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SEX SELECTION

Sex selection is an ancient and persistent practice. At some times and in some places, parents have selected the sex of their children by killing newborns or neglecting babies of the undesired sex, almost always female.

In the twenty-first century, technological developments and marketing practices are bringing new attention to sex selection, and raising an array of new concerns about it.

Some bioethicists and others defend sex selection as a matter of parental choice or "procreative liberty" (Robertson 2001). Others are highly critical, arguing that sex selection reflects and reinforces misogyny and gender stereotypes, undermines the wellbeing of children by subjecting them to excessive parental disappointment or expectations, and sets the groundwork for the future accessorizing and commodifying of children. The spread of prenatal screening for sex selection has caused alarm because of increasingly skewed sex ratios in some areas. Newer technologies now being used for sex selection also raise the prospect of a high-tech "consumer eugenics," in which other traits of future children are also chosen or "engineered."

Contemporary Sex Selection Methods

The development during the 1970s of prenatal testing technologies made it possible to reliably determine the sex of a fetus developing in a woman's womb. These procedures were initially intended to detect, and usually to abort, fetuses with Down Syndrome and other genetic anomalies, some of them sex-linked. But the tests were soon being openly promoted and widely used as tools for social sex selection, especially in South and East Asian countries where a cultural preference for sons is widespread. At the turn of the twenty-first century, prenatal screening followed by abortion remained the most common sex selection method around the world.

However, newer methods of sex selection are also coming into use. Unlike prenatal testing, these procedures are applied either before an embryo is implanted in a woman's body, or before an egg is fertilized. They do not require aborting a fetus of the "wrong" sex. In the United States, these pre-pregnancy methods are being promoted for social sex selection, as ways to satisfy parental desires, and are being marketed as forms of "family balancing" or "gender balancing."

EMBRYO SCREENING. Preimplantation genetic diagnosis (PGD), introduced in 1990, is an embryo screening technique. About three days after fertilization, a single cell is removed from each embryo in a batch that has been created using in vitro fertilization (IVF). Technicians test the cells for particular chromosomal arrangements or genetic sequences; then one or more embryos that meet the specified criteria—in the case of sex selection for a boy, those with both X and Y chromosomes—

are implanted in a woman's body. As a sex selection method, PGD is fairly reliable.

Like prenatal screening, PGD was presented as a way for parents to avoid having a child affected by certain genetic conditions (a motivation that has been strongly questioned by disability rights activists, whether involving prenatal tests or PGD). Before long, some assisted reproduction practitioners and bioethicists began suggesting that PGD should be made available to parents who want to fulfill their wish for a boy or a girl.

As of 2005, about 2,000 children have been born worldwide following the use of PGD, but no one knows how many of these procedures were undertaken for purely social sex selection reasons. In fact, the notoriously minimal regulatory environment for assisted reproduction facilities means that there is no firm data on the total number of PGD procedures conducted worldwide, or even on the exact number of clinics offering them. The risks of PGD to women who must undergo the hormone treatments and egg extractions required for all IVF procedures, and to the children born from screened embryos, are likewise unclear, both because of the small numbers involved so far and because of inadequate follow-up studies.

SPERM SORTING. Separating sperm that carry X chromosomes from those with Y chromosomes is the basis for a sex selection method that is less reliable, but that can be used without in vitro fertilization. A sperm sorting technique known as MicroSort® has been available since 1995. It relies on the fact that sperm with X chromosomes contain slightly more DNA than those with Y chromosomes, and uses a process called "flow cytometry," whereby X-chromosome-carrying sperm is separated from Y-chromosome-carrying sperm. The Genetics & IVF Institute (GIVI), the company that markets this technology for the "prevention of X-linked diseases and family balancing," claims that as of 2004, about 500 babies had been born after MicroSort® procedures. The company claims success rates of 88 percent for girls and 73 percent for boys. It reports that about 15 percent of its customers say they are trying to avoid the birth of a child who has inherited a sex-linked disease from the parents; the rest just want a boy or a girl.

Sex Selection as a Global Issue

In 1992 Nobel Prize-winning economist Amartya Sen (b. 1933) estimated the number of "missing women" worldwide—lost to neglect, infanticide, and sex-specific abortions—at one hundred million. Similarly shocking figures were confirmed by others. In areas of the world

where sex-selection is most widespread, sex ratios are becoming increasingly skewed. In parts of India, for example, the sex ratio of young children is as low as 766 girls per 1,000 boys.

Some observers in the global North who express distress about the pervasiveness of sex-selective abortions in South and East Asia are untroubled by sex selection in countries without strong traditions of son preference. But politically and ethically, this double standard rests on shaky grounds.

As women's rights and human rights groups point out, an increased use and acceptance of sex selection in the United States would legitimize its practice in other countries, and undermines efforts there to oppose it. A 2001 report in *Fortune* magazine recognized this dynamic, noting that "[it] is hard to overstate the outrage and indignation that MicroSort® prompts in people who spend their lives trying to improve women's lot overseas" (Wadman 2001).

In addition, large numbers of South Asians now live in European and North American countries, and sex selection ads in publications including *India Abroad* and the North American edition of *Indian Express* have specifically targeted them (Sachs 2001). South Asian feminists point to numerous ways in which sex selection reinforces and exacerbates misogyny, including violence against women who fail to give birth to boys.

SOCIAL SEX SELECTION AS CONSUMER CHOICE AND COMMERCIAL ENTERPRISE. In North America and Europe, sex selection seems driven less by preference for boys than by a consumer ideology of "choice." In fact, anecdotal evidence suggests that of North Americans trying to determine the sex of their next child, many are women who want daughters.

However, a preference for girls does not necessarily mean that sex selection and sexism are unrelated. One study found that 81 percent of women and 94 percent of men who say they would use sex selection would want their firstborn to be a boy. Another concern is whether sex selection will reinforce gender stereotyping. Parents who invest large amounts of money and effort in order to "get a girl" are likely to have a particular kind of girl in mind.

The new sex selection methods have also been criticized as a gateway to consumer eugenics, both by public interest groups and by some practitioners in the assisted reproduction field. When the American Society for Reproductive Medicine seemed to endorse using PGD for social sex selection, the *New York Times* reported that this "stunned many leading fertility spe-

cialists." One fertility doctor asked, "What's the next step? As we learn more about genetics, do we reject kids who do not have superior intelligence or who don't have the right color hair or eyes?" (Kolata 2001).

Such concerns are exacerbated by the recognition that social sex selection constitutes a potential new profit center for the assisted reproduction industry. It would open up a large new market niche of people who are healthy and fertile, but who nonetheless could be encouraged to sign up for fertility treatments. Since about 2003, several assisted reproduction facilities have begun aggressively going after that market, running ads for social sex selection on the Internet, on radio, and in mainstream publications including the *New York Times* and the in-flight magazines of several airlines. If the parents of 5 percent of the four million babies born each year in the United States were to use MicroSort® sperm sorting at the current rate of \$7,500 each, annual revenues would be \$1.5 billion.

PROSPECTS FOR POLITICAL AND POLICY ENGAGEMENT.

In India women's rights groups have long been at the forefront of efforts to enact laws prohibiting sex-selective abortion. As early as 1986 the Forum Against Sex Determination and Sex Pre-Selection began a campaign to enact legislation to regulate the misuse of embryo screening technology. Though laws have been on the books in India since 1994, they are often not enforced. China banned "non-medical" sex selection in 2004. The Council of Europe's 1997 Convention on Human Rights and Biomedicine also prohibits it, as do a number of European countries including the United Kingdom and Germany, with no adverse impact on the availability or legality of abortion. In 2004 Canada passed comprehensive legislation regulating assisted reproduction that includes a ban on sex selection. The United States currently has no federal regulation of sex selection.

In many parts of the world, even feminists who are deeply uneasy about sex selection have been reluctant to challenge it out of fear that to do so would threaten abortion rights. However, the emergence of pre-pregnancy sex selection methods makes it easier to consider sex selection apart from abortion politics, and may encourage new political and policy thinking about it.

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SEE ALSO *Assisted Reproduction Technology; Eugenics; Sex and Gender.*

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SHELLEY, MARY WOLLSTONECRAFT

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Mary Wollstonecraft Godwin Shelley (1797–1851), author of *Frankenstein* (1818), often considered the first science fiction novel and source of the universal modern image of science gone awry, was born in London on August 30 and died there on February 1. Her father, William Godwin (1756–1836), to whom *Frankenstein* is dedicated, was an important liberal reformer now best known for *An Enquiry Concerning Political Justice, and Its Influence on General Virtue and Happiness* (1793). Her mother, Mary Wollstonecraft (1759–1797), who died four days after her daughter's birth, was an important early feminist now best known for *A Vindication of the Rights of Woman* (1792). In 1814 young Mary eloped to the European Continent with Percy Bysshe Shelley (1792–1822), considered one of the greatest Romantic poets. Two years later, having already produced two children and begun *Frankenstein*, Mary married Percy after the suicide of his first wife. They had four children before Percy drowned, but only Percy Florence survived into adulthood. Mary never remarried, devoting herself to motherhood, writing, and editing her husband's works.

Mary treated science less as a solution to practical problems or an intellectual discipline than as a means to "afford a point of view to the imagination for the delineating of human passions more comprehensive and commanding than any which the ordinary relations of existing events can yield" (Shelley 1969, p. 13) Her consistent philosophical position, expressed in science fictions, historical romances, travel books, and essays, was staunchly democratic, based on her belief that while genius must be encouraged, when the discoveries of genius impinge on others, there must be responsibility to the wider community. Frankenstein's murderous monster represents the escape of untempered genius into the world.

Her novel *The Last Man* (1826) is the first in English of the subgenre of works that imagine a global cata-



Mary Wollstonecraft Shelley, 1797–1851. Shelley is best known for her novel *Frankenstein; or, The Modern Prometheus*, which has transcended the Gothic and horror genres and is now recognized as a work of philosophical and psychological resonance. (Source unknown.)

strophe. In this case the Percy-like protagonist, Lionel Verney, moves from England to a progressively depopulated Europe, apparently the only human with a natural immunity to a new plague. In this situation science is encouraged to tame rampant Nature. Soon after the deaths begin, a character remarks to Verney that should "this last but twelve months . . . earth will become a Paradise. The energies of man were before directed to the destruction of his species: they now aim at its liberation and preservation" (Shelley 1965, p. 159).

Science always raises social and moral problems in Mary Shelley's writing. In her philosophical satire "Roger Dodsworth: The Reanimated Englishman" (1826), the fact that someone is brought back from frozen suspended animation to live out a 209 year life span, raises fundamental questions of authenticity. Was he *alive* while frozen? Is his even one *life*?

In her fiction Mary Shelley consistently articulates ethical issues related to science and technology that have since become major themes of public discussion. In Percy Bysshe Shelley's poem "Queen Mab" (1813),