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Preimplantation genetic diagnosis: public policy and public attitudes

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This paper summarizes the regulatory framework surrounding preimplantation genetic diagnosis (PGD) in the United States. In addition, the author reports results of surveys that reveal conflicting popular opinions about the moral acceptability of manipulating embryos during PGD. For example, some people who feel that an embryo has as much moral status as a born baby nonetheless feel that using PGD to screen embryos for certain diseases is morally acceptable. The national debate about technologies like PGD is stunted because it is currently cast in the same terms as the debate over abortion rights. If national leaders begin discussions about regulation of PGD and similar technologies, it could help depolarize the debate to more accurately consider the nuanced views of the public. (Fertil Steril® 2006;85:1638–45. ©2006 by American Society for Reproductive Medicine.)

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In vitro fertilization (IVF) and genetic testing each present a host of issues that are technically, legally, and ethically complicated. Nevertheless, the worlds of genetic testing and assisted reproduction have converged with the advent of preimplantation genetic diagnosis (PGD), which allows parents to choose which embryos to transfer to the mother's womb on the basis of genetic test results. The arrival of PGD has engendered a host of new scientific, social, ethical, and political quandaries. The fundamental societal questions are whether and under what conditions PGD should be used.

The public debate about PGD and other reproductive genetic technologies has been framed largely by the extremes. Indeed, a recent report on reproductive genetic technologies concluded: "The political division that has hampered public policy is rooted in the vitriolic U.S. debate over abortion. Given the polarizing dynamics of this debate, much of the public policy conversation about embryo research and reproductive policy has consisted of pro-choice and anti-abortion activists shouting past each other" (1). Meanwhile, in the midst of this polarized and paralyzed political environment, the number of genetic tests is expanding rapidly (2). Tests are quickly being used in PGD, giving parents profound new power to identify and select the inherited characteristics of their children before pregnancy (3).

Policy decisions, particularly those involving science and technology, are often informed largely by expert "elites" and influenced by those who have both the most to win or lose and the ability to make their voices heard. However, unlike some areas of science, such as building a superconducting supercollider or developing new brain imaging technology, reproductive genetic technologies affect one of the most profound of human experiences—how we have babies and what babies we have. Thus, the development and use of these technologies is of interest well beyond the technocratic or bioethics elite. As decision makers consider policies to govern these new technologies, they will hear from those at the extremes, but they should also consider the broader public's attitudes toward PGD. This article presents an overview of the current regulatory landscape to highlight how little direct oversight of PGD currently exists. It also presents qualitative and quantitative data about the public's views toward PGD and the social and ethical issues it raises.

CURRENT REGULATORY LANDSCAPE FOR PGD

Preimplantation genetic diagnosis sits at the intersection of two technologies with a confusing regulatory status: assisted reproduction and genetic testing (4). At the federal level, Congress has not explicitly authorized federal regulation of PGD. Thus, to the degree that there is federal oversight of PGD or its component technologies, it is derived from existing statutes having broader applicability. Three federal agencies within the U.S. Department of Health and Human Services oversee areas related to PGD: the Centers for Disease Control and Prevention (CDC), the Food and Drug Administration (FDA), and the Center for Medicare and Medicaid Services (CMS, formerly known as the Health Care Financing Administration). The CDC implements the 1992 Fertility Clinic Success Rate and Certification Act (FCSRCA), which requires clinics that provide IVF services to report pregnancy success rates annually to the federal government. The CDC analyzes the data and makes its findings available to the public, including via the Internet. The law requires the CDC to list on its website the names of clinics that do not report at all or that fail to verify the accuracy

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of the data. Other than being listed by the CDC, there are no penalties for failure to report. The statute does not require clinics to report the use of or outcome from PGD (5).

The FDA regulates drugs and devices (6), including those used as part of IVF treatments, such as drugs to induce ovulation and laboratory instruments used in IVF. Depending on the type of product, the FDA may require submission of data from clinical studies (premarket review) and agency approval before the product may be sold. Some of the products used by clinical laboratories to perform genetic tests are regulated as medical devices by the FDA. However, most genetic testing laboratories develop their own tests and the FDA does not currently regulate these so-called "home brew" tests, although it does regulate certain components that laboratories use to make them (7–10). Thus, there is limited FDA oversight of the vast majority of tests used in PGD.

The FDA also regulates human tissues intended for transplantation. The agency's statutory authority is limited to preventing disease transmission. The FDA regulations require facility registration, screening to detect infectious diseases, record keeping, and the proper handling and storage of tissues. The FDA can inspect tissue banks and order the recall or destruction of tissue found to be in violation of regulations. Recently, the FDA has decided to extend this form of limited regulatory oversight to reproductive tissues under certain circumstances (11, 12).

In addition, the FDA regulates certain human cell and tissue-based therapies as "biological products" (13). For example, the FDA has taken the position that ooplasm transfer in conjunction with IVF cannot be performed without first filing an investigational new drug (IND) application (14). However, the FDA has not determined that reproductive tissues are "biological products" when used for PGD procedures and has not required premarket review. Whether the FDA has the legal authority under current statutes to take such a position, and whether it would choose to do so even if it did, is an open question.

Although FDA regulates claims a manufacturer may make about an approved product, it does not have the authority to regulate the actual uses of approved products by physicians. Such decisions are considered part of medical practice. Thus, even if the FDA required premarket approval for the reproductive tissue or the genetic tests used as part of PGD and limited the claims that could be made about them, the agency could not restrict the actual use of these products by PGD providers.

The CMS implements the Clinical Laboratory Improvement Amendments of 1988 (CLIA), which was enacted to improve the quality of clinical laboratory services. The CLIA defines a "clinical laboratory" as a laboratory that examines materials "derived from the human body" to provide "information for the diagnosis, prevention, or treatment of any disease or impairment of, or the assessment of the health of, human beings" (15). The CMS has taken the position that laboratories that perform PGD are not considered "clinical laboratories" within the meaning of the statute. Some worry that including PGD within the definition would require CMS to take the position that an embryo meets the legal definition of a human being, although it is unclear whether this concern is well-founded because neither the agency nor any court has had occasion to formally address it.

Research performed at institutions supported with federal funds and research to support an application to the FDA for product approval is subject to federal requirements for protecting human research subjects (16, 17). However, these regulations do not explicitly cover research involving preimplantation embryos (18). In addition, since 1996, there has been a prohibition on federal funding for research involving the creation or destruction of human embryos (19), and the FDA does not currently require premarket approval for any aspect of PGD.

States have considerable authority to make laws and regulations that govern the practice of medicine and yet no state has enacted laws that directly address PGD. Some states have passed laws related to assisted reproductive technology (ART) that are mainly concerned with defining parentage, ensuring that the transfer or donation of embryos is done with informed consent or ensuring insurance coverage for fertility treatment. Some states prohibit the use of embryos for research purposes and one state, Louisiana, prohibits the intentional destruction of embryos created via IVF (20). For the most part, states have not assumed oversight responsibilities for fertility clinics.

States can create their own regulatory schemes for laboratories that go beyond the federal mandates, and the CDC has developed a model state program for certifying laboratories that work with human embryos (21). However, most states have not included laboratories that conduct IVF or PGD in their laboratory oversight duties, and no state has adopted the CDC model program. However, New York has developed standards for laboratories that include oversight of the genetic tests associated with PGD (22, 23).

Courts have addressed a variety of cases relating to assisted reproduction, but only a few concerning PGD. In one case, the parents of a child born with cystic fibrosis (CF) following PGD, as well as the child, sued those involved with the embryo screening for failing to detect the condition. The parents made the claim of "loss of consortium," meaning the loss of the companionship they would otherwise have had with a healthy, non-CF-afflicted child. The court rejected this claim, finding that it was too speculative. In addition, it ruled that the defendants could not be held legally responsible for causing the child to suffer from a genetic disease (24).

The court similarly rejected the plaintiff child's claim for damages. Whereas the child asserted a theory of "preconception tort," the court interpreted the claim as one for

"wrongful life" (i.e., that the defendants' alleged negligence deprived the child's parents of the opportunity to choose not to give birth to him) (24). Most courts have rejected wrongful life claims in other circumstances, such as those arising from a flawed prenatal test, in part because doing so would require accepting the general argument that there can be instances in which an impaired life is worse than no life at all (25).

As more people take advantage of the new PGD technology, more legal questions may be brought before the courts, leading to the development of a body of "case law." Standards developed through case law frequently influence legislative action or become a de facto policy by themselves.

Medical and scientific professional organizations present another opportunity for oversight of PGD. They can educate members about advances in the field, develop guidelines addressing appropriate conduct or practices, and impose standards of adherence that are a prerequisite for membership. For the most part, however, such standards are voluntary, in that an individual can choose not to belong to the organization and therefore avoid the obligation to follow the standards. Professional organizations also typically do not have authority to sanction members for noncompliance. Unless the organization is specifically authorized by the federal government to act on the government's behalf in administering and enforcing government standards, actions of the professional organization do not have the force of law. However, courts often look to professional guidelines as the presumptive norm of professional behavior when evaluating claims of negligence.

Professional organizations have developed some PGD-specific guidelines or standards. For example, in 2001, the American Society for Reproductive Medicine (ASRM) issued a practice committee opinion addressing PGD stating that PGD "appears to be a viable alternative to postconception diagnosis and pregnancy termination" (26). The ASRM has also issued an ethics committee opinion cautioning against the use of PGD for sex selection in the absence of a serious sex-linked disease (27). More recently, the European Society for Human Reproduction and Embryology (ESHRE) and the PGD International Society (PGDIS) have released guidelines for PGD (28, 29).

Professional organizations that oversee the conduct of clinical laboratories, such as the College of American Pathologists (CAP), potentially could extend their oversight to the laboratory component of PGD; CAP has developed a voluntary certification program for reproductive laboratories that perform embryology testing (30). However, this latter program does not currently include standards for PGD. Similarly, the American College of Medical Genetics (ACMG) develops laboratory standards and clinical practice guidelines for genetic tests. However, these guidelines and standards do not currently address PGD.

POLICY ISSUES AND PUBLIC ATTITUDES

To learn what Americans know, think, and feel about the use and regulation of reproductive genetic testing, including PGD, a large series of social science research studies were conducted between October 2002 and August 2004. These studies, approved by the Johns Hopkins Institutional Review Board, included 21 focus groups, 62 in-depth interviews, and 2 surveys with a combined sample size of over 6,000 people.

The focus group and interview responses provide a detailed and textured portrait of peoples' attitudes (31–33). Participants were asked a series of questions about: awareness and knowledge of reproductive genetic tests; approval of using PGD for purposes ranging from diagnosing a fatal childhood disease to selecting a baby's sex; thoughts and concerns about the future use of these technologies, and views on how PGD should be regulated. Survey participants were asked a series of similar questions about their beliefs concerning the appropriate uses of these technologies and whether and how they might be regulated (33, 34).

For some observers, PGD raises a number of policy concerns: whether and for what purpose it should be used, whether it has been shown to be safe and effective, how much it costs and how cost affects access, and what it would mean to live in a society where one's genetics become more a matter of choice than chance.

Considering "Acceptable" Uses of PGD

The ethical and moral ramifications of PGD have attracted significant attention. These issues mainly revolve around the issue of whether and under what circumstances the use of PGD is acceptable. In vitro fertilization generally creates more embryos than will ultimately be transferred to a woman's uterus; PGD enables the selection of one or more embryos over others, with the likelihood that embryos deemed genetically undesirable will be destroyed. Some individuals and institutions hold that embryos have the same moral status as a born child and have argued that because PGD involves the creation, and frequently the destruction, of human embryos, it is morally unacceptable. Using a number of social science methods, we sought to understand whether, and to what extent, the American public shares this view.

Some focus group participants expressed their belief that from the time of conception, a human life has been created that has the same moral status as a liveborn child, whereas others felt that a human embryo is merely a clump of cells with no special moral standing (31). To assess the views on the moral status of human embryos in the general population, respondents to an April 2004 survey (33) were asked to rank on a five-point scale the moral worth of an embryo, a fetus at various stages, and a born baby. As expected, a large majority (86%) ranked a born baby as having maximal moral worth. Views on the moral worth of embryos varied significantly depending on the location of the embryo, with 47% of respondents assigning an embryo in the womb as having

maximum moral worth and 26% rating an embryo in a Petri dish as having maximum moral worth (33).

If attitudes about PGD are principally driven by views on the moral status of the human embryo, one would predict that those who believe that an embryo in a Petri dish has maximal moral worth would disapprove of PGD. Survey respondents were asked if they strongly approve, approve, disapprove, or strongly disapprove of PGD for five different purposes. Of those who rated an embryo in a Petri dish with maximum moral worth, 52% (n = 607) nevertheless said they approved or strongly approved of using PGD for a fatal childhood disease. In addition, of the respondents who disapprove or strongly disapprove of PGD for a fatal childhood genetic disease, only 38% (n = 551) rated a human embryo in vitro as having maximal moral worth. Thus, beliefs about the moral status of human embryos do not necessarily predict views of PGD. These data suggest that although one's views on the moral status of the human embryo influence attitudes toward PGD, there are other factors at play in shaping views toward PGD.

Drawing the Line

Today, PGD is primarily used to avoid the birth of a child with severe life-threatening disease, yet some worry about its expanded use to select "desirable" traits unrelated to the health of the child born following PGD. Although few human genetic variants have been identified that are associated with non-health-related characteristics, and the genetic basis of common heritable traits is likely to be complex with multiple weak genetic and environmental contributors, there are no legal limits on which of the hundreds of genetic tests currently available and the many more in development could be used for PGD. Although some providers believe that certain uses of PGD are unethical and refuse to do PGD under certain circumstances (e.g., to select an embryo of a particular sex for nonmedical reasons), others advertise these services and believe that parents should have the freedom to decide what is appropriate. Some observers argue that parents always have tried to give their children every possible advantage, from vitamin supplements to private swimming lessons; PGD, they argue, should be viewed as a technology that simply extends the boundaries of this natural tendency.

Most Americans approve of using PGD to select embryos free from a fatal childhood disease (68%) or to select an embryo that is a good tissue match for an ill sibling (66%) (33). For them, the use of PGD to avoid suffering of a prospective child or to aid another outweighs the risks involved and the concerns they may have about the embryos. Nevertheless, the balance tips for the still hypothetical use of PGD to select embryos based on genetic characteristics unrelated to health. A majority (72%) disapproves of such use (33), but the division between acceptable and unacceptable uses is not entirely clear. For example, 58% approve of PGD to select embryos that will not have a heightened risk of developing a disease, such as cancer, as an adult (33).

The lines often are not clear between what is a serious health problem, what is a mild or treatable disease, and what is purely a trait (i.e. a genetic characteristic unrelated to disease). Interestingly, significant gender differences in approval of PGD for various uses are observed (Fig. 1). Men and women express similar levels of approval for using PGD to identify and select an embryo free of a fatal childhood disease or to find an HLA match for an ill sibling. However, when asked about using PGD for selecting high intelligence or strength, significantly more men (33%) than women (23%) approve. Similarly, 45% of men approve of using PGD for nonmedical sex selection, whereas only 35% of woman approve of this use (Fig. 1).

It is important to note that although a majority of respondents approve of the arguably most sympathetic use of PGD and oppose what may be considered frivolous reasons, there is a significant minority dissent in both cases: 28% approve of PGD for selecting non-health-related traits, whereas 32% disapprove of using PGD to identify a fatal childhood disease (33).

Access to PGD Services

Because PGD is expensive, there are concerns that it will end be accessible and affordable only to the wealthy. As with all new medical treatments and techniques, the availability of PGD will be influenced by a health care system in which cost-benefit considerations largely drive coverage. If there is to be widespread insurance reimbursement of PGD, those who underwrite coverage—mainly employers and insurance companies—must view it as cost effective. Otherwise, the cost of PGD will be paid out-of-pocket by patients.

Having access to PGD determined by financial status could lead to situations in which a poor mother is more likely to give birth to a child with a genetic disorder than a more affluent mother who can afford to have her embryos tested. Families who can least afford it may be more likely to suffer the financial burden of caring for a family member with a genetic disease. As one of our focus group participants said, "I see a world in which only poor people have diseases" (33).

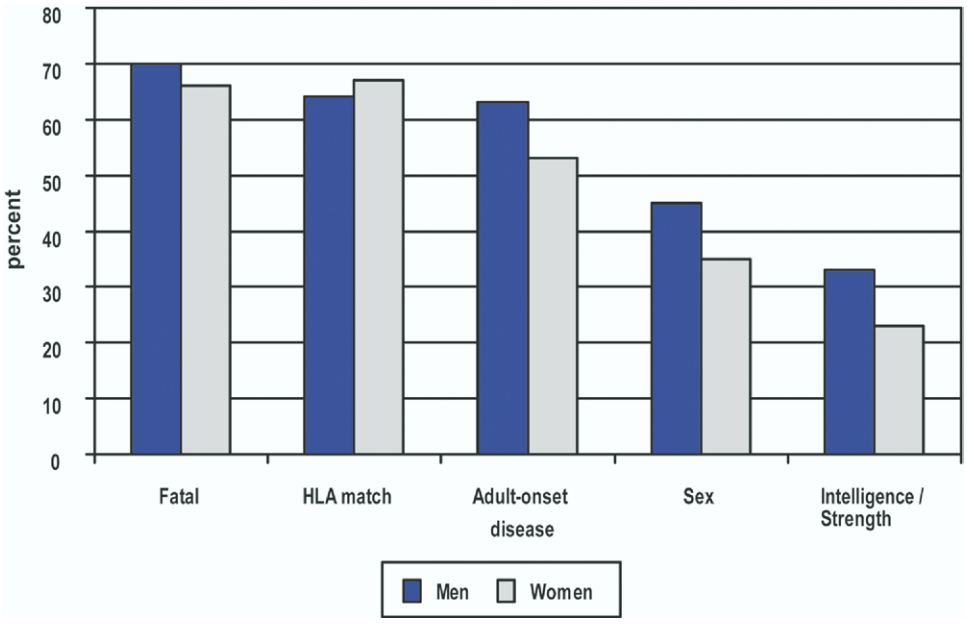
In addition to the fact that the cost-benefit equation could inhibit coverage, there could be pressure on insurers not to pay for PGD services, given the moral issues involved. Furthermore, from a health policy standpoint, an argument could be made that many other health care needs are more important than PGD and should be covered first.

PGD AND ITS FUTURE IMPLICATIONS FOR SOCIETY

Looking to the future, some observers view PGD, or any technology that allows parents the ability to choose the characteristics of their children, as having the potential to fundamentally alter the way we view human reproduction

FIGURE 1

Public approval of various uses of PGD. A representative sample of 4,834 Americans surveyed between April 16 and May 9, 2004 (33) were asked whether they approved or disapproved of selecting which embryos(s) to transfer to a woman's uterus on the basis of preimplantation genetic diagnosis for a fatal childhood disease (*Fatal*); for a good match to donate his or her blood or tissue to a brother or sister who is sick and needs a transplant (*HLA match*); a tendency to develop a disease such as adult-onset cancer (*Adult-onset disease*); for a certain sex (*Sex*); and, hypothetically, for desirable characteristics such as high intelligence or strength (*Intelligence/strength*). A majority of men (*blue bars*) and women (*grey bars*) approve of health-related uses yet disapprove of testing for sex or hypothetical traits, but men were more likely than women to approve of these non-health-related uses of PGD.



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and our offspring as well. Instead of viewing of reproduction as a mysterious process that results in the miraculous gift of a child, human reproduction could come to be considered more as the province of technology and children as the end result of a series of meticulous, technology-driven choices.

Some argue that widespread use of PGD eventually could change the current framework of social equality in many areas. The most dramatic scenarios involve babies who are born with genes selected to increase their chances of having good looks, musical talent, athletic ability, high SAT scores, or whatever a parent who can afford PGD may desire. Meanwhile, such advantages would be unavailable to the less affluent. Such a scenario, while certainly not possible now given the current limits on the technology, is perhaps not completely implausible. Although PGD involves a diagnostic test, as opposed to the genetic manipulation or genetic "engineering" of the embryo, the information it reveals could conceivably allow a parent to select an embryo on the basis of many factors other than the absence of a disease-causing gene mutation. Over time, these factors could grow as science uncovers the links between individual genes and specific traits that play a role in intelligence, appearance, and complex behaviors.

Another concern is that PGD could alter the way society views the disabled because PGD is capable of detecting conditions that are debilitating to various extents yet are not life threatening. Some critics argue that some of the genetic conditions that PGD can now detect, such as those causing hereditary deafness, are merely human differences that do not limit an individual's ability to live a useful and satisfying life.

Advocacy groups point out that children with these conditions can and routinely do grow into healthy, active, and productive citizens with normal life spans. Using technology to prevent their birth, these groups argue, will lead to a society in which aesthetic concerns, convenience, or mere prejudice supplant the inherent dignity due to every human being, regardless of how closely he or she conforms to some ideal of normality or perfection. The worry is that societal norms will evolve such that parents who are at risk of having affected children will be pressured to use PGD, even if they

find the procedure objectionable. Those born with diseases detectable through PGD may come to be viewed as "mistakes" and the parents as irresponsible for not having done what they ought.

Others have responded that for some time now, parents have had the option of using amniocentesis and other types of prenatal diagnostic tests to probe for the same genetic abnormalities PGD can now detect. This information sometimes prompts parents to terminate a pregnancy to avoid having a child with a disability. Yet, despite the tests' widespread availability, many parents still choose to decline testing and to give birth to children with disabilities, and society continues to support families who make these choices.

Specific concerns also have been raised about the societal impact of using PGD for sex selection, when the purpose is to satisfy parental preferences and not to avoid sex-linked disease. One issue is that, historically, in many societies females have been subjected to discrimination based purely on gender, and, in some parts of the world, there are cultures that still openly prefer male children to female. Given this history of discrimination and existing cultural preferences for boys, some observers see using PGD for sex selection as having the potential to devalue women. However, in many countries, including the United States, one sex is not currently preferred over the other, and sex selection has been used to select boys and girls equally.

Additional societal concerns have been raised about the potential for PGD to alter childhood and family dynamics, particularly when it comes to parental expectations and sibling relationships. For example, would parents end up being more critical and demanding of a child who they view as having been carefully selected to possess certain attributes? Would tensions arise among siblings when one is the product of PGD and the other is not, or when one has been selected via PGD to serve as an immunological match for another?

Ultimately, the issues of appropriate use, safety and accuracy, access, and societal impact are interrelated. Scientific advances that make embryo testing more reliable may calm parental fears about accuracy, but those same advances may intensify moral and ethical concerns if they prompt an increase in both the frequency and variety of PGD applications. Similarly, advances that make the procedure safer and more precise could also make it more expensive, widening the gap between those who have access to PGD and those who do not.

The Slippery Slope: Do We Need a Guardrail?

The notion of the slippery slope pervades discussions of PGD and other reproductive genetic technologies (35). The fear is that even if an individual technology or its application is acceptable in its own right, we ought not undertake or encourage it because it will lead inexorably to technologies with hideous applications. In focus groups, participants frequently raised concerns about where PGD might lead, although they rarely used the language of the "slippery slope" (31). Most prominent were concerns about "designer babies" and eugenic applications of PGD.

Focus group participants frequently suggested that scientists lacked limits on their conduct, and that they would inevitably lead us over the precipice and down the slippery slope (31). The following three excerpts are illustrative of the strong distrust of scientists:

> "And what makes you think it won't go to extremes? What makes you think that—there are certain scientists out there, certain people who get into a mentality that, I can fix this. I can do one better. I can do it better. We can push this beyond, beyond, beyond, beyond, beyond."

> "You are a reasonable person. We are responsible people here, but some of those scientists, because of the science and because of their warped minds, they will do something stupid like that, and you know they can, and they will."

> "Even if all of us in this room would agree that they shouldn't do it, you know, either way they're going to do it anyway. One of them are [sic] going to want to go ahead and finish it anyway. You know what I mean?"

Our survey, too, found a substantial concern about scientists ethical boundaries: 52% agreed or strongly agreed that "scientists these days don't pay enough attention to the moral values of society" (33).

Safety, Accuracy, and Effectiveness

Is PGD safe for the mother and the resulting child, and can it be counted on to produce an accurate result? The safety and accuracy of PGD is less likely to be the subject of newspaper stories and public debate, and this topic evoked much less immediate reaction from our focus group participants. Yet, these issues may be most ripe for being addressed through policy. Exploring matters of safety, accuracy, and effectiveness requires a consideration of the technical challenges and risks inherent in the genetic test itself and in the IVF procedure that it entails.

Preimplantation genetic diagnosis involves technical pitfalls that can lead to a misdiagnosis of the embryo. Most notably, the small amount of DNA—from only one or two cells—available for testing and the need to get the results quickly can present difficulties. If DNA analysis is done, both copies (alleles) of the gene may not be detected, which can result in a misdiagnosis. Performing chromosomal analysis of the embryo is also susceptible to mistakes. Only a limited number of fluorescent probes can be used simultaneously; therefore, not all chromosome abnormalities can be detected.

Many unanswered questions exist about the long-term health consequences of PGD and IVF for the mothers and the

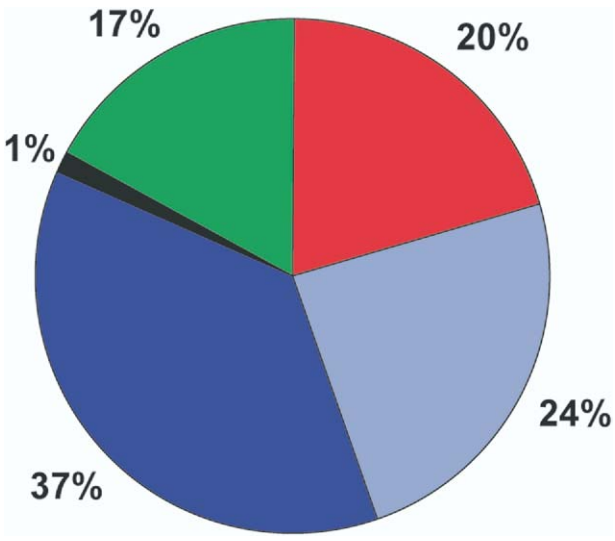
resulting children. In all IVF processes, there are risks associated with the hormones used to stimulate ovulation. Because more than one embryo is usually transferred at once, there is a heightened risk the mother will carry multiple fetuses, which can make for a more complicated pregnancy, posing risks to both mother and fetus. In addition, there is no certainty that a pregnancy will occur after the embryo is transferred; PGD pregnancy rates are estimated to be about 20 percent. In addition, it is not known whether and under what circumstances cell biopsy can harm an embryo or the development of the child.

PUBLIC VIEWS ON THE REGULATION OF PGD

Survey respondents were asked what role the government and other entities should play in the oversight of PGD (33). As presented in Figure 2, the majority of those surveyed (61%) believe that the government should regulate PGD for quality and safety. About one-third of respondents (37%) think the government has a role to play in regulating PGD based on ethics and morality, although it is important to note that these respondents have a range of views on what is ethically acceptable and what is not. Of those surveyed, 20% believe that PGD should not be allowed at all. Thus, whereas those most vocal in the public debate have focused on disallowing PGD entirely or having no government regulation and letting parents and families make the decisions, the majority of the public supports neither of these views and instead favors a role for the government in assuring that PGD is safe and effective.

FIGURE 2

Public attitudes about regulation of PGD. A representative sample of 4,834 Americans surveyed between April 16 and May 9, 2004 (33) were asked about their views about the role of government in regulating PGD: 20% supported a total ban (*red*); 24% supported government regulation of safety and quality (*light blue*); 37% supported government regulation of safety, quality, and ethics (*dark blue*); 1% supported government regulation of ethics only (*black*); and 17% supported no government regulation at all (*green*).



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The issues arising from advances in PGD touch areas of core concern to many members of the public, from the status of a human embryo to the safety of medical technology to the impact of genetic testing on society. Preimplantation genetic diagnosis and its applications move forward apace, yet the development of policy to govern PGD is in a state of suspended animation. The current framing of the PGD debate, dealing almost exclusively with polarized positions on the moral status of the early human embryo, fails to reflect the public's more nuanced views. This divisiveness around embryo politics also means that the public's desire for oversight of the safety and accuracy of PGD are left unattended. Although the public's views should not be considered a mandate for policy making, attentiveness to these views could help redefine and reframe the policy debate to address more productively some of our shared concerns about the development and use of PGD.

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