

# Preconception Gender Selection<sup>1</sup>

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Safe and effective methods of preconception gender selection through flow cytometric separation of X- and Y-bearing sperm could greatly increase the use of gender selection by couples contemplating reproduction. Such a development raises ethical, legal, and social issues about the impact of such practices on offspring, on sex ratio imbalances, and on sexism and the status of women. This paper analyzes the competing interests in preconception gender selection, and concludes that its use to increase gender variety in a family, and possibly for selecting the gender of firstborn, might in many instances be ethically acceptable.

## Keywords

gender discrimination  
preconception  
procreative liberty  
sex selection

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Advances in genetics and reproductive technology present prospective parents with an increasing number of choices about the genetic makeup of their children. Those choices now involve the use of carrier and prenatal screening techniques to avoid the birth of children with serious genetic disease, but techniques to choose nonmedical characteristics will eventually be available. One nonmedical characteristic that may soon be within reach is the selection of offspring gender by preconception gender selection (PGS).

Gender selection through prenatal diagnosis and abortion has existed since the 1970s. More recently, preimplantation sexing of embryos for transfer has been developed (Tarin and Handyside 1993; The Ethics Committee of the American Society of Reproductive Medicine 1999). Yet prenatal or preimplantation methods of gender selection are unattractive because they require abortion or a costly, intrusive cycle of in vitro fertilization (IVF) and embryo discard. Attempts to separate X- and Y-bearing sperm for preconception gender selection by sperm swim-up or swim-through techniques have not shown consistent X- and Y-sperm cell separation or success in producing offspring of the desired gender.

The use of flow cytometry to separate X- and Y-bearing sperm may turn out to be a much more reliable method of enriching sperm populations for insemination. Laser beams passed across a flowing array of specially dyed sperm can separate most of the 2.8% heavier X- from Y-bearing sperm, thus producing an X-enriched sperm sample for insemination.<sup>2</sup> Flow cytometry has been used successfully in over 400 sex selections in rabbit, swine, ovine, and bovine species, including successive generations in swine and rabbit (Fugger et al. 1998). A human pregnancy was reported in 1995 (Levinson, Keyvanfar, and Wu 1995).

The United States Department of Agriculture (USDA), which holds a patent on the flow cytometry separation process, has licensed the Genetics and IVF Institute in Fairfax, Virginia, to study the safety and efficacy of the technique for medical and “family balancing” reasons in an institutional review board–approved clinical trial.<sup>3</sup> In 1998 researchers at the Institute reported a 92.9% success rate for selection of females in 27 patients, with most fertilizations occurring after intrauterine insemination (Fugger et al. 1998). A lower success rate (72%) was reported for male selection.<sup>4</sup>

At this early stage of development much more research is needed to establish the high degree of safety and efficacy of flow cytometry methods of PGS that would justify widespread use. With only one published study of outcomes to date, it is too soon to say whether the 92% success rate in determining female gender will hold for other patients, much less that male selection will reach that level of efficacy. Animal safety data have shown no adverse effect of the dye or laser used in the technique on offspring, but that is no substitute for more extensive human studies (Vidal et al. 1999). In addition, if flow cytometry instruments are to be used for sperm separation purposes, they may be classified as medical devices that require U.S. Food and Drug Administration (FDA) approval. Finally, the holder of the process patent—the USDA—will have to agree to license the process for human uses.

If further research establishes that flow cytometry is a safe and effective technique for both male and female PGS, and regulatory and licensing barriers are overcome, then a couple wishing to choose the gender of their child would need only provide a sperm sample and undergo one or more cycles of intrauterine insemination with separated sperm.<sup>5</sup> A clinic or physician that offers assisted reproductive technologies (ART) and invests in the

flow cytometry equipment could run the separation and prepare the X- or Y-enriched sperm for insemination, or it could have the sperm processed by a clinic or firm that has made that investment. Flow cytometry separation would not be as cheap and easy as determining gender by taking a pill before intercourse, but it would be within reach of most couples who have gender preferences in offspring.<sup>6</sup>

### *Demand for Preconception Gender Selection*

Unkown at present is the number of people who have offspring gender preferences robust enough to incur the costs and inconvenience of PGS. Although polls have often shown a preference for firstborn males, they have not shown that a large number of couples would be willing to forego coital conception in order to select the gender of their children. If PGS proves to be safe and effective, however, it may be sought by two groups of persons with gender preferences.

One group would seek PGS in order to have a child of a gender different from that of a previous child or children. A preference for gender variety in offspring would be strongest in families that have already had several children of one gender. They may want an additional child only if they can be sure that it will be of the gender opposite to their existing children.<sup>7</sup> Couples who wish to have only two children might use PGS for the second child to ensure that they have one child of each gender. If social preferences for two-child families remain strong, some families may use PGS to choose the gender of the second child.

A second group of PGS users would be those persons who have strong preferences for the gender of the first child. The most likely candidates here are persons with strong religious or cultural beliefs about the role or importance of children with a particular gender. Some Asian cultures have belief systems that strongly prefer that the firstborn child be a male. In some cases the preference reflects religious beliefs or traditions that require a firstborn son to perform funeral rituals to assure his parents' entrance into heaven (for a discussion of son preferences in India and China, see Macklin 1999, 148–151). In others it simply reflects a deeply embedded social preference for males over females. The first-child preference will be all the stronger if a one-child-per-family policy is in effect, as occurred for a while in China (Greenlough and Li 1995, 627). While the demand for PGS for firstborn children is likely to be strongest in those countries, there has

been a sizable migration of those groups to the United States, Canada, and Europe.<sup>8</sup> Until they are more fully assimilated, immigrant groups in Western countries may retain the same gender preferences that they would have held in their homelands.

Other persons with strong gender preferences for firstborn children would be those who prize the different rearing or relational experiences they think they would have with children of a particular gender. They may place special value on having their firstborn be male or female because of personal experiences or beliefs. Numerous scenarios are likely here, from the father who very much wants a son because of a desire to provide his child with what he lacked growing up, to the woman who wants a girl because of the special closeness that she thinks she will have with a daughter (Belkin 1999).

### *The Ethical Dilemma of Preconception Gender Selection*

The prospect of preconception gender selection appears to pose the conflict—long present in other bioethical issues—between individual desires and the larger common good. Acceding to individual desires about the makeup of children seems to be required by individual autonomy. Yet doing so leads to the risk that children will be treated as vehicles of parental satisfaction rather than as ends in themselves, and could accelerate the trend toward negative and even positive selection of offspring characteristics. The dilemma of reconciling procreative liberty with the welfare of offspring and families will only intensify as genetic technology is further integrated with assisted reproduction and couples seek greater control over the genes of offspring.

### *Arguments for Preconception Gender Selection*

The strongest argument for preconception gender selection is that it serves the needs of couples who have strong preferences about the gender of their offspring and would not reproduce unless they could realize those preferences. Because of the importance of reproduction in an individual's life, the freedom to make reproductive decisions has long been recognized as a fundamental moral and legal right that should not be denied to a person unless exercise of that right would cause significant harm to others (Robertson 1994, 22–42). A corollary of this right, which is now reflected in carrier and prenatal screening practices to prevent the birth of

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children with genetic disease, is that prospective parents have the right to obtain preconception or prenatal information about the genetic characteristics of offspring, so that they may decide in a particular case whether or not to reproduce (Robertson 1996, 424–435).<sup>9</sup>

Although offspring gender is not a genetic disease, a couple's willingness to reproduce might well depend on the gender of expected offspring. Some couples with one or more children of a particular gender might refuse to reproduce if they cannot use PGS to provide gender variety in their offspring or to have additional children of the same gender (E. F. Fugger, personal communication to author). In other cases they might have such strong rearing preferences for their firstborn child that they might choose not to reproduce at all if they cannot choose that child's gender. Few persons contemplating reproduction may fall into either group; but for persons who strongly hold those preferences, the ability to choose gender may determine whether they reproduce.

In cases where the gender of offspring is essential to a couple's decision to reproduce, the freedom to choose offspring gender would arguably be part of their procreative liberty (Robertson 1996, 434). Since respect for a right is not dependent on the number of persons asserting the right, they should be free to use a technique essential to their reproductive decision unless the technique would cause the serious harm to others that overcomes the strong presumption that exists against government interference in reproductive choice. Until there is a substantial basis for thinking that a particular use of PGS would cause such harms, couples should be free to use the technique in constituting their families. The right they claim is a right against government restriction or prohibition of PGS. It is not a claim that society or insurers are obligated to fund PGS or that particular physicians must provide it.

#### *Arguments Against Preconception Gender Selection*

There are several arguments against preconception gender selection. Although such methods do not harm embryos and fetuses or intrude on a woman's body as *prenatal* gender selection does, they do raise other important issues. One concern is the potential of such techniques to increase or reinforce sexism, either by allowing more males to be produced as first or later children, or by paying greater attention to gender itself. A second concern is the welfare of children born as a result of PGS whose par-

ents may expect them to act in certain gender specific ways when the technique succeeds, but who may be disappointed if the technique fails. A third concern is societal. Widely practiced, PGS could lead to sex-ratio imbalances, as have occurred in some parts of India and China due to female infanticide, gender-driven abortions, and a one-child-per-family policy (Sen 1990). Finally, the spread of PGS would be another incremental step in the growing technologization of reproduction and genetic control of offspring. While each step alone may appear to be justified, together they could constitute a threat to the values of care and concern that have traditionally informed norms of parenting and the rearing of children.

#### *Evaluation of Ethical and Social Issues*

Concerns about sex-ratio imbalances, welfare of offspring, and technologizing reproduction may be less central to debates over PGS than whether such practices would be sexist or contribute to sexism. If the number of persons choosing PGS is small, or the technique is used solely for offspring gender variety, sex-ratio imbalances should not be a problem. If use patterns did produce drastic changes in sex ratios, self-correcting or regulatory mechanisms might come into play. For example, an overabundance of males would mean fewer females to marry, which would make being male less desirable, and provide incentives to increase the number of female births. Alternatively, laws or policies that required providers of PGS to select for males and females in equal numbers would prevent such imbalances.<sup>10</sup> A serious threat of a sex-ratio imbalance would surely constitute the compelling harm necessary to justify limits on reproductive choice.

It may also be difficult to show that children born after PGS were harmed by use of the technique. Parents who use PGS may indeed have specific gender role expectations of their children, but so will parents who have a child of a preferred gender through coitus. Children born with the desired gender after PGS will presumably be wanted and loved by the parents who sought this technique. Parents who choose PGS should be informed of the risk that the technique will not succeed, and counseled about what steps they will take if a child of the undesired gender is born.<sup>11</sup> If they commit themselves in advance to the well-being of the child, whatever its gender, the risk to children should be slight. However, it is possible that some couples will abort if the fetus is of the undesired

gender. PGS might thus inadvertently increase the number of gender-selection abortions.

Finally, technological assistance in reproduction is now so prevalent and entrenched that a ban on PGS would probably have little effect on the use of genetic and reproductive technologies in other situations. With some form of prenatal screening of fetuses occurring in over 80% of United States pregnancies, genetic selection by negative exclusion is already well-installed in contemporary reproductive practice. Although there are valid concerns about whether positive forms of selection, including nonmedical genetic alteration of offspring genes, should also occur, drawing the line at all uses of PGS will not stop the larger social and technological forces that lead parents to use genetic knowledge to have healthy, wanted offspring. If a particular technique can be justified on its own terms, it should not be barred because of speculation of a slippery slope toward genetic engineering of offspring traits (for an analysis of the slippery-slope problem with genetic selection, see Robertson 1994, 162–165).

#### *Is Gender Selection Inherently Sexist?*

A central ethical concern with PGS is the effect of such practices on women, who in most societies have been subject to disadvantage and discrimination because of their gender. Some ethicists have argued that any attention to gender, male or female, is per se sexist, and should be discouraged, regardless of whether one can show actual harmful consequences for women (see Grubb and Walsh 1994; and Wertz and Fletcher 1989). Others have argued that there are real differences between male and female children that affect parental rearing experiences and thus legitimate nonsexist reasons for some couples to prefer to rear a girl rather than a boy or vice versa, either as a single child or after they have had a child of the opposite gender.

To assess whether PGS is sexist we must first be clear about what we mean by sexism. *The Compact OED* (1991, 1727) defines sexism as “the assumption that one sex is superior to the other and the resultant discrimination practised against members of the supposed inferior sex, especially by men against women.” By this definition, sexism is wrong because it denies the essential moral, legal, and political equality between men and women. Under this definition, if a practice is not motivated by judgments or evaluations that one gender is superior to the other, or does not lead to discrimination against one gender, it is not sexist.

Professor Mary Mahowald, an American bio-

ethicist writing from an egalitarian feminist perspective, makes the same point with a consequentialist twist:

Selection of either males or females is justifiable on medical grounds and *morally defensible in other situations* [emphasis added] so long as the intention and the consequences of the practice are not sexist. Sexist intentions are those based on the notion that one sex is inferior to the other; sexist consequences are those that disadvantage or advantage one sex vis-à-vis the other. (2000, 121)

In my view, the *OED* definition, modified by Mahowald’s attention to consequences, is a persuasive account of the concept of sexism. If that account is correct, then not all attention to the biological, social, cultural, or psychological differences between the sexes would necessarily be sexist or disadvantage females. That is, one could recognize that males and females have different experiences and identities because of their gender, and have a preference for rearing a child of one gender over another, without disadvantaging the dispreferred gender or denying it the equal rights, opportunities, or value as a person that constitutes sexism.

If this conjecture is correct, it would follow that some uses of PGS would clearly be sexist, while others would clearly not be. It would be sexist to use PGS to produce males because of a parental belief that males are superior to females. It would be nonsexist to use PGS to produce a girl because of a parental recognition that the experience of having and rearing a girl will be different than having a boy. In the latter case, PGS would not rest on a notion of the greater superiority of one gender over another, nor, if it occurred in countries that legally recognize the equal rights of women, would it likely contribute to sexism or further disadvantage women. As Christine Overall, a British feminist bioethicist, has put it, “sexual similarity or sexual complementarity are morally acceptable reasons for wanting a child of a certain sex” (1987, 27; quoted in Mahowald 2000, 117).

Psychological research seems to support this position. It has long been established that there are differences between boys and girls in a variety of domains, such as (but not limited to) aggression, activity, toy preference, psychopathology, and spatial ability (Maccoby and Jacklin 1974; Gilligan 1980; Kimura and Hampson 1994; Feingold 1994; Collaer and Hines 1995; and Halpern 1997). Whether these differences are primarily inborn or learned, they are facts that might rationally lead people to prefer rearing a child of one gender

rather than another, particularly if one has already had one or more children of a particular gender. Indeed, Supreme Court Justice Ruth Bader Ginsburg, a noted activist for women's rights before her appointment to the Supreme Court, in her opinion striking down a male-only admissions policy at the Virginia Military Institute (*United States v. Virginia*, 116 S. Ct. 2264 [1996]), noted that:

Physical differences between men and women . . . are enduring: "[T]he two sexes are not fungible; a community made up exclusively of one [sex] is different from a community composed of both." . . . "Inherent differences" between men and women, we have come to appreciate, remain cause for celebration.

Some persons will strongly disagree with this account of sexism and argue that any attention to gender difference is inherently sexist because perceptions of gender difference are themselves rooted in sexist stereotypes. They would argue that any offspring gender preference is necessarily sexist because it values gender difference and thus reinforces sexism by accepting the gendered stereotypes that have systematically harmed women (Grubb and Walsh 1994; and Wertz and Fletcher 1989, 21<sup>12</sup>). According to them, a couple with three boys who use PGS to have a girl are likely to be acting on the basis of deeply engrained stereotypes that harm women. Similarly, a couple's wish to have only a girl might contribute to unjustified gender discrimination against both men and women, even if the couple especially valued females and would insist that their daughter receive every benefit and opportunity accorded males.

Resolution of this controversy depends ultimately on one's view of what constitutes sexism and what actions are likely to harm women. Although any recognition of gender difference must be treated cautiously, I submit that recognizing and preferring one type of childrearing experience over the other can occur without disadvantaging women generally or denying them equal rights and respect. On this view, sexism arises not from the recognition or acceptance of difference, but from unjustified reactions to it. Given the biological and psychological differences between male and female children, parents with a child of one gender might without being sexist prefer that their next child be of the opposite gender. Similarly, some parents might also prefer that their firstborn or only child be of a particular gender because they desire a specific rearing and companionship experience.

If it is correct that using PGS for offspring diversity is sexist, then those who deny that biological gender differences exist, or who assume that any recognition of them always reinforces sexism or disadvantages women, will not have carried the burden of showing that a couple's use of PGS for offspring gender variety or other nonintentionally sexist uses is so harmful to women that it justifies restricting procreative choice. Until a clearer ethical argument emerges, or there is stronger empirical evidence that most choices to select the gender of offspring would be harmful, policies to prohibit or condemn as unethical all uses of nonmedically indicated PGS would not be justified.

The matter is further complicated by the need to respect a woman's autonomy in determining whether a practice is sexist. If a woman is freely choosing to engage in gender selection, even gender-selection abortion, she is exercising procreative autonomy. One might argue in response that the woman choosing PGS or abortion for gender selection is not freely choosing if her actions are influenced by strong cultural mores that prefer males over females. Others, however, would argue that the straighter path to equal rights is to respect female reproductive autonomy whenever it is exercised, even if particular exercises of autonomy are strongly influenced by the sexist norms of her community (Mahowald 2000, 188).

#### *Public Policy and Preconception Gender Selection*

Because of the newness of PGS and uncertainties about its effects, the best societal approach would, of course, be to proceed slowly, first requiring extensive studies of safety and efficacy, and then at first only permitting PGS for increasing the gender variety of offspring in particular families.<sup>13</sup> Only after the demographic and other effects of PGS for gender variety have been found acceptable should PGS be available for firstborn children.

However, given the close connection between parental gender preferences for offspring and reproductive choice, public policies that bar all nonmedical uses of PGS or that restrict it to choosing gender variety in offspring alone could be found unconstitutional or illegal. If there are physical, social, and cultural differences between girls and boys that affect the rearing or relational experiences of parents, individuals and couples would have the right to implement those preferences as part of their fundamental procreative liberty. The risk that exercising rights of procreative liberty would hurt offspring or women—or contribute to

sexism generally—is too speculative and uncertain to justify infringement of those rights.

The claim of a right to choose offspring gender is clearest in the case of PGS for gender variety. If flow cytometry or other methods of PGS are found to be safe and effective, there would be no compelling reason to ban or restrict their nonmedical use by persons seeking gender variety in the children they rear. Couples with one child or several children of a particular gender might, without being sexist or disadvantaging a particular gender, prefer to have an additional child of the opposite gender. ART clinics should be free to proceed with PGS for offspring variety in cases where couples are aware of the risk of failure, and have undergone counseling that indicates that they will accept and love children of the dispreferred gender if PGS fails. Clinics providing PGS should also ask couples to participate in research to track and assess the effects of PGS on children and families.

The use of PGS to determine the gender of firstborn children is a more complicated question. The choice to have one's first or only child be female has the least risk of being sexist, because it is privileging or giving first place to females, who have traditionally been disfavored.<sup>14</sup> The use of PGS to select firstborn males is more problematic because of the greater risk that this choice reflects sexist notions that males are more highly valued. It is also more likely to entrench male dominance. The danger of sexism is probably highest in those ethnic communities that place a high premium on male offspring, but it could exist independently of those settings.

Yet restricting PGS to offspring gender variety and firstborn females may be difficult to justify. Given that individuals could prefer to have a boy rather than a girl because of the relational and rearing experiences he will provide, just as they might prefer a girl for those reasons, it might be difficult to show that all preferences for firstborn males are sexist. Nor could one easily distinguish firstborn male preferences when the couple demanding them is of a particular ethnic origin. Although the risk that firstborn male preferences would be sexist is greatest if the PGS occurred in a country in which those beliefs prevailed, the chance that PGS would contribute to societal sexism lessens greatly if the child is reared in a country that legally protects the equal status of women and men.

If prohibitions on some or all nonmedical uses of PGS could not be justified and might even be unconstitutional, regulation would have to take different forms. One form would be to deny public

or private insurance funding of PGS procedures, which would mean that only those willing to pay out-of-pocket would utilize them. Another form would be for the physicians who control access to PGS techniques to take steps to assure that it is used wisely. If they comply with laws banning discrimination, physician organizations or ART clinics could set guidelines concerning access to PGS. They might, for example, limit its use to offspring gender variety or firstborn female preferences only. As a condition of providing services, they might also require that any couple or individual seeking PGS receive counseling about the risks of failure and commit to rear a child even if its gender is other than that sought through PGS.<sup>15</sup> Although such guidelines would not have the force of statutory law, they could affect the eligibility of ART clinics to list their ART success rates in national registries and could help define the standard of care in malpractice cases.

### *Conclusion*

The successful development of flow cytometry separation of X- and Y-bearing sperm would make safe, effective, and relatively inexpensive means of nonmedical preconception gender selection available for selecting female, if not also for male, offspring. The nonmedical use of PGS raises important ethical, legal, and social issues, including the charge that any or most uses of PGS would be sexist and should therefore be banned or discouraged. Assessment of this charge, however, shows that the use of PGS to achieve offspring gender variety and (in some cases) even firstborn gender preference, may not be inherently sexist or disadvantaging of women. Although it would be desirable to have extensive experience using PGS to increase the variety of offspring gender before extending it to firstborn gender preferences, it may not be legally possible to restrict the technique in this way. However, practitioners offering PGS should restrict their PGS practice to offspring gender variety until further debate and analysis of the issues has occurred. In any event, physicians offering PGS should screen and counsel prospective users to assure that persons using PGS are committed to the well-being of their children, whatever their gender.

A policy solution that gives practitioners and patients primary control without direct legal or social oversight, although not ideal, may be the best way to deal with new reprogenetic techniques. Society should not prohibit or substantially burden reproductive decisions without stronger evidence

of harm than PGS now appears to present. Ultimately, the use of PGS and other reprobogenic procedures will depend on whether they satisfy ethical norms of care and concern for children while meeting the needs of prospective parents. ■

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### Notes

1. “Preconception gender selection” (PGS) rather than “preconception sex selection” (PSS) is used throughout this article to convey the importance of the social and psychological meanings with which biologic sex is invested for prospective parents and society generally. Because earlier versions of this article used “sex” rather than “gender,” commentators may not have had the opportunity to revise their comments in response to the change. For the discussion at hand, either “sex” or “gender,” “PSS” or “PGS” is acceptable.
2. When combined with the X-chromosomes of oocytes, X-bearing sperm can produce only XX or female offspring. Similarly, Y-bearing sperm combined with the X chromosome of oocytes can produce only XY or male offspring.
3. See the study's web page, <http://www.microsort.net>. This article uses the term “gender variety” rather than “family balancing” to avoid the misconception that a family is “unbalanced” if it has many or only children of one gender. (I am grateful to George Annas for this suggestion).
4. See the study's web page, <http://www.microsort.net>. Because Y-bearing sperm are smaller and contain less DNA, there is more chance that the sorting machine will fail to distinguish X's and Y's, and thus provide samples that are insufficiently enriched with Y-sperm to give a high chance of having a male child.
5. Presumably flow cytometry separation of sperm could occur with donor as well as couple sperm. It could also be requested by couples undergoing IVF or intracytoplasmic sperm injection (ICSI) who request that the sperm provided be enriched or chosen to effect the gender of choice.

6. The current cost of \$1,500 per insemination cycle should decrease as further progress in the field occurs.
7. Persons requesting PGS for gender balancing in the Fairfax study had an average of 3.4 children of the same gender, and sought boys and girls in roughly equal numbers (Edward Fugger, personal communication to author, 23 February 2000).
8. See Chen (1999). The article describes immigration of a middle class family from the Indian state of Gujarat to Bridgewater, New Jersey, a suburb 40 miles from New York City.
9. It should be emphasized that the right claimed here is a negative right against government interference, not an obligation of a particular provider or public or private insurers to provide those services.
10. See Glover (1994). Professor Glover has apparently changed his position from the more negative one he took in his earlier *Ethics of New Reproductive Technologies: The Glover Report to the European Commission* (1989, 141–144). See also Jones (1992).
11. The risk arises because flow cytometry separation can only provide a greatly enriched sample of X- or Y-bearing sperm for insemination. It cannot guarantee that every sperm in the sample is either X or Y.
12. Wertz and Fletcher overlook how one could have gender preferences based on perceptions of experiential and rearing differences, rather than on differences in the worth or rights of women, when they assert that any form of gender selection violates the principle of equality between the genders “because it is premised upon a belief in sexual inequality.”
13. FDA approval of the safety and efficacy of flow cytometry methods of PGS would also be required before widespread use.
14. Persons taking a more purist approach to sexism would, of course, differ with this assessment.
15. They might also require that consumers agree to participate in research so that policymakers will have reliable information about the uses of PGS and the problems it presents.