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REVIEW

Ethical arguments for and against sperm sorting for non-medical sex selection: a review

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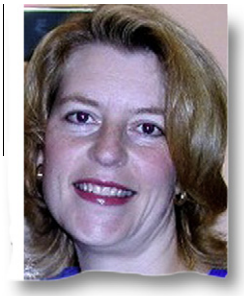

Dr Kalfoglou is an assistant professor at the University of Maryland, Baltimore County, where she teaches public health, research methods in health and public health ethics. Previously, she was a research fellow at the National Human Genome Research Institute and a social science research coordinator at the Genetics and Public Policy Center, Johns Hopkins University. She has extensive experience in ethical and health-policy analysis related to human reproduction, genetics and research ethics. She is on the editorial board of the *American Journal of Bioethics* and a former Chair of the Ethics Special Interest Group within the American Public Health Association. She holds a PhD in public health policy and ethics from the Johns Hopkins Bloomberg School of Public Health.

Abstract Much has been written about the ethics of sex selection. This article thoroughly explores the ethical arguments put forth in the literature both for and against non-medical sex selection using sperm sorting. While most of these arguments come from philosophers, feminist scholars, social scientists and members of the healthcare community, they are often echoed in empirical studies that have explored community values. This review is timely because the first efficacious method for sex selection via sperm sorting, MicroSort, is currently in clinical trials and moving closer to FDA approval for marketing in the USA. While the clinical trials are currently focused on the use of MicroSort to avoid X-linked genetic diseases, MicroSort can also be used to satisfy parental preferences.

KEYWORDS: bioethics, Microsort, policy, preconception sex selection, sex selection, sperm sorting

Introduction

Technologies including ultrasound or prenatal testing followed by selective abortion, preimplantation genetic selection (PGS) for sex, as well as numerous sperm-sorting techniques, are now available to families desiring a child of a specific sex. Selective abortion is an effective means of selecting for sex, but it requires the termination of a pregnancy. PGS is also highly effective, but is invasive and expensive and usually results in discarding healthy embryos. Sperm-sorting technologies avoid both ethical concerns about loss of fetal or embryonic life and invasive procedures, but most methods do not work reliably (Flaherty and Matthews, 1996).

MicroSort is distinctive because it has proven efficacious particularly when selecting for a girl (Fugger et al., 1998). It

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works by exposing spermatozoa to a fluorescent dye. The spermatozoa are passed through a flow cytometer, which is able to sort the spermatozoa on the basis of cell fluorescence. Spermatozoa with an X chromosome (indicating a girl) glow more brightly. This technology has proven to be 93% effective for selecting girls and 82% effective for selecting boys. (www.microsort.com/?page_id=453) Genetics and IVF, the company licensed to develop MicroSort for human use, currently has FDA approval to conduct clinical trials among couples who are at risk of having a child with an X-linked disease such as Duchene muscular dystrophy or haemophilia. Previously, Genetics and IVF had FDA approval to conduct clinical trials for 'family balancing'. In other words, couples that already had a child of one sex could use MicroSort to attempt to create a child of the sex they did not already have.

Because preconception sex selection to avoid X-linked genetic diseases is widely accepted as ethical, the purpose of this review is to explore the ethical arguments in favour of and against the use of preconception sex selection for non-medical purposes, especially parental preference. Arguments unique to abortion and PGS are not considered. While arguments are usually promoted by bioethics, feminist, social science and healthcare scholars, research has also been conducted to explore lay/community values. When appropriate, these data are also discussed.

Arguments in favour of sex selection for parental preference

Freedom of choice

In *On Liberty*, John Stuart Mill argued that the only purpose for which someone's freedom can be constrained is to protect other individuals (Mill, 1859). This is by far the strongest and most common argument in favour of sex selection for parental preference (Dahl, 2003; Dickens, 2002; Dickens et al., 2005; Farrell, 2002; Macklin, 2010; Purdy, 2007; Rhodes, 2001; Robertson, 2001, 2002, 2004; Savulescu and Dahl, 2000; Savulescu, 2001; Steinbock, 2002; Stock, 2001; Tizzard, 2004). It is also the ethical basis by which many sex-selection providers justify making this technology available (Puri and Nachtigall, 2010). The idea is that people should be able to decide for themselves what kind of life they want to live, including the 'right' to make decisions about choices as personal as when, with whom and how to have children. Additionally, even if some might find this choice morally repugnant, the government has no right to interfere unless there is evidence of harm to the person using the technology, the resulting child or the society. Thus far, there is no empirical evidence that sex-selection technologies for parental preference result in harm to users or off-spring. However, sex-ratio imbalances, because of the use of selective abortion, exist in Asian countries and may be a compelling reason for those countries to limit access to sex-selective technologies.

Some advocates of 'a presumption in favour of liberty' would consider allowing restrictions on using sex-selective technologies designed to limit distortions in the general sex ratio (Dickens, 2002). Reproduction by its very nature affects others; therefore, reproductive freedom might be limited when having a negative effect on others (O'Neill, 2006). Restrictions might include limiting access to these technologies only to families who want to have children of each sex; imposing taxes on those who use it for the more requested sex; developing clinic waiting lists for those who want the sex that is more often requested (Heng, 2006); and preventing people from outside the USA (or other countries where the technology is illegal) from engaging in reproductive tourism.

Others, like Dawson and Trounson (1996), argue that restrictions of any kind violate the right 'to freely form families given in the Declaration of Human Rights'. Dawson posits that restricting access to 'family balancing' is unfair to families that live in one-child-only nations and that any restrictions on sex selection will lead to sex-selective abortions. Dickens (2002) also finds that prohibitions on sex selection are unnecessarily oppressive in countries where no sex bias exists. Savulescu (2001) takes an even stronger stand in arguing that any imposition by government on reproductive freedom with the goal of some kind of societal good (such as equality) is similar to the eugenic efforts made by the Nazis.

Avoids erosion of reproductive rights

Scholars are concerned about restrictions on reproductive rights, including the use of sex-selection technologies, because it could lead to an erosion of the right to terminate a pregnancy or to make other reproductive choices (Fletcher, 1980). A number of US state legislatures have attempted to or have passed laws that make it illegal for a woman to have an abortion because of the sex of the fetus (Generations Ahead, 2010). If sex selection through sperm sorting or PGS were regulated at the state or federal level, many fear this would provide additional justification to allow the government to restrict access to abortion services. Nonetheless, those who argue against any governmental intrusion in reproductive decisions may still support those who voluntarily limit the types of services they are willing to provide, such as refusing to provide sex selection for parental preference for a first child. They argue that the technology is only a symptom of the pervasive underlying problem of sexism and that these social and cultural issues must be addressed directly (Dickens et al., 2005; Macklin, 2010).

Avoids abortion of fetuses and destruction of embryos

Preconception sperm sorting is currently the only sex-selection technology that avoids the destruction of embryos or fetuses because it selects spermatozoa prior to the creation of embryos. As a result, sperm sorting avoids many of the ethical concerns associated with using PGS or prenatal testing followed by abortion for the purpose of sex selection (Hall et al., 2006; van Balen, 2006). Dickens (2002), Dawson and Trounson (1996) and Puri and Nachtigall (2010) take the argument a step further by concluding that any restrictions on sperm sorting in areas where there are strong cultural preferences for boys will, in fact, lead to abortions, risks

to the physical and mental health of women and risks to the health and wellbeing of girls who are not wanted.

Best interest of the child

Doyal and McLean (2005) argue that using sex selection to ensure a good future for one's offspring is not sexist. Rather, children born to parents who desire a child of one sex are more likely to have a positive future, particularly in cultures that have a strong sex preference. If a girl born into a patriarchal society is more likely to be neglected or abused, for example, it might be ethically better to allow the parents to choose the sex of their child before it is even conceived (Dickens, 2002; Dickens et al., 2005; Savulescu, 2001; Steinbock, 2002). Dai (2001) echoes this advantage of sex selection. She argues that 'it may forestall potential psychological suffering of unwanted children'. Dai grew up with low self-confidence because she knew her parents wished that she had been a boy. Rhodes (2001) argues that sex selection may be in the best interest of the child regardless of whether the society has a strong male preference. Allowing families to select for a desired sex avoids the birth of multiple children when families are trying to have a girl/boy naturally. A child that is the desired sex is more likely to receive nurturing. Fewer children in a family means that the family's economic and human resources are not stretched as thin (Kilani and Haj Hassan, 2002; Rhodes, 2001).

Along a different but related line of reasoning, Robertson (2001) and Savulescu (2001) make use of Parfit's (1984) argument that it is impossible to say that a child has been harmed by any choices that parents make if, without those choices, the child would not exist. They use it to argue that if a couple would choose not to reproduce unless they can be guaranteed a girl, the child, once born, cannot claim to have been harmed. Without this choice, her parents would not have had her. They are not arguing that the not-yet-conceived child is somehow harmed, only that a child born based on parental decisions cannot claim that she was somehow harmed by that decision when that decision is what ultimately caused her to exist.

Advantages for women living in oppressive societies

Sex selection may have advantages for women living in oppressive societies. In some Asian cultures, women are blamed for not producing male children. Dai (2001) argues that such women might consider themselves lucky if husbands only take a mistress in order to produce a male child rather than divorcing. Asian families may ostracize a woman who does not produce a male child. Additionally, many Indian and other Asian women will undergo prenatal testing and selective abortion of female fetuses or agree to or be coerced into female infanticide to avoid the stigma of a daughter. As a result, sperm sorting might be less physically and emotionally harmful to women who live in such oppressive societies (Dai, 2001; Steinbock, 2002). Again, Rhodes (2001) steps outside the patriarchal society but still argues that it may be advantageous for both women and men to attain their goal of a gender-balanced family with as few children as possible since additional children increase the economic and human burdens of caring for a family.

Arguments against sex selection

Sex-ratio imbalance

Some commentators have argued against allowing the use of sex-selection technologies because they might lead to significant imbalances in the normal sex ratio. These sex-ratio imbalances may result in social upheaval (Hvistendahl, 2011). Hudson and Boer (2004) have described 'broken branches' — men who do not have wives and lose the opportunity to have children because the abortion of female fetuses in the previous decades has led to a sex-ratio imbalance. Not only do these men not have the opportunity to form families, but men with spouses tend to be healthier and live longer lives. On this basis, Etzioni (1968) and Fukuyama (2003) predict that a reduction in the female population will result in less culture, less church attendance and increased violence. Sociologically, the explanation for the increase in violent crime seems straightforward:

> ... young adult men with no stake in society — of the lowest socioeconomic classes and with little chance of forming families of their own — are much more prone to attempt to improve their situation through violent and criminal behaviour in a strategy of coalitional aggression with other bare branches (Hudson and Boer, 2004).

Similarly, although some commentators posit that the status of women in society might increase if there were fewer females, others worry that women in these societies may increasingly be viewed solely for their sexual and reproductive capacities (Baldwin, 2006; Hvistendahl, 2011). Researchers who have studied societies with a preponderance of men have found that such cultures generally emphasize virginity and the sanctity of the family, and women are often viewed as inferior to men in reasoned judgment, scholarship and political affairs (Bumgarner, 2007; Guttentag and Secord, 1983).

What is fairly clear is that banning access to new sperm-sorting technologies will not reduce the sex-ratio imbalances in these societies. The imbalances are based in economic, religious and cultural factors that result in a preference for boys. Since a cheaper and more effective means of selecting for sex already exists (ultrasound and abortion), banning a preconception method will not solve the problem. Similarly, making it available in Western countries is unlikely to exacerbate the problem overseas (Bhargava, 2005).

Empirical research conducted throughout the Western world appears to indicate that it is unlikely that preconception sex-selection technologies will alter sex ratios (Dahl, 2003, 2005; Dahl et al., 2003, 2006). In order for there to be a sex-ratio imbalance, there must be both a strong sex preference and an easy means to select for sex. There is little evidence to suggest that there is a sex preference in industrialized countries. Instead, families that have a preference want to have children of both sexes.

Concerns about creating sex-ratio imbalances in the West can be addressed by limiting sex selection to 'family balancing' or equalling out the number of children born of each sex. A secondary measure that falls short of complete prohibition would be for the state to create incentives through

taxes and distribution of social services for families to have children of the sex that is less in demand (Heng, 2006).

Inherently sexist and violates human dignity

Many scholars have argued that sex selection is inherently sexist because it involves making value judgments about a person or potential person based solely on sex (Dai, 2001; Levy, 2007; President's Council on Bioethics, 2003; Strange and Chadwick, 2009). For example, the feminist philosopher Powledge (1981) argues that choosing the sexes of children is one of the greatest displays of sexism. Sex selection, she finds, is wrong because it bases the worth of a human being on its sex. Concern that sex selection for parental preference supports sexist practices was the American College of Obstetricians and Gynecologists' (2007) primary objection to the use of sex-selection technologies for non-medical purposes.

Some commentators have argued that choosing the sex of one's children is a violation of human dignity because children have the right to be loved, respected and valued for their inherent worth (Blyth et al., 2008), not treated like a commodity.

Other commentators have argued that the use of sex-selection technology is not inherently sexist (Kluge, 2007; Mahowald, 2000; Robertson, 2001; Steinbock, 2002; Wertz, 2001). While some parental motives may be sexist, the vast majority of American couples who wish to use sex selection want to do so for 'family balancing' purposes. They are likely to already have two or three children of one gender and wish for a child of the opposite sex (Dahl, 2007; Strong, 1997). This desire to experience parenting a boy in addition to a girl, for example, is not necessarily sexist (Steinbock, 2002). Others have argued that parents who are focused on the best interest of their child in a sexist society are motivated by concern for their child, and this is not inherently sexist (Ten, 1998). Although concerns that the use of sex-selection technology exacerbates sexist attitudes, it does not follow that policies banning or limiting access to the technology will reduce sexism in society.

Harmful to children

Sperm sorting with intrauterine insemination (IUI) is not 100% accurate. As a result, some opponents have expressed concern that children who are conceived using it but are the less desired sex will be aborted or brought into a family that does not want them (Dai, 2001). The children of couples using preconception sex selection after the birth of multiple children of one sex also might come to believe that they are not what their parents wanted. The use of sperm sorting by parents for family balancing could also suggest to these children that everything, including a baby, is a purchasable commodity. Finally, Sills and Palermo (2002) are concerned that there may be serious psychological issues for a child conceived using sex selection in terms of their interpersonal development, socialization and core identity. They caution parents using sex selection to be prepared for the question: 'Why did you make me this way?'

Although there is no empirical research to support these concerns, families using sperm sorting with IUI can be counselled about the reliability of the method. If they are not willing to accept the risk that the fetus might not be the desired sex, they can be counselled to consider combining sperm sorting with PGS (Robertson, 2001). Additionally, the fact that families sometimes have children who are not the desired sex will not change with the introduction of sperm-sorting technologies. The psychological harm that might come to existing children who then know or believe they are not the sex their parents wanted presupposes that: (i) they do not already assume their parents desired a child of the opposite sex; and (ii) that the parents have disclosed their use of the technology to their children. As more children are created through sex-selection technologies, psychologists can study these families to empirically determine whether these concerns are warranted.

Another related objection is that parents of a child born following sex selection may expect the child to behave in certain gender-specific ways and the child may be resented if they fail to do so (Bhatia, 2010; Generations Ahead, 2010; President's Council on Bioethics, 2004). Levy (2007) argues that even if a girl is selected, the simple fact that certain characteristics are attributed to girls puts unreasonable gendered expectations on that child. The belief that there are gender differences is a product of sexism. Levy argues '[c]atering to [individual] whims' by providing sex selection endorses sexist practices. There is currently no empirical evidence the use of sex-selection technology increases the existing preconceived ideas couples have about the gender of a child. This concern might be addressed by requiring clients to undergo counselling about gender expectations prior to using the technology as suggested by the Ethics Committee of the American Society for Reproductive Medicine (2004).

A number of commentators (Davis, 2001, 2010; Murray, 1996) have argued against sex selection on the basis that children ought to have a 'right to an open future'. What this means is that children ought to be brought into the world with as much freedom as possible to figure out for themselves who they are or want to become. Davis writes: 'to view a child primarily through its gender narrows the child's ability to choose his or her own path through life'. When a child is selected based on sex, the 'full humanity of each girl and boy' is not celebrated (Davis, 2001). Similarly, Habermas (2003) is concerned that children may 'no longer regard themselves as the sole authors of their own life history'. Baldwin (2006) articulates this argument nicely. The problem is:

> ... the child's own discovery of [the use of sex selection] is held to induce a profound sense of alienation: when a daughter discovers that her sex is not a chance result which she can integrate as such into her own sense of her identity, but is the product of her parents' wish to have a child of that sex, she relates to it primarily as something that has been imposed upon her, so that her sense of her own identity as a girl is of someone who has been deliberately created by someone else to be of that sex.

There are others who argue that gender stereotypes are endemic already. Whether parents use technology to have a boy or conceive one naturally, certain behaviours are attributed to boys. Eliminating the ability to choose the sex of a child will not eliminate these stereotypes or pressures that parents put on their children to meet certain expectations of what it means to be male or female (Steinbock, 2002).

There is a concern that if reproductive technologies progress to the point where parents can choose attributes of their children, parents will begin to think of children as commodities (Strong, 2001). If money is invested to create a child of a certain sex, something is expected for that investment. If that investment does not turn out as expected (a child is not born or is not the desired sex), parents may feel as though they have been cheated. Leon Kass (2002), philosopher and former Chair of the President's Council on Bioethics, argues:

> ... the price to be paid for producing optimum or even genetically sound babies will be the transfer of procreation from the home to the laboratory. Increasing control over the product can only be purchased by the increasing depersonalization of the entire process and its coincident transformation into manufacture. Such an arrangement will be profoundly dehumanizing.

Distortions in birth order

If enough parents utilize sex selection and choose to have a male as their first child, there is the potential to cause social inequality between the sexes. Some research has indicated that the first-born child is more likely to be successful in life (Andrews quoted in Belkin, 1999). For example, Warren (1992) has found that first-born children tend to be more independent, active, dominant, intelligent, responsible and conservative. First-born children also have an advantage in that they have a monopoly on their parents' time and attention early in life (Warren, 1992). Yet, Hvistendahl (2011) found that in Indian and Asian cultures, families tend to leave the sex of the first born up to nature, but will then intervene to ensure that a second or third child is a boy if the first was a girl. If this is true, concern about a generation of 'little sisters' is without empirical support.

Data from American reproductive centres suggest that most couples who are willing to undergo preconception sex selection already have two or three children of the same sex and wish to have at least one child of the opposite sex. A 1989 study analysed 2505 inquiry letters from couples and found that only 1.4% were childless couples seeking to use sex selection to have a boy (Chico, 1989). Even if preconception sex selection becomes widely available and leads to a statistically observable increase in the number of first-born boys, it does not follow that this will create inequities in society. After a thorough review of the literature on birth-order differences, Salmon concludes that the empirical evidence does not 'provide any significant evidence to support a claim that pre-conception sex selection will result in second-best or poor-achieving girls: neither does it guarantee that such an outcome might not occur' (Salmon, 2007).

Unknown safety

Safety is a legitimate ethical concern with any new medical technology. If there is strong reason to believe that a new technology could have harmful effects on persons who use it or persons who are the result of it, there may be a legitimate argument to regulate or ban it.

Unlike other innovative reproductive procedures, MicroSort involves the use of a new medical device and thus requires a more stringent review of safety and efficacy by the FDA. Despite the fact that hundreds of apparently healthy children have been born using this technology, it is still not FDA approved for marketing. Additionally, because MicroSort involves the direct manipulation of human gametes, its long-term safety must also be studied. All new reproductive technologies involve an unknown amount of long-term risk. In fact, every drug or medical procedure involves some amount of risk, but patients are permitted to use them so long as the patient is fully informed about the potential risks and voluntarily agrees to undergo the procedure or to take the medication. Thus the way to address the hereto unknown long-term risks associated with MicroSort is via full disclosure to individuals who wish to use this technology and follow-up research on children. Because there are potential long-term implications for the child-to-be, parents will be accepting this risk on behalf of their future child. But parents give consent on behalf of their future children every time they use any kind of assisted reproductive technology.

The loss of what it means to be a parent

Empirical studies with two groups of lay people in the USA and Switzerland found that some participants thought that trying to manipulate the design of one's children requires a loss of what it means to be a parent. Parental love, they argued, ought to be unconditional (Kalfoglou et al., 2008; Scully et al., 2006). Rothman (1986) wrote that sex selection denies parents the lesson of having to make the best of the 'wrong' sex. Finally, commentators are concerned that sex selection will change the meaning of parental love and acceptance (Baldwin, 2006; Murray, 1996). Parents, Murray (1996) argues, are choosing to have *this* child, not a child.

This may be a legitimate concern and it may provide a justification for moral exhortation to avoid using the technology, but public policy should not be based on unproven fears. Future follow-up research with families who have use sex-selection technologies may help us understand whether this harm really exists.

Slippery slope to increased acceptance of other eugenic technologies

There is the widely popular objection that sex selection is the first step down a road that will inevitably lead to the creation of 'designer babies' (Macklin, 2010; President's Council on Bioethics, 2003; Sandel, 2007; Strong, 2001). Once parents are permitted to choose the sex of their children, it may be difficult to justify stopping at choosing other characteristics such eye colour, height or intelligence, particularly if these selections are meant to give children an advantage in society (Strong, 2001). Changes this drastic in how decisions are made about who is allowed to be born might also create a climate where parents are blamed when their children are born with imperfections. Parents of a handicapped child will become aware of this handicap prenatally and have to make an affirmative choice to continue the pregnancy (Strong, 2001). This 'choice' could come with social condemnation.

Allowing enhancements or the selection of desired traits could erode our freedom from state-enforced genetic

manipulation of the next generation (Strong, 2001; Wertz and Fletcher, 1989). Sandel (2007) is concerned because PGS, particularly as it enables the selection of traits, is not limited to just the infertile or those with genetic disease risks. The ability to select for traits becomes available to the general public, and 'selection is the first step to design'.

As Macklin (2010) points out, this slippery slope argument is based on the belief that the slide is inevitable and that where it leads is morally objectionable. There is no evidence that a slide into acceptance of genetic enhancement is inevitable. Permitting parents to choose the sex of their children does not mean that society cannot place limits on the availability of technologies that might lead to genetic enhancements. Arguments about the ethics of genetic enhancement are outside the scope of this discussion, but there is no empirical evidence that use of these technologies would have profoundly negative effects on society (Dahl, 2007).

Medical procedures should only be performed for medical reasons

Yet another objection to sex selection is based on the claim that medical procedures ought to be employed only for medical purposes. Flow cytometric sperm separation, it is argued, is a medical technology designed to enable couples who are at risk of transmitting a severe X-linked genetic disorder to have a healthy child. In the absence of a known risk to transmit a serious X-linked disease, there is simply no valid justification for using flow cytometric sperm separation (Dresser, 2001; Sauer, 2001).

Others have pointed out that constitutional reproductive rights are a right of non-interference, not a positive right that requires physicians to assist with every reproductive request. Strong (2001), for example, argues that physicians have the freedom to refuse to perform non-medical sex selection. In fact, physicians are justified in creating ethical or practice guidelines against this use of technology on the grounds that it is a step towards condoning genetic enhancement and that it gives parents too much control over the characteristics of their offspring.

On the other hand, medical technology is used all the time to address non-medical concerns and desires. Contraception is not a disease-preventing technology, but it is still permitted, and insurance companies often cover it (Heyd, 2003). In order to justify the use of drugs, medical devices, interventions and surgeries, our society has turned ageing, physical attractiveness and even the ability to conceive and bear children into 'pathologies'. In many cases, these 'pathologies' are simply the result of genetic variation or the ageing process. Regardless, we 'treat' baldness, wrinkles and erectile dysfunction with drugs and other 'medical' interventions, and infertility is now largely perceived to be a disease rather than a social condition. Although the use of professional guidelines or individual healthcare providers' consciences to place limits on reproductive technology is a step back from government-based laws regulating reproductive decisions, this produces its own set of concerns. If physicians are the gatekeepers deciding who gets access to what technology, they become agents of society in implementing social or religious values (Heyd, 2003).

Inappropriate use of limited medical resources

Medical care is a limited resource. Some authors have noted that physicians who are providing non-medical sex selection could be using their time and talent to provide care that prevents or treats disease and injury. Perhaps the use of a physician's time, talents and other medical resources could be better allocated (American Society for Reproductive Medicine, 1999). Dahl (2007) argues that this criticism is flawed because it implies that every time a person gets cosmetic surgery, another person is denied necessary medical care. This objection betrays a severely distorted conception of economics and simply does not work in a predominantly private-run capitalist economy based on a free market.

Physicians' medical training is sometimes subsidized by tax dollars, so this creates an obligation to use medical training in the best interest of society (Pennings, 2002). Further, funds invested in developing the technology and buying access to it might be better spent. Pennings (2002) suggests that in countries where physicians' training is subsidized by public taxes, there ought to be a tax on non-medical sex selection to offset this social investment.

Social injustice

If being a certain sex carries with it certain advantages, such as the potential to earn more if you are male because of gender bias, access to sex-selection technologies could perpetuate advantages for those who can afford them (Strong, 2001). Bhatia points out that in Western culture, the affluent will have access to the socially approved sex-selection technologies such as MicroSort and PGS, but the less affluent will use the socially stigmatized selective abortion (2010). Another argument ties into the slippery slope argument, if this path is taken, it will inevitably result in two classes within society — those with and without access to genetic enhancements (Strong, 2001). One way to overcome this concern is to advocate for universal access to the technology. Another way to improve access to a technology is by using market forces, stimulate competition and, consequently, lower the prices. Thus, if there is true concern about poor couples being 'left out', the use of the technology should not be discouraged, but rather encouraged. This is potentially the best way to lower its current price.

'Playing God'

A constantly recurring objection to sex selection is that choosing the sex of our children is 'playing God'. What is 'natural' ought to be respected as part of divine creation. When something disrupts this natural order, such as a system of the body not functioning as it should, it is acceptable to make corrections back to what is a typical species function, but to step beyond natural function is hubris (Baldwin, 2006). This religious objection has been made against all kinds of medical innovations. The use of inoculations was opposed with sermons preaching that diseases are 'sent by Providence' for the punishment of sin. It is wrong of man to escape from such divine retribution. An additional religiously based argument is that the ability to beget children should not be separated from the sexual act that is the

expression of marital love. This is the position of the Roman Catholic Church.

Historically, what has been thought of as divinely ordained has changed. Even fundamentalist Christians ceased to regard the alleviation of pain and the curing of diseases as morally impermissible. What was once seen as 'playing God' is now seen as acceptable medical practice.

More importantly, the objection that sex selection is a violation of divine law is an explicitly religious claim. As Western liberal democracies are based on a strict separation of state and church, no government is entitled to pass a law to enforce compliance with a specific religion. People who consider the option of sex selection as contrary to their religious belief are free to refrain from it, but they are not permitted to use the coercive power of the state to impose their theology upon those who do not share their religious world view.

Discussion

There are two questions that must be addressed when thinking about the ethics of sperm sorting for sex selection. First, does the government have a strong enough interest in prohibiting the use of the technology? Second, is it ethical for individuals to use the technology for this particular purpose?

The major justification for a government becoming involved in regulating the use of sex-selection technologies is if use of the technology is likely to have a detrimental effect on society such as skewing the sex ratio. Based on the existing empirical evidence, it is highly unlikely that the availability of an effective sperm-sorting technology will have any noticeable effect on sex ratios in Western countries.

Additionally, alternative sex-selection methods are currently available to couples around the globe through PGS and prenatal screening with selective abortion. Soon, it may be possible for women to know the sex of a fetus as early as 7 weeks into a pregnancy through screening of fetal cells found in maternal blood (Devaney et al., 2011). Laboratories could eventually offer these blood tests through the mail without the involvement of the medical community. This would allow for a private abortion using non-surgical interventions such as mifepristone before anyone else is aware of the pregnancy.

Some countries have attempted to ban the use of these technologies for non-medical sex selection. For instance, physicians in India offering ultrasound for the sole purpose of identifying the sex of a fetus can be prosecuted (Sarvate, 2006), and the UK and Canada only permit the use of PGS to avoid genetic disease (Assisted Human Reproduction Act, 2004; HFEA, 2006).

In the USA, there have been attempts to make sex-selective abortions illegal (Generations Ahead, 2010), but even if these attempts were to become law, these laws would be extremely difficult to enforce. The availability of PGS for non-medical sex selection in the USA is up to each IVF clinic. In a survey conducted by the Genetics and Public Policy Centre (Baruch et al., 2008), 42% of IVF centres that provide PGS for genetic diseases are also willing to provide PGS for non-medical sex selection. Based on the survey results, in 2005 9% of all PGS cycles (or about 300 cycles among the survey respondents) were for non-medical sex selection, and 82% of PGS clinics will permit couples undergoing PGS to avoid a genetic disease to select the sex of embryos that are transferred to the woman's uterus (Baruch et al., 2008).

Given that two more invasive and more expensive technologies are available for non-medical sex selection in the USA and some other Western countries, and given that many ineffective methods of sperm sorting are also available, it would be counterintuitive to block the availability of an effective method of sperm sorting such as MicroSort. Because MicroSort requires a device, it falls under the jurisdiction of the FDA. MicroSort must be approved by the FDA before it can be marketed. The FDA recently renewed its permission for MicroSort clinical trials to proceed for couples wishing to avoid a X-linked genetic disease, but it did not renew permission to continue clinical trials for 'family balancing'. This decision came with very little explanation other than the FDA did not see a public-health benefit in the use of MicroSort for non-medical purposes. This decision by the FDA is odd given that drugs that prevent male pattern baldness and Botox to reduce facial wrinkles have received FDA approval.

If and when MicroSort receives FDA approval for non-medical use, access will be controlled by one IVF centre. This centre can monitor requests for and actual use of the technology. If statisticians determine that use of this technology is, in fact, affecting the sex ratio of specific communities, the centre could create a queue for the sex that is in greater demand and only make the technology available once an equal number of children of the opposite sex are created (Heng, 2006).

Assuming that sex selection via sperm sorting is legal and available, is it ethical for couples to use this technology? This is a much more difficult question to answer. Like abortion, the answer will vary from person to person. Many may perceive all uses of sex-selection technology as a selfish choice for those who do not perceive children as a gift, but as a product of our will. Religious leaders may preach against this use of the technology because it is hubris to attempt to control characteristics of our children such as their sex. On the other hand, couples may have what they believe to be perfectly justifiable reasons to desire a child of a specific sex. In a pluralistic society that values reproductive freedom, couples ought to be able to decide for themselves whether or not it is ethically permissible, under their specific circumstances, to use a technology to attempt to choose the sex of their children.

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