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Reproductive Rights and Reproductive Technology in 2030

John A. Robertson

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INTRODUCTION

John A. Robertson is the Vinson & Elkins Chair in Law at the University of Texas Law School.

Larry, a pediatrician, and David, a wills lawyer, meet in their late 20s, fall in love, and marry on June 15, 2025 in Indianapolis. Three years later they take in a foster child for eight months, and find the experience rewarding. By 2030, they are well-enough established in their careers to think about having their own child. Larry's 24-year-old sister Marge has agreed to donate her eggs, and David will provide the sperm, so that each partner will have a genetic connection with the child. They work with an agency that matches couples with gestational surrogates, and settle on Janice, a 34-year-old nurse and mother of two, who is willing to help them in exchange for a $75,000 fee.

In the process, Larry and David come to realize that they would prefer to have a male child that shares their sexual orientation. Reproductive cloning won't do—the FDA hasn't yet certified it as safe and effective. But gene studies show a strong correlation between five genes and sexual orientation in both males and females. Larry and David discuss with their doctors the feasibility of screening the embryos they create with Marge's eggs for male genes linked to a homosexual orientation. The clinic doctors are experts in embryo screening and alteration, but cannot guarantee that the resulting embryos will in fact turn out to be homosexual. To increase the certainty, they will insert additional "gay gene" sequences in the embryos before they are placed in Janice. Embryos not used will be frozen for later use or for stem cell technology to create eggs from Larry's skin cells so that the resulting child would be the genetic offspring of both Larry and David.

The scenario painted here is futuristic, but only partially so. The techniques to be used—IVF, egg donation, and gestational surrogacy—are now widely available, as is embryo screening for genetic disease and gender. Same-sex marriage is likely to be soon recognized as a federal constitutional right. No "gay genes" have yet been identified. But genomic knowledge is mushrooming. The genetic code for nonmedical traits such as sexual orientation may be unlocked in coming years. Altering a person's genes by inserting or deleting DNA sequences is still theoretical, but great progress has occurred with animals. Cloning is unlikely to be available by 2030, but producing gametes from somatic cells in a person's body might by then be feasible.

Technical prowess, however, should not be confused with ethical and social acceptability. The 30 years between 1980 and 2010, when assisted reproduction, egg donation, surrogacy, and genetic screening of embryos became widely used, has been fraught with ethical, legal, and social controversy. These techniques pose major challenges for deeply held values of autonomy, family, the welfare of children, and the importance of reproduction to human flourishing. They call starkly into question the meaning of kinship, parenthood, and the degree of control which parents should have over their children's genes. Increased genetic screening, alteration of genes, and cloning or obtaining gametes from somatic cells will be even more contested.

In America, the law is usually entwined in public controversy, especially when

sexual, family, and reproductive norms clash. Yet these techniques were launched and found a home with little legal scrutiny. Outside of abortion, the law has been largely absent from battles over reproductive and genetic technologies. As a result, there are few Supreme Court precedents directly on point. Legislation, for example, has not restrained the use of cutting-edge genetic technologies such as embryo screening and manipulation. Reproductive cloning, though not yet feasible, is highly controversial but most states have not banned it. When the law has inched forward with legal solutions to particular problems, such as disputes over lost or frozen embryos or how to share parentage among gamete donors and rearing parents, new techniques with new problems have sprung up. In Larry and David's case, it is the desire to choose their child's gender and shape its sexual orientation that is novel and challenging.

That situation might change as techniques evolve to expand choice over the genetic characteristics of children. Eventually, legal limits will be imposed, limits which will raise questions about the constitutionality of restrictions on reproductive and genetic choice. The Constitution, however, was written in an era when none of these techniques were practiced or even imagined. Indeed, it said nothing about reproduction at all. As a result, the Supreme Court has spoken often and most recently about abortion and contraception but seldom about engaging in reproduction as such, and not at all about parents' choosing the genes of their offspring.[1] When it did speak against forced sterilization of criminals, it assumed heterosexual and coital conception.[2] The principles underlying those decisions provide general guideposts for procreative rights in a technological age, but the specifics of those rights will have to be teased out from the logic of those precedents as new techniques challenge old values and new options for reproduction open. Larry and David and thousands of other couples will need answers so that they can have the families they wish.

Reproduction in the Laboratory: IVF and Its Dilemmas

Larry's and David's plan pushes all of the buttons of reproductive conflict. Most of the issues their case raises involve relatively well-explored territory—or, at least, territory we can expect to be well explored by 2030. In some areas, however, their case involves radically new ground. Let's begin by briefly surveying the general state of the law as we can expect them to find it.

First, they are a non-traditional family. In 1986, the Supreme Court found the claim for a right to homosexual sodomy to be "facetious."[3] Seventeen years later, it became part of the Constitution's fundamental liberties.[4] By 2010, same sex marriage was legal in five states, with a federal court challenge looming that could lead to legal recognition nationwide.[5] Even if not constitutionally grounded, by 2030 same-sex marriage should have become routine and accepted in most states, including Indiana. The idea that gay individuals or couples will be having children, which they often did before legal recognition of same sex marriage, is not especially surprising. Nor that they would want to choose their children's sexual

orientation, as other couples might, once the technology for doing so is available. But we can expect that full acceptance of gays and lesbians—particularly when contriving to have gay and lesbian children—will not be universal.

Second, the technical innovation that has made Larry and David's reproduction and that of millions of infertile couples possible—in vitro fertilization (IVF) of sperm and egg outside of the body prior to the placement of an embryo in the uterus—has been on the scene since 1978. By 2010, it represented one percent of U.S. births, a figure that is likely to grow as it becomes cheaper, safer, and more effective.[6] We are long past the original objections to IVF based on unnaturalness, wastage of embryos, and subjection of women, though these concerns still animate objections to particular procedures. Despite widespread ethical debate and the pleas of the Vatican, no legislature has banned IVF or even placed significant restrictions on it. Yet legal disputes remain about ownership and control of embryos and to a lesser extent about research and other uses of embryos.

The most important policy issue in IVF has been the need to reduce the high level of multiple births that plague the field. More than a third of IVF births every year are twins or more, which is well above the coital rate of five percent. Since success is measured by a live birth, this has led assisted reproduction (ART) programs and patients to implant several embryos at one time. Professional guidelines have brought down the number of triplets and higher-order multiples, but they have had less success in preventing twins. What's more, those guidelines have lacked teeth. They did not, for example, stop an ART doctor from transferring six embryos to a 32-year-old woman who already had six IVF children, leading to the birth of octuplets and a furor over the abuses of an unregulated fertility industry.[7]

Larry's and David's efforts here will likely lead to the creation of more embryos than can be safely or permissibly implanted in Janice at one time, and by 2030, we can probably expect clear guidelines or laws to limit that number. Single embryo transfer will probably be the norm, with a limit of two in the most promising cases, as would be the case with eggs from a healthy, 24-year-old donor such as Marge. If Janice does not deliver after the first transfer or if Larry and David want to have additional children, they will probably have several frozen embryos to use in later attempts. Because limits on the number of embryos placed in the uterus at one time should not substantially affect success rates, such limits should not infringe the procreative liberty of infertile persons or gays and lesbians.

Right-to-life groups will continue efforts to limit the number of eggs fertilized to prevent the discarding of unused embryos. But they will have a hard time overcoming the strong deference accorded to parents and their doctors about how best to treat infertility. Constitutional rights to procreate may also limit state restrictions beyond the number of embryos transferred at one time. Laws, for example, that limit the number of embryos *created* will directly interfere with the ability to use IVF to reproduce, and will be difficult to justify. Limits on the number of embryos transferred per IVF attempt, however, may pass muster because embryos not transferred when created can be frozen for later use.

Larry and David should also be aware of their ownership rights in their embryos, and whose wishes take priority if they have a falling out. The law has long been clear that the couple is the "owner"—the unit with dispositional control—of the embryos.[8] The owner is not the clinic that has created them and now holds them in storage. Marge has given her eggs to Larry, and David has provided the sperm. Although Larry and David cannot control the number of embryos that will be placed in Janice at one time, they can decide how many eggs will be fertilized and whether they will be discarded, donated to others, or used in research or in therapy for themselves or their child. If the clinic loses the embryos, renders them unusable, or places them in the wrong uterus, it will have violated their legal rights and will owe them compensation.[9]

The most active area of IVF litigation has involved disputes between divorcing couples over what to do with stored embryos. With heterosexual couples, the one who objects to the use of the embryos usually wins out, because the other will have been forced to reproduce against his or her wishes.[10] The same principle would partially hold if Larry and David divorce with one or more embryos in frozen storage. David, the sperm provider, could prevent Larry from using those embryos because their use would lead to unconsented reproduction by David. But the reverse is not true. Because Larry has not provided his own gametes—just those from his sister—he may not be able to stop David from using them if they had previously agreed to David's having that right.

Third, Larry's and David's plans to have a child with the help of an egg donor and gestational surrogate touch another ethical and legal hotspot—the intentional blurring of family and kinship relations. Egg donation separates the genetic and the gestational mothers, with the child possibly never knowing her genetic mother. With sperm donation, the genetic father has usually been absent and unknown. Gestational surrogacy separates the woman bearing the child and the woman providing the egg, with sometimes a third woman doing the rearing. Surrogacy can also lead to conflicts over custody and rearing, conflicts which can also arise with respect to gamete donors. Sometimes, children of these arrangements feel cut off from or abandoned by their "true" (genetic) family. Because gamete donors and surrogates are invariably paid, there are charges of exploitation and commodification of gamete donors, surrogate mothers, and sought-for children.

By 2010, the use of egg donors and surrogates has been well-integrated into ART practice. No records exist of the number of children born with donor sperm. Egg donors are used in ten percent of IVF cycles.[11] Gestational surrogacy is used by many fewer persons, but it is accepted for a woman who has ovaries but lacks a uterus and for gay males. The main legal issue is whether the gestational surrogate mother can be held to her advance agreement to have no role in custody, visitation, or rearing. As of 2010, these questions have not been resolved in all states, but there is enough certainty for most persons needing surrogacy to go forward.[12] By 2030, a firm legal regime for surrogacy is likely to be in place, giving Larry, David, and Janice more certainty about what to expect if their plans go awry.

Larry and David present another variation on the gamete donation and

surrogacy theme. Commonly, a couple or individual will need only one collaborator—a donor or a surrogate. Sometimes, however, both partners will lack gametes and will request egg and sperm donation, which can take the form of an embryo donation. Or the woman may lack both healthy eggs and the ability to carry a pregnancy.[13] In rare cases, they might need egg and sperm donation *and* surrogacy in order to produce a child. That situation, however, does not involve their own reproduction. Because they are contributing neither genes nor gestation, they are not exercising procreative liberty. Rather, they are arranging a prebirth conception and pregnancy so that they might then adopt the resulting child.

Larry and David are not going that far, but they are pushing the boundary a bit by involving both an egg donor and a surrogate. If the egg donor were unrelated, the child will have a nanny, perhaps a wetnurse, and babysitters, but may spend no time with its genetic or gestational mother. The child may never be told who the donor or carrier was or have contact with either. In this case, Larry and David expect Marge to be more actively involved. They may tell their child that "Aunt Marge" is also his genetic mother, making Marge both an aunt and a mother at the same time. By 2030, related gamete donation or surrogacy will likely have become so common that a set of social norms or practices for how they are described and celebrated, including even a line of greeting cards tailored to them, will have emerged.

Larry's and David's need to use technology to reproduce gives them protection against laws that limit them from doing so. While lesbians and single women can be inseminated with sperm from a donor, Larry and David will need the help of an egg donor and a gestational carrier to have a child. Their reproductive liberty—their interest in having and need to have offspring—is at stake, and should be recognized as a protected right to the same extent that heterosexuals have such rights. The U.S. Supreme Court never had to rule on whether gays and lesbians have a right to use ART to reproduce because they were never faced with a direct ban on them doing so, just as it has never had to face that question with heterosexuals. Yet there is good reason to think that if government ever did try to stop IVF, egg donation, or gestational surrogacy for gays or straights, it would lead to constitutional recognition of a liberty right to reproduce in this way.

The basis for constitutional rights to reproduce derive from Court decisions dealing with compulsory sterilization and birth control and abortion. The idea first pronounced in 1942 in *Skinner v. Oklahoma* that reproduction is a basic civil right of man has been reiterated frequently in dicta in cases about the importance of marrying, having a family, and raising one's children.[14] Indeed, in *Eisenstadt v. Baird*, a case involving access to contraceptives, Justice William Brennan stated that "if the right of privacy means anything, it is the right of the *individual*, married or single, to be free from unwarranted governmental intrusion into matters so fundamentally affecting a person as the decision whether to bear or beget a child."[15] These statements assume heterosexual marriage and coital conception, but the underlying values and interests at stake exist in noncoital, assisted reproduction too. Infertile persons have the same interests in the primal human

experience of having offspring—in having heirs, in nurturing children, and in enjoying their company—that fertile persons do. Because reproduction is as important to the infertile as it is to the fertile, they should not be denied that opportunity without a strong showing that their use of assisted reproductive techniques would cause substantial harm to others, a very difficult standard to meet. Moral objection alone does not count as a compelling interest. Treating gays and lesbians equally would mean recognizing their reproductive rights as well.

While few states have tried to stop gay and lesbian reproduction directly, the family law structure has sometimes impeded it by not recognizing the prebirth or preconception agreements made for rearing rights and duties in the resulting child. This is less of a problem with gamete donation than it is with surrogacy. Most states have laws regulating parenting rights in sperm donation, with the donor agreeing to relinquish all rearing rights and duties and the recipient couple or individual taking them on. The few states with egg donation statutes quite sensibly follow that model. Surprisingly, there have been few legal disputes arising from egg or embryo donation, and none that has drawn the Supreme Court's attention.

Thus, we can expect that Marge's egg donation to Larry for use with David will pose fewer problems than Janice's role as a gestational surrogate. Quite wisely, Larry and David have chosen Janice, who already has had children, so she knows what pregnancy is like and what the experience of birth and relinquishment might entail. She has chosen to be a surrogate to help a needy couple, and also to earn money. In this case the $75,000 fee is half of what she would have earned if she continued as a nurse, but she likes the flexibility of surrogacy and has the support of her husband in doing so. She receives a payment every few months, with the bulk of it coming after the birth of the child.

Larry, David, and Janice have discussed her diet and activities during pregnancy. If medical problems develop, she is free to terminate the pregnancy. If as a consequence of spontaneous twinning she ends up with triplets or more, she has also agreed to selective reduction to one or two fetuses, as the three of them decide at the time. If prenatal testing shows that the fetus has a serious genetic defect, she has also agreed to terminate the pregnancy. Some of these provisions might not be legally enforceable, but they give the parties enough assurance to proceed.

The most likely source of conflict in surrogacy in 2010 is the risk that the surrogate will change her mind after birth of the child and not relinquish rearing rights and duties to the hiring couple. This issue received national attention in 1989 with the Baby M case in New Jersey. That state's supreme court ruled that the surrogate, who in that instance had provided the egg as well, could not be held to her agreement.[16] She was the mother under the law and was entitled to visitation and shared custody. California, on the other hand, took a different approach in 1991 in a gestational surrogacy situation involving an infertile married couple. Its high court found that the child had two mothers—one genetic and one gestational—and allowed the contract assigning rearing rights and duties to the genetic mother to be enforced.[17] This gave a big boost to gestational surrogacy

arrangements, and led to several states making such arrangements legally enforceable in advance.[18]

By 2010, the question of child custody in gestational surrogacy cases has come to depend on whether a state adopts the New Jersey or California approach. Given the Supreme Court's preference for deferring to the states on family law matters, it may not have yet ruled on gestational surrogacy when Larry, David, and Janice go forward. Yet if a case were presented involving a couple that uses a gestational carrier because the wife has ovaries but no uterus, there would be strong case for recognizing such arrangements. If so, the California solution would become the constitutional standard. This would be particularly true if it were incorporated into a statute that had a court or a state agency review the contract in advance to ensure that the surrogate has been fully informed about the risks she faces and has made a free and knowing choice.[19] Even without prior review, a law that refused to recognize surrogacy contracts or banned payments to surrogates might be found to be an unconstitutional burden on an infertile couple's right to procreate with the help of a surrogate.

If that right exists, Larry and David are entitled to exercise it to the same extent as infertile heterosexual couples. They too are married, and they too have interests in having and rearing children. It is true that only David has a direct genetic connection, but Larry's interest, particularly with use of his sister's eggs, in rearing a child of his spouse should be treated the same. Thus, a state that has an advance review procedure for surrogacy contracts would have to extend that arrangement to all couples, gay or straight, and arguably to any gestational surrogacy arrangement. If it does not have a pre-certification process or bans or prohibits such arrangements, then the courts should find such a ban unconstitutional and should give effect to Larry and David's surrogacy arrangement in the same manner as they would honor that of an infertile couple.

In short, it is reasonable to expect that by 2030, Larry and David will be on well-trodden ground with their plans to use Marge and Janice and IVF to have a child.

Screening Embryos and Choosing Genes

More novel and challenging is their request to choose both the gender and the sexual orientation of their child. Sex selection by preconception sperm sorting and preimplantation embryo testing is now available to choose the gender of offspring, but sex selection for nonmedical reasons is not yet widely practiced in the United States. Preimplantation and prenatal tests are also used to screen out embryos and fetuses with mutations that would lead to infant, childhood, and even adult diseases, such as cystic fibrosis, sickle cell anemia, breast cancer, and Huntington's disease. Very few mutations associated with non-disease traits, such as sexual orientation, have been identified so far, in part because those traits are governed by complex combinations of genes and environment.

The growing ability to sequence quickly whole human genomes and find genetic associations with many complex traits may change that situation, however. In addition, scientists are also becoming adept at removing or inserting DNA sequences in animals. They will eventually be able to alter genes in humans as well. By 2030, the prebirth genetic shaping that Larry and David request might be routine for many traits. Their case will be more difficult if they want to use those techniques before they are proven to be safe and effective. But they are a cautious and responsible pair, and are not interested in taking on the physical risks of untested techniques. Selection of embryos for transfer on genetic grounds poses fewer physical than social risks. Insertion or deletion of genes, by contrast, ups the ante on physical, social, and ethical grounds.

As the power and availability of genetic-selection techniques grow, the legal system is likely to get involved. The ethical conflicts present in earlier battles over IVF and gamete donation and surrogacy will reemerge with new force when parents want to choose or shape their children's genomes prior to birth. Many persons will cry out against parents' having such power, because of the effect it will have on children and parenthood and the role of family in society. In some cases, the fact of selection itself will be the issue. In others, it will be the specific genes or traits selected for and their implications for children, persons with disabilities, and other groups.

It is no surprise that individuals want choice in their mates and their sperm and egg donors. There are many physical, behavioral, and personality factors that make up attraction. Poets and artists celebrate the miracle of chance that leads people to fall in love and find a desirable mate for reproduction. Choosing sperm and egg donors is less mystical and more explicit, with a list of donor traits in a catalogue or photographs on the internet.

Couples who choose to have children now routinely practice some degree of screening and selection to avoid the birth of a child with a serious disease. Ultrasound and amniocentesis are mainstays of prenatal diagnosis, which leave the option of abortion when test results come back positive. By 2030, it is likely that a simple blood test will provide enough fetal DNA for genetic testing that no entry into the uterus will be necessary. As genetic knowledge grows, so will the list of testable conditions, including adult-onset diseases and risks for cancer. However, termination of pregnancy to avert a birth when there is a positive test is difficult and will be rare unless the condition is a very serious one.

The advent of preimplantation genetic diagnosis (PGD) allows the screening of embryos prior to pregnancy, but it does so by IVF and embryo biopsy. First developed in 1990 for cystic fibrosis, it is now used for several hundred congenital conditions, most of them quite rare. It has also been extended to adult-onset diseases and risk factors, such as for breast and colon cancer, which appear only in adult years. PGD is attractive because it avoids the need for abortion, but it can be troubling in its own rights. IVF replaces coital conception. Embryos have a cell clipped and analyzed, and some embryos will be discarded, rather than transferred. By 2030, PGD and embryo biopsy techniques should be vastly

improved, but they will still involve a choice among embryos. With genome sequencing so cheap and easy, a genome-wide scan of genes associated with many low-risk medical conditions—and eventually nonmedical traits—may be used to choose embryos for transfer.

Ethical issues leap out here and will lead some groups to call for a hand on the brake. Persons with more traditional or conservative views about family and reproduction see preimplantation and prenatal screening as a threat to the idea that children are "gifts" who should be accepted as they are, a norm which they see as the core of successful parenting and transmission of societal values.[20] Rather than accept what nature has given them, prebirth selectors are choosing their children not for their own sake but for how well they serve parental needs. It is offensive to traditionalists that a child has to pass a genetic test to be born. Such practices harm embryos and fetuses and set up unrealistic expectations for resulting children. Even selection to prevent the birth of children with serious genetic disease—such as Tay Sachs, sickle cell, or cystic fibrosis—is questionable in this view, because it devalues existing persons with those diseases. Once established for medical purposes, genetic selection will then be used to design the characteristics of offspring, traditionalists warn. This will overvalue particular traits, set up unreal, rigid expectations for children, and lead to unequal access to enhancement traits.

Traditionalists know they cannot rely on a profit-motivated reproductive industry to rein in these uses, so they may be happy to have the law intervene. Prenatal diagnosis won a place in obstetrical practice because it met needs and raised few problems beyond encouraging abortion for fetuses with genetic conditions and the risk of devaluing persons with disabilities. PGD has developed, in turn, free of legal scrutiny. Aside from an occasional tort case about missed diagnosis, there have been no bans or even regulation of what may be tested. As a result, there has been little occasion for constitutional development in state courts and no word from the Supreme Court. As with most medical technologies, doctors do what patients want and the technology permits, often shaping that demand. But selection for nonmedical traits may change that situation, with some legislatures imposing restrictions on nonmedical genetic choice.

At this point, the scope of a prospective parent's right to choose the genes of children will arise. Although no more legally established in 2010 than the right to use ART or donors and surrogates, a robust right to genetic selection and even alteration should follow from the constitutional right of individuals, fertile or infertile, gay or straight, to decide to have or not have children.[21] Information about a child's genetic makeup, like information about the child's future health status, could directly determine whether an individual goes forward with reproduction. Withholding that information by banning tests that provide it or actions based on them would directly interfere with reproductive choice. Such laws should stand only if there is a compelling justification for them.

This point is clearest with regard to prenatal tests, such as ultrasound and amniocentesis, that tell whether the fetus has severe genetic or chromosomal

deficiencies. But if it holds there, it should hold for less serious medical or health conditions: the presence or absence of such risks could be central to a person's decision to go forward with reproduction. If so, it will be hard to exclude nonmedical genetic preferences from rights protection as well. A person's choice to reproduce could be as strongly affected by nonmedical traits, such as gender or sexual preference, as is a person's choice about a child's medical risk status. Choices about nonmedical traits should thus be as protected as is the right to use amniocentesis or embryo screening for health reasons. Indeed, as the ability to alter genes grows, protection for the right to remove deleterious mutations or even add desirable ones should follow.[22] Causing serious harm to offspring or others would justify limiting rights of selection and alteration, but moral or religious objection alone should not suffice.

Larry and David want to have a boy who is gay. As of 2010, only sex (and a few other single gene traits) can be chosen in advance. The sex of fetuses can be seen on ultrasound. Although abortion for nonmedical sex selection falls presumptively within a woman's right to terminate a pregnancy, few such abortions occur in the United States, though they do frequently occur in India and China. Abortion for other nonmedical traits, once they become known, is also unlikely in the United States unless definitive testing can be done very early in the pregnancy.

But gender can also be identified in embryos. Embryos of the desired sex then can be transferred to the uterus, with the others discarded or donated to others. For persons who believe that the fertilized egg is already a person or moral subject in its own right, this will be anathema. Larry, David and many others disagree and find embryo selection, because it is at such an early stage of development, much more acceptable than abortion. Indeed, they may be willing to screen and discard embryos but be repelled by the thought of abortion for sex selection.

The gender of children can also be chosen via sperm sorting techniques. Indeed, the clinic treating Larry and David will first separate the male-bearing from the female-bearing sperm and use only the former to inseminate Marge's eggs. They will still do PGD to make sure that the fertilization has resulted in male embryos and to identify those with the genes associated with a homosexual orientation.

No laws now regulate sex selection, though the FDA does have authority over devices and drugs that are intended for that purpose. With preconception sperm sorting available, a big jump in sex selection is expected. In the United States this is most likely to come from Asian communities, which place a high value on first born males. Other individuals may also want to choose the sex of their first born child or use sex selection for second and later-born children to provide gender variety in the family.

By 2030, the rules for sex selection are likely to be well-developed. One sensible approach would be to make sure that no sex ratio imbalance results, as has occurred in China with an earlier one-child-per-family policy. This could be done

by requiring clinics to select for an equal number of males and females or by limiting sex selection to second and later children. The main social concerns with such a practice are its tendency to foster sexism and thus harm women. Males may be chosen, particularly as the first born, and continue to dominate society. There is also the risk that parents will have a fixed menu of expectations of what they want from a child of a certain gender. If they have a girl, the fear is that they will expect girl-like behaviors and roles, and they may expect the same of males they have chosen to have. Imagine their disappointment if the child of a chosen sex does not live up to the stereotypical view they have of how that child should act. However, not all parents selecting the sex of children will have such strong expectations. In any case that risk is not strong enough to support a ban on all nonmedical sex selection.

Once sex selection is accepted, there will also be requests to select embryos for other traits for which a genetic basis is known. Opposition to such a practice reflects many concerns beyond respect for the embryos destroyed in the process. These include expectations of the child and harm to those groups not chosen, as well as the more global, traditionalist concerns about not accepting what nature or God has provided. Unreal or rigid parental expectations may clash with the child's own needs and development. This could occur with embryos selected for sexual orientation, musical ability, fast and slow twitch muscles tied to athleticism, beauty, IQ, and other traits.

In most cases the trait chosen might seem beneficial to the child: height, IQ, beauty, or memory, for example. But it may also set a premium on the child's living up even more fully to parental expectations of someone with that trait—especially when the parents have gone to the expense and inconvenience to produce it in their child. In some cases, the trait might seem less attractive, or even harmful, to the child, as is the case with short stature, deafness, or as some persons will perceive it, the homosexual orientation that Larry and David want for their son. Strictly speaking, however, those children would not have been harmed by the choice, since they would not have been born if the parents had not been free to choose the trait in question.[23]

The situation is complicated by the genetic reductionism motivating many persons who want to select offspring genes. In 20 years we will know much more about a person's genome and how those genes interact and affect phenotype, but the strength of the correlation will vary greatly. For many traits, nurture will dominate nature, with the environment playing a stronger causal factor than genes alone. Widely publicized genetic discoveries may lead people to jump to the conclusion that they can easily choose from a genetic menu the traits they wish for their child. Such an assumption inflates the role of genes in shaping a person and underplays the polygenic and environmental complexity of most desirable traits. This could lead to disappointment and renewed efforts to shape the child to parental wishes, with disappointment, frustration, hurt, anger, and conflict all around.

As doubts about genetic efficacy grow, the push for legal regulation may also

gain strength. Although no bans now exist, it would not be surprising to see legal barriers arise as problems with genetic selection surface. Parents may challenge those laws on constitutional grounds. Again, the question would be whether the interest in the traits of the child is such an essential part of deciding whether or not to reproduce that it is part of procreative liberty.[24] If so, the state would have to have some stronger reason to restrict parental freedom than religious or moral notions decrying selection itself.

In short, Larry and David are skating along ethical and constitutional frontiers when they request embryo screening to pick a male with a gay orientation. Their choice of a male child is more likely to be honored than is their preference for a homosexual child, as long as there are protections against sex ratio imbalances and harming women. It will be hard, however, to deny parents the right to select embryos for sexual orientation, whether gay or straight. Gays and lesbians have the same right to respect in choices over intimacy, marriage, and reproduction that heterosexuals have. If their social and legal status is protected, what basis would there then be for saying that knowingly opting for a gay child will harm that child's well-being? The right to choose other nonmedical traits may follow as well, depending on the specifics of those cases. Regulation to minimize untoward effects or maintain safety may occur as long as it imposes no undue burden on the parental choice at issue.

Gene Alteration: Inserting and Deleting DNA

Larry's and David's plans to have a male child through preconception sperm sorting and then screening embryos to identify those with gay genes should fall within the spreading canopy of procreative liberty. Although some persons will condemn their efforts, particularly their choice of their child's gender and sexual orientation, by 2030 such choices should be a recognized part of procreative liberty for gays and straights alike because it could be so central to their reproductive choice. Indeed, as noted earlier, there is a logical basis for courts finding the right to genetic alteration to be within the scope of reproductive liberty. Such rights, of course, exist only when material to whether a person proceeds with or avoids reproduction, and are subject to regulation for health and safety or other compelling reasons. Courts may not accept all the implications of reproductive liberty outlined here, but there is a logical case for doing so.

By 2030 much more controversial than selection alone will be Larry's and David's efforts to have DNA inserted or deleted from embryos to ensure that their child is homosexual. The technique of gene targeting was developed in the early 1980s in mice. In 2007 scientists Mario Capecchi, Martin Evans, and Oliver Smithies received the Nobel Prize for this work.[25] It has led to the creation of knock-out mice—mice with specific genetic sequences deleted which enable them to serve as experimental models to study particular diseases. Imagine that by 2020 knock-out techniques have been applied to human embryos and gametes, enabling scientists to delete or insert particular sequences of DNA and then create stem cell

lines to study the origins of diseases and ways to fight them.

By 2030 some parents who are carriers of serious genetic diseases will likely think that this may be a way for them to have a healthy child without abortion or embryo discard. They could create embryos through IVF, and then test them for the disease genes of concern (Tay Sachs, cystic fibrosis, sickle cell anemia, etc). If they have embryos free of disease, they would simply transfer them to the uterus. If they have only diseased embryos, the missing gene sequence could be inserted and mutated sections deleted. This would be genetic surgery on the child they eventually have.

No alteration of human embryos prior to transfer is likely to occur until studies in animals, including larger mammals and primates, show a high degree of safety and efficacy. As that evidence mounts, however, human application will follow. First, we will need to learn that human embryos and cells from them can develop normally, thus enabling a few families to request transfer of altered embryos to the uterus. Early miscarriage may occur, but if the vast majority of children are born healthy, this technique may be quickly accepted as a viable alternative for interested parents. If that occurs, by 2030 Larry and David could plausibly request gene alteration to ensure that the male child they plan to have will also have the genes associated with a homosexual orientation.

What is wrong with doing so? If they can choose embryos with gay genes to begin with, why not alter them as well for that effect? Here the problem cannot be deliberately choosing a gay male offspring, because that can be done by transferring embryos so endowed. Rather, it is the deliberateness of it: changing nature to ensure a result. There is also a greater risk of error and harm to offspring because manipulation is occurring. So much more can go wrong.

Some of the fear of gene alteration stems from the precedent it might set for other forms of alteration. It would enable, for example, genes to be added for enhancement of IQ or other desirable attributes, which raises the specter of even greater social inequality between the better and the less well off and a twisted search for the perfect child. Intentional diminishment must also be thrown into the mix: parents with healthy embryos might perversely decide to delete certain genes to diminish the future child's capabilities. Science fiction presents such scenarios in the service of evil dictators who use it to engineer a servant race, as in popular films such as Bladerunner. Bioethicists, on the other hand, debate scenarios of deaf parents' knocking out the hearing genes in their embryos to ensure deaf children, and dwarf parents inserting genes to make sure that an otherwise-average-height child will be of short stature.

In Larry and David's case, acting on their doctor's advice, they are not willing to trust genetic selection alone to ensure that their child will carry a sufficient dose of genes for same-sex attraction. They want to delete the genes associated with heterosexuality and insert those that link to same sex attraction. Other couples will request different traits, though not all desirable traits will have the genetic wiring that can be manipulated, and cost and other factors will still make coital

conception the preferred method of having children.

Fevered debate and discussion will erupt as such techniques move toward human application. The pro-use side will argue that parents have the right, if not the duty, to do the best for their children, particularly if they are already going through IVF and can access their embryo's genome. In Larry and David's case, they think they will do a better job as parents with a gay child, but will not force that orientation on the child if the selection and alteration are not successful. Parents who choose other traits will argue that they can spend as much as they want after birth to give the child the lessons and experiences that equip him early on for a competitive life, so why should they not be able to do so before birth as well. The anti-side will decry the engineering of children to serve parental ends. They will hang their opposition on the welfare of children: those deliberately diminished and those who have unreal and rigid expectations placed on their shoulders. They will also appeal to egalitarians to help them stop the wealthy from gaining even more advantages over the rest.

Long before gene alteration is ready for prime-time use, state or federal authorities might step in with laws restricting alteration research in humans and transfer of altered embryos so that a child may be born. Opponents will tout such laws as both necessary to protect children from the unknown harms of gene tinkering and necessary to protect society at large from the social inequalities that could result. Civil libertarians will protest that their procreative liberty is being trampled. With the support of persons who back the use of gene selection and alteration for health purposes and scientists who see restrictions on research as blocking scientific inquiry, they may prevail.

If laws are passed limiting alteration, responsible couples who want to choose their child's genes might sue to establish their constitutional right to do so. Their case will be stronger if the scientific evidence shows that genes can be knocked out or inserted in primates and human embryonic stem cells without developmental ill. They will also rely on the explicit constitutional protection expected in coming decades for a couple's use of ART and embryo screening to identify embryos they wish to transfer. With such precedents on the books, the case for genetic engineering to produce children will be plausible and even compelling, though of course one cannot confidently predict that lower court or Supreme Court justices will accept the its logic to its full extent. Additional support will come from the well-established right of parents to rear their children as they wish, for example, by teaching them foreign languages, sending them to private schools, or inculcating in them minority religious tenets.[26] Parental autonomy should not hinge on whether actions to benefit their children are taken before or after birth, particularly when the before-birth actions are safe and effective and necessary if the parent is to reproduce at all.

Cloning

What if Larry and David decide they wish to have a child that is the clone of one of them? A major problem is safety and efficacy, and that problem may persist for many years to come. If cloning techniques improve so that scientists can clone monkeys and other primates with ease, however, the question of cloning oneself or another person will inevitably follow. The ethical concerns here, however, are particularly daunting. Since the birth of Dolly the cloned sheep in 1998, there has been a wide, though not complete consensus, that reproductive cloning of humans is unacceptable.[27] Yet if cloning is safe and works in primates, attempts to use it in humans will undoubtedly occur. For example, Larry and David might prefer to clone Larry for the first child and then clone David for the second. Similarly, a man who lacks viable sperm may have no other way to have genetic offspring. Gay and lesbian couples or single men or women may make the same argument.

Overcoming current reservations about reproductive cloning will be a difficult journey, and one which is less likely to find support in constitutional theories of procreative liberty than the embryo screening and alteration situations already examined. In those cases, would-be parents are chosing particular genes, not the entire genome, and have a clear kinship tie with the resulting child. The strongest case for reproductive cloning would be a situation of true gametic infertility, where a person has no way to reproduce genetically.[28] If that need were established, it could then be balanced against potential harms to offspring and other dangers from reproductive cloning.

But neither Larry or David is gametically infertile. Either could reproduce with an egg donor and gestational surrogate, as David is doing here. By using Larry's sister Marge as the source of eggs fertilized with David's sperm, Larry will be sharing 25 percent, rather than 50 percent, of his genes with the child. Cloning Larry with an egg from another donor would give him almost 100 percent of the genes, but then David would have no genetic connection. Of course, they could take turns; one child could be the clone of Larry and the next the clone of David. But this means that the partner who has not been cloned will not be reproducing in that case, as they would if they contributed the usual 50 percent complement of genes. The other questions about the technical viability of cloning, and lingering concerns about the expectations set for a child that is truly a "chip off the old block" makes this a less appealing case.

Nor does the logic of procreative liberty necessarily lead that far. A constitutional question would arise if a state or the federal government blocked reproductive cloning altogether once the case for its safety and efficacy were more firmly established. The constitutional claim would turn on whether procreative liberty extends to choosing the entire genome of one's offspring, rather than just choosing particular genes, as might be recognized in cases involving genetic selection and alteration.[29] Although a proponent might argue that he would not reproduce unless he could clone himself, I see a distinction between reproductive cloning when gametically infertile and when not, with the latter enjoying less protection. The distinction turns on the strength of the purported need for cloning and whether it serves kinship and rearing interests in the ways that make

reproduction so important to human flourishing and hence protected as a constitutional right. When the genetic tie that is so central to reproduction can be established without the more dangerous method of cloning, than the right to reproduce seems less strongly implicated.

If this distinction is accepted, then the question of whether gay couples or a single man or woman should be viewed as gametically infertile would arise because they could reproduce with an egg donor and surrogate or lesbian partner and sperm source. In such cases the state would need to show only a rational basis for banning their cloning. Such distinctions, however, may be lost in legislative and judicial battles over cloning.

Gametes from Stem Cells

In 2030, Larry and David might also consider using stem cell technology to derive the gametes they need to reproduce—for example, if stem cell technology has progressed to the point that it is practical to derive gametes from embryonic stem cells or a person's own somatic cells. Because of ethical concerns about destroying embryos, recent scientific attention has focused on developing non-embryonic sources of pluripotent stem cells. Great success has occurred with reprogramming a person's own somatic cells to an earlier pluripotent state, which can then be induced to develop into the particular tissue needed for research or therapy. Eventually, it might be feasible to direct induced pluripotent stem cells to form male or female gametes.

With the enormous investment of resources and talent now pouring into stem cell research, it would not be surprising if the ability to derive gametes from pluripotent stem cells were well-established by 2030 or soon after. Such a feat might lead to easy production of the eggs needed to carry out some important forms of stem cell research, including nuclear transfer cloning for research or therapeutic purposes. It might also lead to gametes for reproduction by persons lacking viable egg or sperm as a consequence of chemotherapy, disease, or trauma. Gay, lesbian, and transsexual persons might also welcome the availability of gametes derived from their own somatic tissue, rather than resorting to a sperm or egg donor to have a family.

If the stem cell technology is developed enough, Larry and David might prefer to use to use eggs derived from stem cells, instead of from an egg donor. They would still need a gestational carrier and would still have to screen or alter embryos resulting from this procedure to have the gay male child they desire. But if Marge withdrew or were not able to provide viable eggs, this procedure might provide a way for Larry's own cells to produce the eggs needed for David and Larry to have a child.

But what then about the kinship and family issues that would arise if Larry's cells were used to produce eggs? He would be making the 50 percent genetic contribution to a child that occurs in coital reproduction. In this case, however, he

will be providing an X chromosome and not the X or Y chromosome that the male partner in reproduction provides. The very description sets off alarm bells about pushing the envelope too far. But if safety concerns are allayed, would it matter that he would be providing the X chromosome that the female provides in reproduction, and thus would in a technical sense be the genetic "mother" of his gay son?

Arguably, the label attached to the 50 percent of the chromosomes provided by each partner should not matter to them or the child. Their son will necessarily have a gestational mother and have both an X and a Y chromosome. If Larry and David decided that the child's sex was less important to them, they might have a girl, with Larry and David each by different routes providing an X chromosome. The child would have two "dads" rearing her just as a child of a lesbian couple would have two "moms." Yes, she would be a child without a genetically female mother with whom the child might have contact, but that is now happens with the use of an unrelated egg donor.

The mind reels with the ethical and social complexity of producing children in this way, which I offer as an exercise for focusing the meaning and scope of reproductive liberty and not as a prescription for the good society. Would a law banning the use of stem-cell-derived gametes to have children be constitutional? Because genetic selection and alteration is not directly implicated, the question is one of kinship and family relations. The purpose here, however, is to establish the kinship and family relations that are not otherwise available to a gay couple because of their homosexuality. For a gay male couple to reproduce, female gametes (as well as gestation) is needed. If their resort to an egg donor is accepted or even protected as an exercise of their reproductive liberty, then finding that female gamete within themselves, as stem cell-derived gamete techniques might enable them to do, should also be protected. If it can be safely done, it should not be banned because of its novelty or strangeness. Reproductive technology bends conceptions of parenthood in many ways. If it serves the core reproductive need of safely having genetically related offspring, its use should be protected, even if not applauded.

Conclusion

Larry's and David's plans now seem far-reaching and brim with controversy. The Supreme Court would most likely prefer not to be involved, and if it is, may step gingerly to avoid recognizing the full implications of a constitutional doctrine of procreative liberty. A conception of procreative liberty that extends to ARTs and then some to degree of genetic selection could plausibly lead to the surprising conclusion that what Larry and David propose may by 2030 fit within the mainstream of reproductive choice. Technology will push our value system and our laws to include many things now considered outré. Will this be bad? It will depend on safety, efficacy, numbers, and how far their plans deviate from the experiences that make reproduction and parenting so central to human flourishing.

Two decades is a short period of time for full scale trait association networks to be teased out and then to perfect the ability to insert and delete genes in humans in a safe and effective way. Two decades may also be too brief a time for social and cultural norms about parental choice to change and develop in the direction described here. But there is much room for legal and constitutional norms now focused on abortion and sterilization to evolve to encompass assisted reproduction, genetic selection and alteration, stem-cell derived gametes, and even reproductive cloning. As technical developments occur, technology will exert hydraulic pressure on procreative practices and the legal rights that protect them. As conceptions of family and parental choice change, courts and legislatures will respond accordingly. By 2030 the logic of procreative freedom should recognize the right of Larry and David to use the technologies available to have the family they choose.

John A. Robertson holds the Vinson and Elkins Chair at The University of Texas School of Law at Austin. He has written and lectured widely on law and bioethical issues. 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, genetics, organ transplantation, and human experimentation. He has served on or been a consultant to many national bioethics advisory bodies, and is currently Chair of the Ethics Committee of the American Society for Reproductive Medicine.

Governance Studies
The Brookings Institution
1775 Massachusetts Ave., NW
Washington, DC 20036
Tel: 202.797.6090
Fax: 202.797.6144
www.brookings.edu/governance.aspx

Editor
Jeffrey Rosen
Benjamin Wittes

Production & Layout
John S Seo

E-mail your comments to gscomments@brookings.edu

Endnotes

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