for a donation to a single donor, could be recovered by selling the now frozen donated eggs to several donors. Depending on the number of eggs retrieved and the demand for a donor with those characteristics (age, education, looks, proven fertility, etc) a single donation via the frozen egg bank route could make egg donation cheaper for recipients and more profitable for the egg agency/ART program. It would also lead to fewer women acting as donors, since one donor could provide eggs to several recipients. The 7–10 egg banks now in existence follow some form of this model.66

Such a change in the egg donation system would entail some reframing of how egg donation is currently perceived. As Professor Rene Almeling shows in her insightful study of egg and sperm donation, egg donation is now framed as a gift to infertile women, albeit for a fee.67 While the money is the key to women choosing to be egg donors, the gift nature of the situation is also important, and very different than how sperm donation is framed by sperm banks and experienced by sperm donors.68 Would donors be as easily recruited for contributions to a frozen egg bank, which then sells their eggs in batches to recipients? Although this change would inject more commodification into egg exchanges, the donors would still be helping infertile women, indeed, more than the one that their donation would traditionally have aided.69 Their need to meet or know about the recipient could also be met by providing that information prior to the donation and informed of it when other women wish to buy their eggs from the bank.

Key here, of course, is whether this system would maintain or increase demand for frozen relative to fresh donor eggs. Would a woman or couple seeking an egg donation be willing to forego the notion that the donor donated just for them? If the success of egg freezing is comparable to initiating successful pregnancies, information is available about the donor, and the price is lower, the use of donor eggs from egg banks might well meet the needs of recipients, and thus reinforce this practice. It may also make it easier to keep track of half-siblings born as a result and enable contact with the donor, if she has chosen identity release on the eighteenth birthday of offspring.

66 Alexander M. Quaas et al., *Egg banking in the United States: Current Status of Commercially Available Cryopreserved Oocytes*, 99 Fertil. Steril. 827 (2013).

67 RENE ALMELING, *SEX CELLS: THE MEDICAL MARKET FOR EGGS AND SPERM* (2011).

68 Id at. Almeling describes how it is customary to give the egg donor a small gift or token beyond any fee to indicate the personal importance to the recipient and her appreciation of the donor’s efforts.

69 One donation could lead to that person/couple having subsequent children from the donation if the donated eggs were all inseminated and then frozen for later use, as is often the case.
Indeed, it may lead to a much greater use of donor eggs obtained from egg banks, which will cost less and may give a greater range of choice, though it will lack the chance to meet or talk with the donor, as now sometimes occurs. A further alienation from the body and the person may result.

The expansion of egg donation in this way depends on the legal infrastructure for ownership of eggs. It assumes that the egg donor is transferring all of her ownership interests in her eggs to the egg donor entrepreneur who recruits her and pays her fee and the costs of stimulation and retrieval, and then sells or transfers her eggs to others as he or she finds fit. The donor would retain no rights, nor would the recipient who previously would have gained title to all of them, since the recipient would be purchasing only a portion of the donor’s output. There is a gain in efficiency here at a cost in greater alienation or commodification of gametes, though it may also be easier for resulting offspring to contact each other and their genetic mother.

In the transition period before such arrangements proliferate, couples or women who arrange for an egg donor will ordinarily be paying for and acquiring her entire output. But they may not need all of them, and instead of inseminating all, might choose to share (for a part of the expenses) with other women looking for an egg donor. This might be feasible in a fresh cycle for both, but logistics might be easiest if the recipient freezes eggs that she does not use to create embryos. As purchaser of the donor’s output in that cycle, she would be free to freeze some of them and sell or share with others. This would turn the recipient into an entrepreneur who then sells some of the eggs she purchased from the donor to another. To facilitate such a market, egg banks specializing in donor eggs may buy her surplus and sell accordingly.

These speculations arise from current practices with ART and gamete and embryo donation. No doubt other problems will arise as the field grows, beyond the issues already noted. A section will later discuss the regulatory issues in more detail.

**Egg freezing and research**

Egg freezing and banking should make human oocytes for research more widely available. A shortage of eggs has plagued some embryonic stem cell researchers, in part because of bans on paying egg donors (even though egg donors for infertility can be paid). The successful production of embryonic stem cell lines through somatic cell nuclear transfer will spur demand for research eggs as will the UK’s recent approval of experimental treatment of mitochondrial DNA defects using defect-free partial egg.

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70 Elizabeth Cohen, *Egg Freezing Changing Fertility Treatments*, CNN, [http://www.cnn.com/2012/10/22/health/frozen-egg-banks/](http://www.cnn.com/2012/10/22/health/frozen-egg-banks/) (accessed 20 February 2014).

71 This is different from the practice of ‘egg-sharing’ by a woman undergoing IVF with another infertility patients during a fresh cycle to reduce some of her costs. This practice was acceptable in the UK before it adopted a policy in 2011 allowing egg donors to receive a one-off payment of L750. Jane Hughes & James Gallagher, *Egg Donor Compensation Is To Triple Under New HFEA Guidelines*, BBC (19 October 2011), [http://www.bbc.co.uk/news/health-15356148](http://www.bbc.co.uk/news/health-15356148); [http://www.hfea.gov.uk/egg-donation-and-egg-sharing.html](http://www.hfea.gov.uk/egg-donation-and-egg-sharing.html) (accessed 20 February 2014).

72 Since only two or three of embryos created from donor eggs can be safely placed in the uterus at one time, it would be wise to create some other embryos to be stored, which could still leave eggs to sell or share.

73 John A. Robertson, *Compensation and Egg Donation for Research*, 86 Fertil. Steril. 1573 (2006).

74 Tachibana et al., *supra* note 5.
donors. With a growing number of women freezing and banking their eggs, eventually some of them will donate unwanted eggs to researchers, to banks that will provide them to researchers, or paid egg donors will be recruited specifically to donate to research, with unused eggs at the time frozen for later research.

A main barrier to the shortage of research eggs has been ethical concerns about the propriety of paying egg donors for research eggs, even though it is now well accepted that paying women who donate eggs to infertile women is acceptable. The legal prohibition on paying for organs never extended to blood and gametes, and only a few states ban payment for eggs. In the United States, however, the controversy over federal funding of embryonic stem cell research led to a funding policy of not funding research with cell lines derived from embryos created from paid gamete donors. Several states followed suit by banning any use of paid gametes in stem cell research, even though they allowed fertility donors to be paid. New York has now removed that ban but Governor Jerry Brown vetoed such a bill in California. In any case, the federal limit on paying gamete or embryo donors in federally funded stem cell research still remains.

With a growing number of women freezing and banking their eggs, eventually some of them will donate unwanted eggs to researchers, to banks that will provide them to researchers, or paid egg donors will be recruited specifically to donate to research, with unused eggs at the time frozen for later research.

Freezing technology will not dissolve moral concerns about paying egg and sperm donors, but it should make eggs so widely available at a reasonable price that many researchers will be able to go forward with non-federally funded research. As scientific interest in using oocytes in research takes off, the availability of eggs from women who have banked eggs initially for themselves and from donors recruited for that purpose should meet most scientific needs.

75 Kate Kelland, Britain plans world’s first go-ahead for ‘3-parent’ IVF babies, Reuters (28 June 2013), http://www.reuters.com/article/2013/06/28/us-mitochondria-britain-idUSBRE95Q1J020130628 (accessed 20 February 2014). Such treatments will involve donor eggs which will be enucleated and have the diploid pronucleus of the patient’s fertilized egg transferred to her egg. Other options may include cytoplasmic injections from healthy eggs. Perfecting this technique and variations on it will depend on a robust supply of eggs for research.

76 National Organ Transplantation Act, 42 U.S.C.§247e(a) (2006). The ASRM has set a limit of $10,000 on payment to egg donation for infertility (and been sued for a violation of antitrust laws as a result. Kamakahi vs. American Society of Reproductive Medicine, Case No. 3:11-CV-1781 SBA (N.D. Cal. 2011).

77 NATIONAL RESEARCH COUNCIL AND INSTITUTE OF MEDICINE, GUIDELINES FOR HUMAN EMBRYONIC STEM CELL RESEARCH, The National Academies Press, Washington, D.C. (2005); Exec. Order No. 13,505, 3 C.F.R. 229 (2009); NIH Guidelines for Human Stem Cell Research, 74 Fed. Reg. 32,170 (7 July 2009).

78 See, eg, MASS. GEN. LAWS ANN. ch. 111L §8 (West West, WESTLAW through ch. 177 of 2013 1st Annual Session).

79 EMPIRE STATE STEM CELL BOARD, STATEMENT ON THE COMPENSATION OF OOCYTE DONORS (2009), available at http://stemcell.ny.gov/sites/default/files/documents/files/ESSCB_Statement_on_Compensation_of_Oocyte_Donors.pdf (accessed 20 February 2014); Beth E. Rodand, New York State’s Landmark Policies on Oversight and Compensation for Egg Donation to Stem Cell Research, 7 Regenerative Med. 397(2012). California’s repeal of its ban has passed both houses of the legislature and now awaits the governor’s signature (egg donors will be allowed to receive compensation in the same manner as other medical research subjects).

ASRM Office of Public Affairs, California Bill Allowing Compensation for Research Egg Donors Passed, 15 ASRM Bull. 24 (2013).
REGULATION AND THE PROBLEM OF INNOVATIVE VS ESTABLISHED THERAPY IN ART

The movement of egg freezing from research to innovative therapy to accepted practice illustrates the trajectory of much medical development and the pitfalls along the way. The United States does not have a national fertility regulatory agency to announce when success rates with egg freezing are acceptable, nor are such judgments within the jurisdiction of the FDA. As a result, it fell to a professional society of doctors offering IVF (and egg freezing) to play that role. Indeed, it took that responsibility quite seriously because of earlier criticism from a Presidential Bioethics Council that too many new reproductive technologies were being used without adequate testing.\(^80\)

That charge was not without basis. ART developed amid great controversy without carefully controlled studies.\(^81\) Basic IVF itself was highly innovative and full of risks to resulting children, but when it succeeded in 1978, doctors inside and outside the U.K. soon learned how to use it successfully.\(^82\) The ability to hyperstimulate the ovaries and remove several eggs, fertilizing and transferring some embryos to the uterus, and freezing surplus embryos for later use, gave a great boost to the field. The use of ICSI was also introduced without controlled trials, first for problems of male infertility, and then for a wide array of other situations, so that it is now used in 50% of basic IVF.\(^83\) Many other aspects of ART have also been adopted without controlled trials or systematic investigation, including different embryo cultures, the use of assisted hatching, when to transfer embryos to the uterus, preimplantation genetic diagnosis, egg freezing, and the like. ART is not exceptional here—this pattern is typical of many areas of medicine.

Professional society determination of nonexperimental status

To deal with criticisms that too many assisted reproductive innovations were being used without adequate study the ASRM issued a report in 2009 on the ‘Definition of “experimental procedures”’.\(^84\) It proclaimed that procedures, tests, treatments or other interventions for the diagnosis or treatment of infertility are ‘considered experimental or investigational until the published medical evidence regarding their risks, benefits, and overall safety and efficacy is sufficient to regard them as established medical practice.’\(^85\) Medical evidence relevant to determining whether something is ‘established medical practice’ must be derived from ‘appropriately designed, peer-reviewed,
published studies performed by multiple independent investigators.\textsuperscript{86} Id. It went on to say that the ASRM will state specifically in official publications that a procedure is considered experimental or investigational and will remove a procedure from that status when evidence warrants it.

The ASRM also warned that procedures classified as experimental or investigational should not be ‘represented or marketed to patients as established or routine medical practice.’\textsuperscript{87} Advertisements and other materials describing or relating to that procedure ‘should state specifically that the procedure is not established medical practice and is classified by the ASRM as experimental or investigational.’\textsuperscript{88} Patients choosing that procedure should be counseled about the experimental nature of the procedure and have that counseling documented.

The ASRM report, however, does not require that a physician offering an investigational procedure do so only in the context of a research study. An experimental treatment must be labeled as such, regardless of whether it is offered as part of a research project blessed by an IRB.\textsuperscript{89}

**Application of ASRM’s statement to egg freezing**

The ASRM’s handling of the problem of when an experimental or innovative practice moves to established status illustrates some of the issues that arise with use of a professional association to make those decisions. Issuance by a self-interested and resource-limited professional association risks establishing minimum rather than optimal standards of care, with no effective means of enforcement. Despite best efforts, those standards may be internally inconsistent, are time-dependent, and may be quickly outmoded. Unsurprisingly, they may also reflect the interests of those issuing the guidelines or their sponsors.\textsuperscript{90}

Several of these problems are evident in the ASRM guideline on egg freezing, a practice initially offered or marketed to women without good evidence that it was safe and effective. As noted, the ASRM Practice Committee had taken the position that egg freezing is experimental and not ready for prime time use because the live birth rate was significantly less than the success with fresh or frozen-thawed embryos. When it announced in 2013 that egg freezing was no longer experimental in younger, highly selected populations for particular purposes, it based its conclusion both on ‘preliminary data’ on safety and four random controlled trials of fresh versus vitrified/warmed oocytes, finding that implantation and clinical pregnancy rates are similar in young, highly selected populations to success rates with fresh eggs or frozen-thawed embryos.\textsuperscript{91} It noted, however, that these results may not be generalizable, and clinic

\textsuperscript{86} Id. Compare Daubert v. Merrell Dow Pharm., Inc., 509 U.S. 579 (1993) (standards for admission of scientific testimony).
\textsuperscript{87} Thomson, supra note 15, at 1517.
\textsuperscript{88} Id.
\textsuperscript{89} The only sanction for noncompliance is that a program may no longer claim membership in the Society of Assisted Reproductive Technology (SART), a professional organization of doctors doing this procedure. SART membership requires compliance with ASRM Practice and Ethics Committee Guidelines. Unless a member of SART, a fertility program will not be listed in the clinic-specific national registry of IVF programs maintained by the Centers for Disease Control, the ASRM, and SART.
\textsuperscript{90} Ronen Avraham, Private Regulation, 34 Harv. J. L. Pub. Pol’y. 543 (2011).
\textsuperscript{91} Practice Committee, American Society of Reproductive Medicine, supra note 1.
Specific success rates should be used to counsel patients whenever possible. Also, large observational studies of clinical practice suggest that success rates overall may be lower.

While finding that egg freezing was no longer experimental for patients receiving gonadotoxic therapies for cancer or other diseases, by women with genetic disease, and couples with ethical or legal constraints on freezing embryos, it took a different position with regard to egg freezing to circumvent reproductive aging in healthy women. It found no data ‘to support the safety, efficacy, ethics, emotional risks, and cost-effectiveness of oocyte cryopreservation for this indication.’92 One may question why the same data that supports recognition for approved uses would not also support recognition for this use, other than the population of older women who been the main customers for egg freezing.93

So how to explain the ASRM’s inconsistency in 2013 to certify some uses of egg freezing as non-experimental and others, such as social uses of egg freezing, as still experimental. In its view there was ‘no data to support the safety, efficacy, ethics, emotional risks, and cost-effectiveness of oocyte cryopreservation’ for the ‘sole purpose of circumventing reproductive aging in healthy women.’94 Presumably the ASRM would like to see studies of women who have banked eggs for this purpose, especially over age 35, who were its main customers so far in the ‘experimental setting’ in which it had been approved. Yet the data was not overwhelming for the ‘non-experimental’ uses that had been approved, simply because there had been so few studies. The data for social uses (the health effects of doing so, the live-birth rate of pregnancy after freezing and thawing, psychosocial reactions, and more) will not be immediately forthcoming because those uses have been relatively few, offspring born even fewer, and studies of them nonexistent.

Initially the ASRM’s hedge on freezing as social insurance smacked some women as less consumer protection than old-fashioned, male-dominated medical paternalism.95 Women were quick to argue that they should be informed of that option so that they could make their own choice.96 In fact, behind its labeling rhetoric this was all that the ASRM was urging: fully informed choice. The ASRM feared that some clinics or agencies would tout social uses as a way to sell IVF cycles and egg banking services, when there are too many uncertainties to justify the costs and physical burdens of doing so, particularly for women over 35 who appeared at this time to be the most likely users. Some UK doctors agree with this position because of lack of benefit to justify the harm imposed.97 In addition, if programs...
were not fully informing patients of egg freezing’s non-established status, they would be violating the principle of informed consent.  

The ASRM’s position was actually less protective than it purported to be, which is one of the problems with professional self-regulation. ART programs could not sell egg freezing as standard, established therapy, but they could advertise and sell it as long as they labeled it truthfully as ‘experimental.’ Nor did it require that a program bring egg freezing to an IRB as a research study. In the end, informed consent would be the watchword here, as seemingly everywhere else in bioethics.

A similar strategy is seen here in the ASRM’s Practice Committee’s discussion of limits on the number of donor egg cycles.  

In the Abstract, The Practice Committee does not say that more than six cycles should not be done, but only that donors be informed of the possibility of undocumented but possible health risks. In the Conclusions it states that ‘it is prudent to limit the number of stimulated cycles… to approximately six.’ The slushy language here shows another limitation in professional society regulation, in this case to try to avoid mandatory statements that are based on insufficient data or that could lead to charges of antitrust collusion.

Regulation of egg freezing
The map provided here of how egg freezing fits into the ethical, legal, and medical matrix of existing ART practice has mentioned several kinds of regulation that might apply or be needed. The safety of egg freezing for women and resulting offspring is a key concern. There already are FDA guidelines on handling donor gametes in the laboratory, which will apply if women who freeze eggs for their own use wish to sell or donate them to others. If egg producers had not been tested for various infectious diseases at the time of freezing, they will have to be tested before their eggs can be used by others.

A new area of regulation will be of egg banks directly. Here existing state laws such as those in California and in New York will be a model for ensuring safe operation, as will the federal Clinical Laboratory Improvement Act. But egg banking raises special issues concerning the depositor’s need to be sure that deposited eggs are safely preserved and returned to the depositor or to a designated recipient. There will be many similarities and differences from traditional cash banking, which may yield some insights about how egg freezing and other forms of biobanking should be addressed. An issue of general regulatory concern with biobanking is what damages if one’s banked sperm, embryos, cord blood, or other tissue has been lost, stolen, or damaged. Because of the family importance of the banked materials or their need in specific medical procedures, money damages may be hard to calculate and will have an alienating effect on those persons who have lost banked material.

Disclosure of risks and uncertainties satisfies the duty of informed consent, even if the procedure did not otherwise meet the standard of care for those age groups. Then the question would be whether a physician is acting reasonably in responding to requests for a service that will subject women to costs, burdens, and risks for a less certain pay-off. Fertility programs have financial incentives to offer this service. Women in their twenties will gain the most protection, but may need it the least because they may end up having offspring without thawing stored eggs.

Practice Committee of the American Society of Reproductive Medicine, Repetitive Oocyte Donation, 86 Fertil. Steril. (Suppl. 1) S216.

Id. at S217.

See supra note 46.

Clinical Laboratory Improvement Act of 1967, Pub. L. No. 90-174, 81 Stat. 536 (codified as amended at 42 U.S.C. § 263a et seq).
Beyond health, safety, and banking issues, there is a need for clear recognition of the woman’s ownership of and hence dispositional control of her eggs. While such a result would seem to follow from previous cases and practices, any regulatory regime should start with recognition of her legal rights in her eggs. Until she has validly transferred full or partial control to a spouse, partner, physician, bank, or researcher, it is her right to decide whether to produce eggs, store them, have them inseminated, or transfer full or partial control to another. By the same token, once she does so, she loses that control and may have no further say in whether they are used to produce research embryos or embryos for infertile persons. A full regulatory regime is lacking for many aspects of ART and egg freezing is no exception.

CONCLUSION: EMPOWERMENT, ALIENATION, AND GENDER IN ART

ART expands fertility options for both men and women. Women, however, play a special role both as providers of gametes and as gestators. No man can reproduce without an egg source and/or gestator, while women can gestate without using their own egg. Traditionally, they have also played a much larger role in rearing, though more involvement by fathers is occurring in the United States and in many European countries.

ART expands both women’s career, education, and fertility options, and makes special demands of them. Sometimes they will resort to ART to help the man overcome his infertility, for example, by going through IVF when he has sperm problems, or making sure that he will have progeny when his wife lacks ovaries or uterine function by employing a surrogate gestator or an egg donor. Women’s resort to ART, however, is largely driven by their own desire for children, reflecting personal and cultural narratives of the importance of reproduction for female identity.

ART with spouse or partner gametes itself has an alienating dimension. Science not sex becomes the primal scene, with the glare of laboratory lights replacing the darkness of the fallopian tubes. New narratives fit IVF and embryo freezing into old ones of husband and wife having children. Surrogate motherhood challenged that narrative because it was so directly an alienation of gestation from rearing and so explicitly for a price (though a diminished gift rationale remained). Egg donation seemed less of a challenge. It devalued the female genetic tie but kept the gestating mother as rearing mother. For women who valued genes over gestation, it was a greater challenge. Both areas came to privilege preconception/implantation intent over the later wishes of the gestational surrogate. Egg donors also lost out on rearing rights if the recipient’s gestation and rearing had been agreed to in advance.

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103 If IPS cells are ever a reliable source of gametes, both men and women may be able to derive the sperm or eggs they need to reproduce. A woman would thus be able to derive IPS sperm from her cells, use it to fertilize her naturally derived oocyte, and then gestate. A man could produce an oocyte from his IPS cells and fertilize it with his sperm, but until artificial wombs are developed, would still need a woman to gestate. See John A. Robertson, Reproductive Rights and Reproductive Technology in 2030, in CONSTITUTION 3.0: FREEDOM AND TECHNOLOGICAL CHANGE 155–77 (Jeffrey Rosen & Benjamin Wittes eds., 2011), on eggs from IPS cells, see Katsuhiko Hayash et al., Offspring from Oocytes Derived from in vitro Primordial Germ Cell-Like Cells in Mice, 338 Science 971 (2012).

104 Cf. In the Matter of Baby M, 537 A.2d 1227 (N.J. 1988) (state adoption laws and policy prohibit enforcement of preinsemination surrogate contract for postbirth rearing) with Johnson v. Calvert, 851 P.2d 776 (Cal. 1993) (preimplantation agreement for rearing child created by hiring parents’ embryos with a gestational surrogate will be enforced).
With egg donation and surrogacy now widely accepted, egg freezing seems empowering. By shifting or rescheduling genetic motherhood to a later time, it enables women to enter the workforce, establish career, and undergo cancer treatment with less of a chance of missing out on genetic motherhood. On this view, the empowering aspect, though firmly rooted in cultural narratives of the importance of female reproduction, is more important than any accompanying alienation or shift in ART business and profit models. The main task is to make freezing as safe and effective as other forms of ART, bring the cost down, and ensure that women know what they are getting into.

Another perspective, while crediting the empowering narrative, will remind women that there are costs here as well, such as the likely low success rate of freezing after 35 and the need to find an experienced program. This translates to storing eggs at the earliest age possible, which alters the passage of women to early adulthood. What better graduation gift than paying for a young woman’s egg freezing cycle? It also means resisting a de rigueur attitude to freezing and pro-life efforts to diminish the right to freeze and discard embryos.

The trick is to find the sweet spot between these goals. In striking that balance within the prevailing market framework, women may come to view their eggs not only as products of their body essential for their genetic motherhood, but also as products that can be streamed into commerce. This can arise from women who no longer need to store eggs and want to recoup their investment or make a profit. It will also arise in the egg donor market, which despite payment has residues of gift economy. Now egg donors will be simply paid for their ovarian bounty, with less of a connection to the recipients they are helping. It may also lead them to negotiate prices pegged to the number of eggs produced. Why should egg donor entrepreneurs retain that surplus rather than the egg sources?

Once everyone adjusts, the rough edges may smooth, increasing welfare and flourishing for most participants. As usual, how it is done rather than that it is done will probably turn out to be the key issue. The onslaught of genetic screening now waiting in the wings will be a far more important development for all concerned. But even then viable eggs will be needed to reproduce. Mapping egg freezing on to these issues and showing how regulation largely by professional societies emerge with all its flaws will help in devising practices and policies for egg freezing and other innovations in assisted reproduction.

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105 As with all insurance, some moral hazard follows. Women might become complacent about risks to fertility or think that they can freeze their eggs to preserve their fertility.

106 Although far-fetched and dissimilar in terms of resulting harm, one could posit a cross-cultural similarity between egg freezing in the late teens or early twenties and female genital cutting of adolescents in African cultures. In a broader anthropologically sense both could be seen as a rite of passage to ensure that a woman will be a good wife—one by preventing sexual pleasure and thus reducing her desire to stray and the other by ensuring fertility so the husband won’t stray.

107 Wickard v. Fillburn, 317 U.S. 111 (1942) (wheat grown for own use has market effect and thus reachable by Congress under its interstate commerce power).

108 See Almeling, supra note 66, and her account of donor recipients giving a gift to the donor at time of retrieval. She found no evidence that sperm donors were similarly requited, although sperm and egg donors were both paid.

109 This would not remove the floor on payment that is a central part of egg donor guidelines and practices now. Sperm donors, however, have to provide a sample with a minimum of 50 million sperm of adequate motility to be paid. Almeling, supra note 66, at 32.