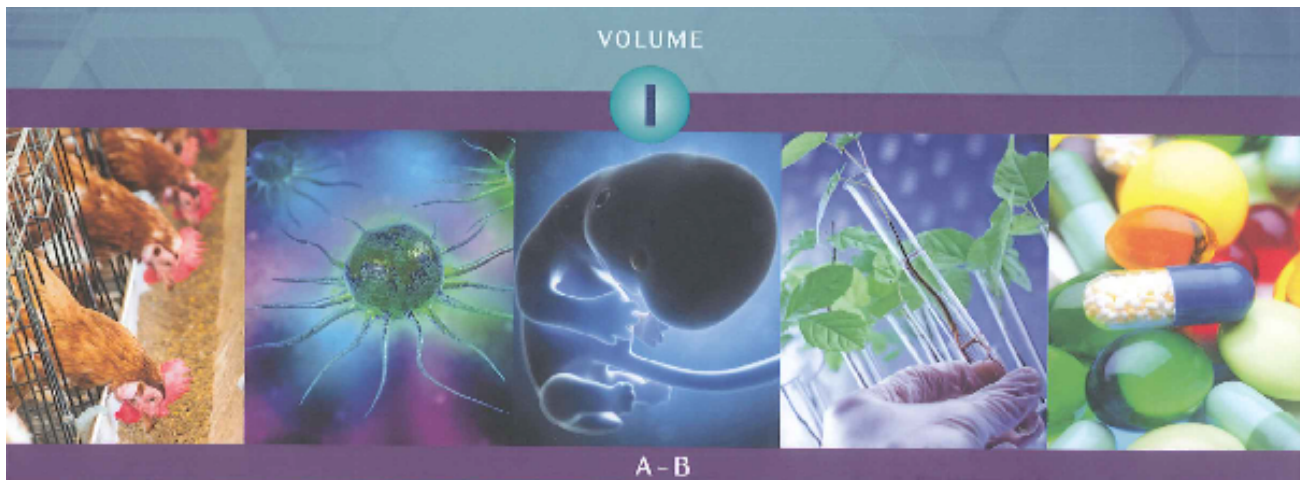


ENCYCLOPEDIA of BIOETHICS



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BIOPOLITICS

The term *biopolitics* has several overlapping meanings, and the common thread running through them traces the way that biological technologies confer powers to control human bodies, populations, and societies. These power dynamics are not new, but innovations in the life sciences and biotechnologies, especially since the turn of the twenty-first century—sometimes called the biotech century—have given them new currency.

Some observers regard biopolitics as the appearance in the public sphere of issues previously addressed by professional bioethicists and medical ethicists (Pellegrino 2006). According to a broader emerging definition, which guides this entry, biopolitics refers to public understandings, public policies, and public-interest advocacy regarding the social meanings and consequences of a range

of human genetic, reproductive, and biological technologies and practices. As such technologies and practices have become more advanced, biopolitics has come to mark important tensions among science, markets, the state, political life, and civil society. Although biopolitics in some contexts includes controversies over genetically modified organisms (GMOs) in the agricultural sector, such issues are not considered in this entry.

The life sciences today are based on techniques of manipulation, in contrast to the emphasis on observation and interpretation that characterized biology in earlier eras. Biotechnologies can alter the workings of cells and entire organisms; they can act directly on human bodies, behaviors, and minds. Another key transformation of the life sciences lies in their fast-growing commercialization:

since the birth of the modern biotechnology industry in the 1970s, the boundary between academic and commercial biology has become more and more blurred. Biotechnology-related products and services provided by laboratories and start-up companies spill out into the marketplace, medical care, the legal and criminal justice systems, pregnancy and family formation, and other realms of daily life. They increasingly shape our imaginations, our values, and our understanding of what it means to be human—now and in the future.

Accordingly, the social and ethical challenges posed by human biotechnologies in the early twenty-first century encompass much broader issues, and capture much greater public attention, than was the case in the early days of the field of bioethics. Biopolitical controversies play out in social realms, including academia, news and online media, and popular culture, and on political stages, including the courts, legislatures, and even national elections. And biopolitics is increasingly a focus for civil-society constituencies and public-interest organizations.

In contrast to bioethics, then, biopolitics focuses on broad social and political dynamics more than on encounters in institutional settings between doctors and patients or between researchers and human subjects. It emphasizes social values and policy proposals more than procedural recommendations and professional guidelines. Though bioethics and biopolitics are in constant conversation with each other, biopolitics is situated largely outside the organizational structures (such as academic departments, hospitals and clinics, institutional review boards, and corporate advisory boards) that are most closely associated with bioethics. Bioethics and biopolitics do, however, share an important affinity in their shared focus on practical responses to ethical questions raised by advances in the life sciences and biotechnology.

This entry sketches the history of the term *biopolitics* in scholarly usage and then turns to its use since the early 2000s by advocates with sharply divergent motivations and views about the preferred biopolitical future. It then comments on a number of biopolitical controversies that have played out in the public sphere.

BIOPOLITICS IN SCHOLARLY USAGE

The term *biopolitics* is used in a number of academic fields, including bioethics, sociology, anthropology, political science, philosophy, and science and technology studies, which examine the power-laden interplay among science, technology, and society. In 1979 two political scientists, Steven A. Peterson and Albert Somit, argued that “the influence of biology seems to have been felt in political science more than in some other social sciences” (Peterson and Somit). Many scholars today associate the term with the work of the French philosopher Michel

Foucault (1926–1984), who introduced his theories of “biopower” and “biopolitics” in the mid-1970s (Foucault 2008; Lemke 2011).

Although Foucault’s work focused on eighteenth- and nineteenth-century Europe, his ideas about the political powers conferred by biological technologies have had tremendous influence across the social sciences and humanities. Foucault’s understanding of biopolitics is situated within his argument for a new way of understanding power: in addition to the top-down control exercised by a sovereign state, he claimed, power is built into our social relationships, norms, and everyday routines. Biopolitics for Foucault represented the means through which populations and individuals are governed in diffuse yet pervasive ways, including those that reach to the level of the body and life itself.

Foucault’s post-structuralist approach to biopolitics has been interpreted and expanded upon by many critical theorists, including Donna J. Haraway (1991), Giorgio Agamben (1998), and Michael Hardt and Antonio Negri (2004). In addition, it has motivated similar concepts, such as Paul Rabinow’s (1996) “biosociality,” Nikolas Rose’s (2007) “vital politics,” and Adele E. Clarke et al.’s (2010) “biomedicalization.” Rose’s reworking of biopolitics deserves special attention because it focuses on the twenty-first-century context in which genetics and biotechnology have greatly influenced the politics of what he calls “life itself.” In *The Politics of Life Itself*, Rose explains:

Politics has long been concerned with the vital lives of those who are governed. ... But the vital politics of our own century looks rather different. ... It is concerned with our growing capacities to control, manage, engineer, reshape, and modulate the very vital capacities of human beings as living creatures. It is, I suggest, a politics of ‘life itself.’ (2006, 3)

BIOPOLITICS IN SOCIAL AND POLITICAL ADVOCACY

The history of *biopolitics* in social and political advocacy—both as a term and as a set of concerns raised by developments in the life sciences and the biotechnology industry—has been less frequently discussed than has its academic genealogy. A full discussion of this history would be an important contribution to understanding the current landscape of biopolitics. This entry provides just a few landmarks on a rather sketchy map.

Emergence of Issues. Several events in the mid-1970s presaged the emergence of biopolitics in the United States and around the world. The publication in 1975 of Edward O. Wilson’s *Sociobiology: The New Synthesis*,

which argued that genetics rather than social and environmental conditions are determinant in individual human behavior and in social formations, sparked heated controversy about the politics of biology. Also in 1975 some 140 biologists, physicians, lawyers, and others gathered in California at the “Asilomar Conference on Recombinant DNA” to discuss the potential hazards of biotechnology and to draw up voluntary safety guidelines that many believe were designed to fend off calls for enforceable regulation. The conference and its recommendations pushed the emerging field of biotechnology into public awareness (Berg et al. 1975). In 1976 venture capitalist Robert Swanson and biochemist Herbert Boyer launched a company called Genentech, an event often said to mark the founding of the biotechnology industry.

In 1980, still during the prehistory of biopolitics, a US Supreme Court case, *Diamond v. Chakrabarty*, and a piece of congressional legislation, the Bayh-Dole Act, encouraged the development of the private-sector biotechnology industry and set in motion some of the important economic and political dynamics underlying the emergence of biopolitics. In *Diamond v. Chakrabarty*, the court ruled that genetically engineered organisms could be patented, and the Bayh-Dole Act allowed universities and individual scientists to patent and commercialize technical inventions. In 1983 the first US public-interest organization focusing on the social, ethical, and environmental implications of modern genetic technologies was established in Cambridge, Massachusetts. Called the Council for Responsible Genetics (CRG), the organization has examined biological weapons, worker and community safety in biotechnology laboratories, agricultural biotechnologies, and biomedical developments. It has also developed critiques of genetic reductionism, genetic determinism, and germ-line genetic interventions (Council for Responsible Genetics 2013a).

By the late 1980s and early 1990s a different approach to human biotechnologies in general—and to inheritable genetic modification and other enhancement technologies in particular—began to take shape. This was the futurist ideology, today known as transhumanism, which advocates using genetic and other technologies to enhance (as adherents see it) human capacities and to take control of human evolution. An early transhumanist organization, the libertarian Extropy Institute, was founded in 1990; in 1998 the World Transhumanist Association was established (Hughes 2004).

Developments and Debate. During the 1990s dialogue and debate continued in scholarly publications, bioethical discussions, mainstream media, and popular culture concerning emerging and future applications of human genetic and reproductive technologies. In light of experimental gene-transfer procedures and in anticipation

of the completion of a “map” of the human genome, gene therapy was heralded as a miraculous new medical treatment until the tragic death of an eighteen-year-old in a gene-therapy clinical trial in 1999 (Marshall 1999; Nelson and Weiss 1999). Meanwhile, feminist scholars and others examined the growing use of in vitro fertilization (IVF) and its variants, the growth of a market in human eggs and commercial surrogacy (contract pregnancy), and the implications of these developments for women’s health and well-being and for the commodification of human reproduction (Rothman 1998).

In the late 1990s a small but influential number of scientists began openly to advocate the development and use of extreme human biotechnologies, including reproductive cloning and inheritable genetic modification for enhancement purposes. The conversation exploded and moved to mainstream news media and popular culture after the 1997 announcement that the first cloned mammal, a sheep called Dolly, had been born. The film *Gattaca*, released the same year (and still exerting strong cultural influence into the twenty-first century), explored the filmmakers’ vision of a not-too-distant future of genetic castes and DNA-based discrimination, in which “valids”—those with high-caliber preselected genes—are the ruling elite while “in-valids” labor at menial jobs with no way up or out. In 1998 a conference at the University of California, Los Angeles called “Engineering the Human Germline” drew one thousand participants and was covered on the front pages of the *New York Times* (March 21, 1998) and the *Washington Post* (March 22, 1998). The goal of the conference, said the scientists who organized it, was to make human germline engineering acceptable to the American public (Stock and Campbell 2000).

Even with all this activity the term *biopolitics* was not yet commonly used with its current meaning. An exception was in a volume of collected essays titled *Biopolitics: A Feminist and Ecological Reader on Biotechnology*, published in 1995 by the politically liberal British publisher Zed Books (Shiva and Moser). Its focus was the ecological risks, ethics, and social implications of agricultural biotechnology, but it also included (previously published) essays titled “Human Nature” and “Genes as Causes,” both by Ruth Hubbard, professor emerita of biology at Harvard University and a board member of the Council for Responsible Genetics. The publisher’s description begins by saying, “Biotechnology is the single most powerful bundle of new technologies currently under development. It is also the most intrusive and determinative technology relating to nature generally and the human body specifically.”

Wider Adoption of the Term. In the early 2000s the term *biopolitics* was adopted by writers and advocates with

starkly different political and ethical commitments. In 2002 the environmental writer and activist Jeremy Rifkin published “Fusion Biopolitics” in *The Nation*, a left-leaning journal of opinion. Rifkin’s news hook was then-pending federal legislation about a research cloning technique, but he went on to note that opposition to creating cloned human beings was found among both progressives and social conservatives. The latter, he said, were motivated by “what they regard as the rights of the unborn,” whereas many progressives “argue that with cloning the new progeny become the ultimate shopping experience—designed in advance, produced to specification and purchased in the biological marketplace. ... The left also warns that cloning opens the way to a commercial eugenics civilization.” Rifkin went on to predict that new and emerging biotechnologies would rearrange traditional political affiliations: “The current debate over cloning human embryos and stem cell research is already loosening the old alliances and categories. It is just the beginning of the new biopolitics.”

Transhumanists also began using the term *biopolitics*. According to the World Transhumanist Association founder James Hughes (2004, 55), “at one end of the biopolitical spectrum are the bioLuddites, defending humanity from enhancement technologies, and at the other the transhumanists, advocating for our right to become more than human.” Like Rifkin, Hughes argues that biopolitics is becoming “a new dimension” of the “political terrain of the twenty-first century,” cutting “across the existing political lines.” Hughes distinguishes between what he calls “right bioconservatives” and “left bioconservatives” and describes a “polarization between the transhumanist and bioconservative positions within biopolitics” (Hughes 2011, 165).

The Center for Genetics and Society (CGS), with which both authors of this entry are or have been affiliated, was founded in 2001. Its initial focus was the threat to social justice and equality raised by the prospect of inheritable genetic modifications that could be enabled by cloning, gene transfer, and assisted reproductive technologies. CGS’s mission statement, published on the organization’s website, signaled its commitments to fundamental progressive principles, including “the equitable provision of health technologies,” reproductive rights, disability rights, and a precautionary approach to new technologies (Center for Genetics and Society 2013a). The organization soon adopted the term *biopolitics*; in 2006 it established a blog called *Biopolitical Times*, accessible through its website. For CGS the term *progressive biopolitics* and the phrase *a new biopolitics* connote a commitment to social justice, human rights, and public-interest values. CGS has worked with scholars across a range of disciplines, including law, sociology, anthropology, public health, biology, and science and

technology studies, and with advocates promoting various issues, including reproductive health, rights, and justice; racial justice; disability rights; and environmentalism (Center for Genetics and Society 2013b).

BIOPOLITICAL CONTROVERSIES

What does biopolitics look like on the contemporary political landscape? This section offers several brief comments on selected biopolitical issues that have emerged as politically or socially significant in the twenty-first century. This is far from an exhaustive list; the issues discussed here have been chosen because they are widely recognized as politically salient, have triggered legislation or judicial decisions, or have been engaged by public-interest organizations and civil-society constituencies.

Stem Cell Research and Cloning. Research on human stem cells has been one of the most high-profile and fiercely controversial technoscientific issues of the early twenty-first century, especially in the United States. When human embryonic stem cells were first isolated in 1998 at the University of Wisconsin (Devitt 1998), it was immediately evident both that they held significant scientific and medical promise and that they would be politically divisive, primarily because of staunch opposition among social and religious conservatives to research involving human embryos and fetal tissue.

The controversy intensified considerably after President George W. Bush announced a policy in 2001 limiting federal funding for embryonic stem cell research. Stem cell research became a litmus-test issue in the 2004 presidential campaign, with Ron Reagan (b. 1958), the son of the former US president Ronald Reagan, telling the Democratic National Convention that it would produce for each of us a “personal biological repair kit standing by at the hospital” (Reagan 2004). Meanwhile, opponents of embryonic stem cell research proclaimed equally miraculous powers for stem cells derived from adult tissues.

A key aspect of the stem cell debate concerned the use of cloning-based techniques (known as “research cloning” or “somatic cell nuclear transfer”) in efforts to create disease-specific and patient-specific stem cell lines. Progressives and liberals who raised concerns about research cloning focused on the enormous numbers of women’s eggs it would require and the risks to women this would pose, as well as on the need for rigorous oversight to prevent cloned embryos from being misused in efforts to produce cloned human beings. At the conservative end of the political spectrum, both reproductive cloning and research cloning were objectionable as practices that entail the destruction of (cloned) human embryos (Weiss 2002).

These concerns, and headlines about a few fertility doctors and marginal figures who claimed they were engaged in efforts to clone human beings (Center for Genetics and Society 2004) prompted efforts in state legislatures, in the US Congress, in other countries, and at the United Nations to address human cloning. A handful of US states passed laws against human reproductive cloning (National Conference of State Legislatures 2008), as did dozens of countries (BioPolicyWiki 2009). But legislation at the federal level in the United States (Center for Genetics and Society 2008) and a proposed binding international treaty at the UN (Center for Genetics and Society 2006; United Nations 2005) failed because conservatives refused to support prohibitions on reproductive cloning unless research cloning was included in the same measure.

The stem cell controversy has often been portrayed as a fierce but simple clash pitting scientists, patient groups, and most liberals and progressives against conservatives committed to the full moral status of human embryos—that is, the view that embryos have the same rights as adults and children. But the debate involved additional important issues: irresponsible scientific hyperbole about the certainty and imminence of breakthroughs and cures; the widely agreed-upon need to prohibit the creation of cloned human beings; and the importance of protecting research subjects, starting with the women who at the time were being asked to provide the large numbers of eggs needed for cloning-based stem cell research. In addition, public-interest groups in California raised basic issues of responsible governance concerning that state's stem cell research agency, which was created in 2004 after voters approved a ballot measure for \$3 billion in funding (Hayes 2006).

Women's organizations in South Korea, and some women's health advocates in the United States, engaged in the stem cell debate because of concerns about the risks to women undergoing procedures to retrieve the vast quantities of eggs required for cloning-based stem cell research. These concerns played out during the scandal surrounding Hwang Woo Suk, the South Korean researcher whose 2004 announcement that he had created cloned human embryos was revealed to be fraudulent two years later. Hwang had used more than two thousand eggs, many obtained under dubious conditions that sent some twenty women to the hospital (Sample 2006). Two of these women, supported by a coalition of thirty-five Korean women's groups, filed a lawsuit against the South Korean government, but the case was dismissed by the Seoul District Court in 2009 (*Nature* 2009).

The stem cell debate cooled in 2007, when Japanese scientists announced that they had used ordinary skin cells to derive induced pluripotent stem cells, which have properties similar to those of embryonic stem cells

(Takahashi et al. 2007). In 2009 President Barack Obama lifted federal funding restrictions on embryonic stem cell research, and in accompanying remarks he called reproductive cloning “dangerous” and “profoundly wrong.” By 2009 new controversies had erupted over fraudulent claims made by companies in the United States as well as in countries including Mexico, Ecuador, Japan, Thailand, South Korea, Ireland, and the Netherlands regarding stem cell treatments (Kiatpongsan and Sipp 2009; Cyranoski 2012). Another simmering but not yet widely recognized stem cell issue concerns research into creating human gametes from induced pluripotent stem cells, which could enable experiments with human germline modification (Shanks 2012).

Patents on Human Genes. Although the United Nations and the World Medical Association have stated that human genes are part of the common heritage of humanity, the US Patent and Trademark Office has granted thousands of patents on human genes. About 20 percent of human genes are now patented, and a company or university that holds a patent on a gene can prevent anyone else from studying, testing, or even looking at it (Lovgren 2005).

In 2009 the American Civil Liberties Union (ACLU) and the Public Patent Foundation filed a lawsuit (*Association for Molecular Pathology v. Myriad Genetics*) on behalf of a group of plaintiffs challenging the constitutionality of gene patents, arguing that granting patent protection to genetic sequences is a violation of the First Amendment. The suit named as defendants the US Patent and Trademark Office, as well as Myriad Genetics and the University of Utah Research Foundation, both of which hold patents on the breast cancer genes known as BRCA1 and BRCA2. The twenty plaintiffs included scientific organizations representing 150,000 geneticists, pathologists, and laboratory professionals; women's health groups, including Breast Cancer Action and Our Bodies Ourselves; and individual researchers, genetic counselors, and cancer patients. The scientists said that Myriad had directly prevented some of their work by issuing cease-and-desist letters, thus stifling diagnostic testing and research. The plaintiffs also argued that Myriad had kept the cost of the test for BRCA1 and BRCA2 unreasonably high and that the patents limited women's health care options by disallowing independent medical opinions about particular genetic variants or their interpretation. Friend-of-the-court briefs were filed by women's health, environmental, and scientific organizations, as well as other public-interest groups (Darnovsky and Reynolds 2009). The biotechnology sector was itself divided about the lawsuit.

In June 2013 the US Supreme Court ruled unanimously that human genes may not be patented, a

decision greeted with unbridled enthusiasm by the large coalition of plaintiffs and supporters (Liptak 2013).

DNA Police Databases. Police forces around the world are increasingly turning to genetic information to help solve criminal cases. Genetic evidence is being used both to convict perpetrators and to exonerate people who were wrongfully convicted, including many on death row (Handwerk 2005). DNA-based forensic tools are highly accurate when used to compare an unknown DNA sample with another that has already been identified, though they are far from foolproof—serious problems have resulted from human error and sample contamination. The development of massive DNA police databases containing millions of profiles, however, has given rise to new problems and questions. Some concern the accuracy of “cold hits”—searching databases for matches with DNA found at a crime scene when other investigative options have failed. In these cases, and especially when the DNA is incomplete or degraded, reliability plummets. Yet jurors deciding cases involving DNA evidence from cold hits “are often told that the odds of a coincidental match are hundreds of thousands of times more remote than they actually are” (Felch and Dolan 2008).

In many states and countries police are permitted (or required) to obtain and store genetic samples from people arrested for but not necessarily charged with or convicted of crimes. These preconviction sampling practices mean that police databases contain DNA from a large and growing number of innocent people. Furthermore, police are increasingly tapping DNA databases using a technique called familial searching, which brings under surveillance members of extended families, most of whom have never broken the law but whose DNA profiles share commonalities with samples gathered at crime scenes. DNA police databases thus raise significant concerns about civil liberties and the prospect of genetic surveillance. These threats are particularly worrisome for communities that already have disproportionately frequent encounters with criminal justice systems (Obasogie 2009; Krinsky and Simoncelli 2011).

The United Kingdom’s national DNA database, which was established in 1995 and is the world’s oldest, had by 2008 collected DNA from more than three-fourths of the country’s young black men and from more than one-fourth of its entire black population. In 2011, following pressure from civil society organizations and a ruling by the European Court of Human Rights, the government agreed to remove the genetic profiles of an estimated one million innocent people—the first time that any government had rolled back a DNA database and restricted the data that is retained (GeneWatch UK 2013). In the United States, the American Civil Liberties Union has challenged these practices in several jurisdictions.

Direct-to-Consumer Genetic Testing. Dozens of direct-to-consumer (DTC) genetic testing companies, some with significant financial backing, offer to sequence and interpret their customers’ genomes. People send in a saliva sample and then receive a report that claims to predict risk for a variety of common diseases and conditions. Most DTC companies test partial genomes, but with prices rapidly plummeting beginning in 2008, whole-genome sequencing is expected to be readily available in the near future (National Human Genome Institute 2013). An investigation by the US Government Accountability Office (2010), however, revealed that the same DNA sent to multiple companies, including those considered most reputable, yielded contradictory results. And the predictions are often highly misleading: many medical professionals are concerned that recipients of these reports will misinterpret them and flood the health care system with requests for consultations or undergo unnecessary medical procedures.

The scientific assumptions underlying genetic testing are also controversial. An increasing number of medical and genetic experts agree that when it comes to predicting common diseases (including most forms of cancer and heart disease) in healthy people, gene tests “have produced little for medicine” (Wade 2010); leading geneticists have begun to acknowledge the “missing heritability” of common traits (Zuk et al. 2011). According to these views, responsible medical practice would limit gene tests to those that are clinically meaningful and useful, and it would temper grand claims about the revolutionary potential of so-called personalized medicine (Dickenson 2010). In 2010 the FDA began considering what kind of regulatory policy and authority it will exercise over DTC gene testing (Singer 2010).

Sex Selection. In China and India sex selection, typically accomplished by abortion after the sex of a fetus has been identified in an ultrasound test, has become staggeringly widespread. Because such abortions mainly affect female fetuses, the practice has created wildly skewed sex ratios: well over 100 million females are statistically missing from these populations (Sen 1990). This imbalance has led to bride migration and bride trafficking and has exacerbated violence against women (Hvistendahl 2011b). Notwithstanding common assumptions by demographers and social scientists that the practice of sex selection would diminish with the spread of modernity and affluence, it is actually growing in popularity, in part because of the increased availability since the early 1980s of cheap and portable ultrasound machines used for prenatal testing. And sex selection is spreading throughout south and east Asia and beyond, to the Caucasus region and even eastern Europe (Hvistendahl 2011b; Hennen 2013). In India women’s health groups and feminists have campaigned

since the late 1970s against sex selection (Hvistendahl 2011b, 152). India passed a law in 1994 (amended in 2002) prohibiting sex selection through abortion (CHILDLINE India Foundation n.d.), but this legislation has been largely ineffective (Hvistendahl 2011b, 47).

In the United States sex selection has not caused skewed numbers of boys except among second and third children in families of Chinese, Indian, and Korean descent (Almond and Edlund 2008). But sex selection using high-tech methods, such as sperm sorting or embryo screening in conjunction with IVF, has become a \$100 million per year industry. A 2006 survey of fertility clinics found that, of the clinics that at that time offered genetic testing of embryos created through IVF, nearly half offered nonmedical sex selection (Genetics and Public Policy Center 2006). Anecdotal evidence suggests that, for the most part, Americans who use these techniques choose to have girls as often as boys. Some argue that this makes sex selection unproblematic; others point out that selecting for boys *or* for girls raises concerns about gender stereotyping, parental expectations, and normalizing selection of other traits. Libertarians have argued that sex selection should be seen as an extension of reproductive choice (Robertson 2001); others see a clear distinction between choosing whether and when to have children and choosing the particular traits of those children (Bhatia et al. 2003).

Antiabortion advocates in the United States have tried to use sex selection as a wedge issue to undermine support for abortion rights, complicating efforts to address the issue by feminists who are in favor of abortion rights but are critical of sex selection. In countries such as Canada, Germany, and the United Kingdom, sex selection has been prohibited without affecting abortion rights (Hvistendahl 2011a).

Noninvasive Prenatal Testing. New techniques for noninvasive prenatal testing (NIPT) analyze fetal DNA that is collected from a woman's blood as early as five weeks into a pregnancy. Already on the market for diagnosing Down syndrome and other chromosomal anomalies, the techniques are being refined to allow identification of fetal genes at thousands of sites. The development of such tests would mean that expecting parents who use NIPT would receive the same kinds of reports about their early-stage fetus as they would get about themselves from a direct-to-consumer genetic testing company. They would face the same kinds of inherent uncertainties in interpreting the results but would be in a position to make a consequential decision about whether to continue the pregnancy.

Because NIPT is less invasive, less risky, and less expensive than the other kinds of fetal gene tests available,

and because it relies on a simple blood draw so early in pregnancy, if widely used it would dramatically change the experience of pregnancy and childbearing. Disability rights advocates ask whether health insurers will encourage NIPT, or even require it, in order to avoid the costs of special-needs children. Such advocates are concerned that larger numbers of parents will choose to terminate a pregnancy if the fetus is reported to have any kind of disability, even a type with which many people live full and happy lives. Stanford University bioethicist Henry T. Greely (2011) predicts that the "spectre of eugenics will loom over the whole discussion" of NIPT and that concerns about eugenics "will increase as such testing moves from fatal diseases to less serious medical conditions and then on to nonmedical characteristics" (Greely 290). Meanwhile, reproductive rights advocates, including those disquieted by the prospect of medically irrelevant genetic testing that could carry society into the realm of eugenics, worry that these difficult questions will be swamped by blanket condemnation of the new tests by those who oppose abortion rights under any circumstances (Darnovsky 2011).

Egg Freezing. While techniques to freeze human embryos and sperm have been used for several decades as part of assisted reproduction practices, freezing human eggs has proved more technically challenging. Because of the large amount of water contained in eggs, cryoprotectant chemicals are added to prevent damage when they are frozen and thawed. By the mid 2000s, freezing methods associated with higher survival rates led some fertility clinics to offer egg freezing, though the procedure was considered experimental. In 2012 the American Society for Reproductive Medicine (ASRM) announced that it was removing its "experimental" label from egg freezing (Practice Committee of the American Society for Reproductive Medicine and the Society for Assisted Reproductive Technology 2012).

The move generated a flurry of media coverage, with many news accounts presenting the procedure as an unproblematic path to greater women's freedom and autonomy while omitting or downplaying risks to women's health and social concerns about their lives. In fact, the ASRM's revised guideline is narrowly written; it applies only to women facing infertility as a result of impending medical interventions, typically chemotherapy as a cancer treatment. The ASRM guideline notes that there is inadequate data on the safety and efficacy of egg freezing when used by older women and when eggs are frozen for long periods. In addition, the statement acknowledges that, at the time of publication, the few children born from frozen eggs were still very young and that, therefore, data on long-term risks for these children is limited. Furthermore, there are significant but

under-studied health risks of egg extraction that are often not fully explained to women considering undergoing the procedure for any reason (Beeson and Lippman 2006). The risks, over the short term and the long term, are mostly associated with the hormones that shut down and then hyperstimulate the ovaries as part of the procedure.

The prospect of healthy young women with no known fertility problems freezing their eggs as a form of insurance for achieving pregnancy when they are older may be attractive to the fertility industry because it represents a potentially large new customer base. Egg freezing could also trigger another business shift; namely, to an increase in frozen egg banks. This would be more convenient for egg recipients and fertility doctors but could mean lower payments for egg providers in general. It could also mean a new emphasis on recruiting providers from areas of the world where women with traits that are considered desirable may be willing to accept less money, but where the risks of exploitation may be higher.

Some women's rights advocates view egg freezing as a technical fix likely to distract attention from social changes that would address some of the reasons women delay childbearing, such as the dearth of family-friendly workplaces (McCurtis 2008). A related concern is the prospect of women facing additional pressures from employers to postpone childbearing because of the availability of egg freezing (Dana 2012).

Commercial Surrogacy. Commercial surrogacy is a growing sector of the fertility industry. Surrogacy enables gay couples, and some infertile couples who could not otherwise have children, to form families. However, feminist and other critics have long noted the class dimensions of the practice: women who serve as surrogates are invariably less affluent than those who hire them. Concerns about exploitation are heightened when surrogates are poor women in developing countries. The early decades of the twenty-first century have seen a surge in arrangements involving couples looking abroad for surrogates, a practice often referred to as reproductive tourism. India is the most common destination; surrogacy for foreigners is also offered in countries including Mexico, Argentina, Guatemala, and Spain. In India surrogates are often required to live in fertility clinic dormitories away from their own families and to agree to medical procedures, including cesarean sections, for the convenience of those who hire them (Twine 2011; Pet 2012).

Genetic Discrimination. The spread of genetic testing has raised the prospect of discrimination by employers, health insurers, and others against people with genetic variations that may signal increased risk of future disease. Beginning in the 1990s, disease-specific groups, consumer rights

organizations, genetic counselors, and others began working to prohibit genetic discrimination. The Coalition for Genetic Fairness, founded in 1997, grew to include more than five hundred organizations by 2008, including industry groups and employers. Legislation to protect against genetic discrimination was first introduced in the US House of Representative in 1995, and a bill called the Genetic Information Nondiscrimination Act was finally signed into law by President George W. Bush in 2008. It covers employment and health care insurance and is widely seen as an important step. But because the legislation does not cover military personnel nor extend to life, disability, or long-term-care insurance, political efforts to prevent genetic discrimination in the United States are sure to continue (Coalition for Genetic Fairness 2013; Council for Responsible Genetics 2013b).

Race-Based Research and Products. Several developments in the biotechnology field threaten to revive discredited notions about race as a scientifically valid biological category, rather than a social and political system. Examples include the misuses of racial categories in genetic and biomedical research, the regulatory approval and marketing of drugs for specified racial groups (most notably the drug BiDil, approved by the FDA in 2005 as a heart medication specifically for African Americans), and representations about racial legacies in genomic ancestry testing (Obasogie 2009). These products and practices obscure the social and political dynamics that shape race, and they divert resources and attention away from identifying and addressing the socioeconomic causes of health disparities (Kahn 2012). As legal scholar Dorothy Roberts (2011) points out, this tendency is particularly disturbing given that many people believe that American society has entered a postracial age. In other words, Roberts says, biological race is being revived at the same historical moment that the social importance of race is being denied or neglected.

BIOPOLITICAL PROSPECTS

The social, ethical, and political challenges posed by human biotechnologies are among the thorniest and most consequential that society faces. As Rifkin (2002) and Jonathan D. Moreno (2011) note, they are already roiling the conventional politics of left and right.

Biopolitical issues are also producing tensions within civil rights and human rights constituencies. Many advocates of gay and lesbian rights, for example, welcome assisted reproductive technologies that expand opportunities to have biologically related children (Mamo 2007), but also worry about the implications of a so-called (and almost certainly spurious) gay gene (*Frontline* 2000). Some racial justice advocates take the advent of race-specific drugs as a sign that the pharmaceutical industry is

finally addressing racial health disparities (Winstein 2007); others denounce the drugs as throwbacks to fallacious and dangerous views of racial groupings as biologically determined rather than socially and politically enforced (Roberts 2011; Kahn 2012). Some supporters of reproductive rights believe that reproductive choice should extend to selecting the traits of future children (Robertson 2001); others argue that this is altogether different from a woman's right to decide whether to terminate a pregnancy (Darnovsky 2009; Hvistendahl 2011a).

The biopolitical spectrum is still in formation. Its shape will be determined by several broad political questions: first, the relative weight given to social justice, the public interest, and the common good versus individual liberty and autonomy; second, the extent to which society welcomes responsible public policy and regulation rather than relying on laissez-faire market mechanisms and corporate agendas; and, third, the degree of enthusiasm or caution brought to the assessment of various technologies, practices, and products associated with human genetic and reproductive technologies (Darnovsky 2009).

SEE ALSO *Bioethics: X. Politics of; Cloning; DNA Identification; Embryo and Fetus: III. Embryonic Stem Cell Research; Food; Genetic Discrimination; Genetic Testing and Screening; Health Policy and Politics; Patenting Organisms and Basic Research; Personalized Medicine; Precautionary Principle; Reproductive Technologies; Transhumanism and Posthumanism*

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