Journal of Law and the Biosciences, 1–26
https://doi.org/10.1093/jlb/lsac019
Original Article

OXFORD

The death of *Roe* and the future of *ex vivo* embryos

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ABSTRACT

This article examines the possible effects of the end of a federal constitutional right to abortion on clinical practice and research involving *ex vivo* human embryos. It first analyzes the likely outcomes of *Dobbs v. Mississippi*, concluding the Supreme Court will either overrule the federal constitutional abortion right or restrict it in a way that leads to its rapid disappearance. Next, the article discusses a possible increase in use of preimplantation genetic testing as one result. It then forecasts the likely ramifications of such a court decision on state legislation affecting ex vivo human embryos in two ways. It examines the possibility that victory over *Roe* will inspire embryo support groups to push for limitations on *in vitro* fertilization, perhaps on its destruction of embryos and more likely on permissible grounds for prospective parents to use in choosing embryos for transfer. It ends by discussing the prospects of new laws in some states banning or limiting research with human embryos.

KEYWORDS: Abortion, Assisted reproduction, Embryos, In vitro fertilization (IVF), Preimplantation genetic testing (PGT), U.S. constitution

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On Monday, January 22, 1973, almost exactly 49 years before I submitted this article, a seven justice majority of the U.S. Supreme Court delivered its decision in *Roe v. Wade*, holding that women had a federal constitutional right to an abortion.[1] That same day former President Lyndon Johnson died in Texas, aged 64. Two days before the decision, Richard Nixon had been sworn in for his second term in office. One day after *Roe* came down, President Nixon announced the Paris Peace Accords, which he said would bring 'peace with honor' to the War in Vietnam. And 1 week after that, G. Gordon Liddy and James McCord were convicted for their roles the previous June in breaking into the Democratic National Committee Headquarters in a then-little known Washington, D.C. office and residential building complex called 'the Watergate.'

For most of you, this is history. About 70 percent of Americans are too young to remember any of that. And the Dec. 1, 2021 oral arguments at the United States Supreme Court in *Dobbs v. Jackson Women's Health Organization*,[2] strongly suggest that the federal constitutional right to an abortion announced in *Roe* will also soon, in a more colloquial sense, become history.

Overturning what has been a medical, political and emotional reality for nearly half a century will have many consequences, predicted and unforeseen. It clearly will change the lives of countless individual Americans, as well, perhaps, as the politics, culture, and society of the entire country. This article focuses on one area that will be affected—clinical practice, and research involving human embryos outside the uterus—not because it is the most important consequence but because I know most about it. Based on that knowledge, I predict that its course, and that of closely related scientific research, may well change substantially after the *Dobbs* decision is announced, most likely at the end of June 2022.

After briefly laying out my expectations about the future of the federal constitutional abortion right, the complex product of 49 years of constitutional abortion litigation after *Roe v. Wade*, I will turn to two different kinds of possible consequences: first, the short-term effects of greater abortion restrictions on the practice of assisted reproductive technologies (ARTs); and second, the effects on the clinical practice of ART and on scientific research if the death of *Roe* inspires new legislation to protect embryos outside the uterus ('*ex vivo*').

In taking this look into the future, I am mindful of a Danish saying 'It is always hard to predict things, especially the future.'[3] I disagree with the saying—I think it is actually

1 *Roe v. Wade*, 410 U.S. 113 (1973).

2 *Dobbs v. Jackson Women's Health Organization*, Oyez, https://www.oyez.org/cases/2021/19-1392 (last visited Jan. 27, 2022) (follow 'Oral Argument—December 01, 2021' link for a recording and transcript of the oral arguments).

3 This saying has intrigued me for more than 20 years. As I said in a chapter I co-authored in 2011,
"This quotation has been attributed to many people, especially Yogi Berra, but Bohr seems to be the most likely candidate, even though it does not appear in anything he published.' *See* discussion in Henry T. Greely, *Trusted Systems and Medical Records: Lowering Expectations*, 52 Stan. L. Rev. 1585, 1591–92 n.9 (2000). One of the authors, however, recently had a conversation with a scientist from Denmark, who knew the phrase (in Danish) as an old Danish saying and not something original with Bohr."
Henry T. Greely and Anthony D. Wagner, *Reference Guide on Neuroscience*, *in* Reference Manual on Scientific Evidence: Third Edition 747–812, 811, fn. 82 (2011). (Of course, it is possible that Bohr was the originator of what seemed to someone in about 2010 an 'old saying.')
After the initial submission of this article, I had a tennis court conversation with a Danish scholar visiting Stanford, Dr Kasper Møller Hansen, who became intrigued with the question. He found a transcription

easy to predict the future (I'm doing it in this essay); it's just hard to be right. I will do my best.

I. THE FUTURE OF THE FEDERAL CONSTITUTIONAL ABORTION RIGHT

Others who follow the Supreme Court more closely than I do have written many words to try to read the tea leaves of the oral argument in *Dobbs*.[4] The Mississippi statute in question became law on March 19, 2019.[5] It bans abortion after 15 weeks since the first day of the pregnant woman's last menstrual period with exceptions for medical emergencies and severe fetal abnormality, although none for pregnancies that resulted from rape or incest. The day after the law came into effect a federal district court issued a temporary restraining order forbidding its enforcement. The court later granted summary judgment to the plaintiffs, which in December 2019 the Fifth Circuit Court of Appeals affirmed. Mississippi asked the Supreme Court to review the decision by filing, on June 15, 2020, a petition for a writ of certiorari. After the case was distributed for discussion at each one of the Court's 22 internal conferences between September 29, 2020 and May 13, 2021, on May 17, the Court granted the petition, limiting its consideration to just the first of the three questions presented by the petition: 'whether all pre-viability restrictions on elective abortions are unconstitutional.'[6]

Going into the oral argument of the case, on December 1, 2021, my assumption, and that, I believe, of many others, was that five or six justices would vote to uphold the Mississippi statute, three would clearly vote instead to uphold the abortion right, and only the vote of Chief Justice Roberts was in any real doubt. Published opinions written by Justices Breyer, Sotomayor, and Kagan have made it clear that they will vote to uphold the right to an abortion. Those from Justices Thomas and Alito have been equally clear that they believe *Roe v. Wade*, and the cases following it, should

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of an October 31, 2013 Danish public radio item about the quotation, *Mystik om oprindelse af kendt citat* (which Google translates as 'Mystery About Origin of Famous Quote'), https://www.dr.dk/nyheder/viden/mystik-om-oprindelse-af-kendt-citat.According to Dr Hansen's translation of the transcription, the program discusses the attribution at some length, with a focus on Danish cartoonist, author, and inventor Robert Storm Petersen, generally known as 'Storm P'. The Wikipedia entry on Storm P. includes some more discussion of this quotation: https://en.wikipedia.org/wiki/Robert_Storm_Petersen. None of the sources finds a clear origin for the phrase, but it does appear to have been in use in Denmark by the 1940s and possibly the 1930s, with similar expressions found in other countries then or earlier. (But it was *not* used by Yogi Berra. See Yogi Berra, The Yogi Book or I Didn't Really Say All the Things I Said (1998).)

4 See, eg Amy Howe, *Majority of Court Appears Poised to Roll Back Abortion Rights*, SCOTUS Blog (Dec. 1, 2021), https://www.scotusblog.com/2021/12/majority-of-court-appears-poised-to-uphold-mississippis-ban-on-most-abortions-after-15-weeks/; Charles M. Blow et al., *Four Times Opinion Writers Debate Abortion at the Supreme Court: 'My Guess is They Overturn'*, NY Times (Dec. 1, 2021), https://www.nytimes.com/2021/12/01/opinion/abortion-supreme-court-dobbs-roe-wade.html ; Paul Waldman, *Opinion: At the Supreme Court, the Bell Tolls for Roe v. Wade*, Wash. Post (Dec. 1, 2021), https://www.washingtonpost.com/opinions/2021/12/01/bell-tolls-for-roe/; Peggy Noonan, *Will the Justices Let Go of Abortion*, Wall St. J. (Dec. 2, 2021), https://www.wsj.com/articles/will-the-justices-let-go-of-abortion-roe-wade-jackson-mississipi-fifteen-weeks-dobbs-11638487513.

5 Gestational Age Act, Miss. Code Ann. §41–41-191.

6 The timeline for this case can be most easily tracked at the very useful on-line publication, the SCOTUS Blog. *See Dobbs v. Jackson Women's Health Organization*, SCOTUS Blog, https://www.scotusblog.com/case-files/cases/dobbs-v-jackson-womens-health-organization/ (last visited Jan. 27, 2022).

be overruled entirely.[7] The three justices appointed by President Trump—Justices Gorsuch, Kavanagh, and Barrett—are expected, based on their past judicial and non-judicial statements as well as the circumstances of their appointments, to vote to uphold the Mississippi statute, with only Justice Kavanagh viewed as at all doubtful. Chief Justice Roberts, although clearly not a supporter of *Roe v. Wade* or the constitutional analysis that led to it, has been seen as uncertain because of his strong commitment to the institution of the Supreme Court and its standing with the public—standing that the overturning the nearly 50 year old *Roe* precedent might put at risk.

Supreme Court oral arguments should not be overanalyzed. The questions justices ask, and the points they seek to make, do not necessarily reflect how they will eventually vote or why. Having said that, nothing in the transcript of the argument cast doubt on those assessments,[8] with the possible exception of Justice Kavanagh appearing more willing flatly to overrule *Roe* than expected.[9] Based on the dangerous practice of reading oral argument tea leaves, the Chief Justice appeared to remain in doubt, asking questions not so much about the right to an abortion itself but about the use of viability as a dividing line for the states' power to ban the procedure.[10]

On May 2, 2022, the magazine *Politico* published, on-line, an article discussing a leaked draft of a proposed Opinion of the Court, written by Justice Alito and circulated, as a first draft, to his colleagues on February 10, 2022.[11] The Alito draft called *Roe v Wade* 'egregiously wrong' and announced that it was being overruled. This draft showed no justices concurring or dissenting but its self-description as the opinion of the Court implied that Justice Alito thought at least five justices would agree to its position. The next day, a press release from the Supreme Court confirmed the authenticity of the leaked draft while quoting Chief Justice Roberts announcing an investigation into the leak.[12] A few days later, on May 11, more than 3 months after the date of the leaked opinion, *Politico* reported that no other opinions had been circulated, no revision of the Alito opinion had been circulated, and that the positions of none

7 Justice Thomas took that position in the most important case upholding, with modifications, *Roe v. Wade, Casey v. Planned Parenthood of Southeastern Pennsylvania*, 505 U.S. 833, decided on June 29, 1992, almost exactly 30 years before the likely decision in *Dobbs*. Justice Thomas had taken his seat on the Court less than 9 months before the *Casey* decision. He did not write his own opinion but joined opinions of both Chief Justice Rehnquist and Justice Scalia. The second sentence of Chief Justice Rehnquist's opinion takes a position from which Justice Thomas has not wavered: 'We believe that *Roe* was wrongly decided, and that it can and should be overruled consistently with our traditional approach to *stare decisis* in constitutional cases.' *Id.* at 944.

8 *See* sources cited *supra* note 4.

9 *See Dobbs v. Jackson Women's Health Organization*, *supra* note 2 (Justice Kavanaugh asking 'if we think that the prior precedents are seriously wrong, if that, why then doesn't the history of this Court's practice with respect to [other influential cases overturning precedent] tell us that the right answer is actually a return to the position of neutrality and—and not stick with those precedents in the same way that all those other cases didn't?').

10 *Id.* (Chief Justice Roberts stating '[V]iability, it seems to me, doesn't have anything to do with choice. But, if it really is an issue about choice, why is 15 weeks not enough time?').

11 Josh Gerstein and Alexander Ward, *The Supreme Court Has Voted To Overturn Abortion Rights, Draft Opinion Shows* (May 2, 2022), https://www.politico.com/news/2022/05/02/supreme-court-abortion-draft-opinion-00029473. The magazine made available the draft opinion itself that same day, at https://www.politico.com/news/2022/05/02/read-justice-alito-initial-abortion-opinion-overturn-roe-v-wade-pdf-00029504.

12 U.S. Supreme Court, Press release (May 3, 2022), https://www.supremecourt.gov/publicinfo/press/pressreleases/pr_05-03-22.

of the five conservative justices who had initially agreed with the direction of the leaked opinion—Alito, Thomas, Gorsuch, Kavanagh, and Barrett—had changed. It also reported that the eventual position of Chief Justice Roberts was unknown.[13]

I revised this final version of the article a few weeks after the leak. The leaked draft opinion does not modify, and to some extent confirms, the predictions I made when I first submitted this article. I predicted at least six votes to sustain the Mississippi statute banning abortions after 15 weeks. I think it is most likely that the Court will overrule *Roe* (and hence all or almost all of their other post-1973 abortion decisions upholding any federal constitutional right to an abortion) and say that abortion has no special constitutional protection. It seems possible, though less likely, that the Chief Justice could seek, and might gain, one or two other votes for a more limited position, upholding the Mississippi statute but saying that the decision only governs bans after 15 weeks. He could say 'that is all the statute before us does.' That would answer the question on which the Court granted review: 'whether all pre-viability restrictions on elective abortions are unconstitutional.' The answer would then be 'No, when the restriction starts at 15 weeks; no comment (yet) if it comes earlier.'

That position could allow the Chief Justice to uphold an abortion ban without committing the Court to overruling a precedent that has survived for nearly half a century in spite of many hard fought challenges. The problem with this solution is that the Court will immediately face more restrictive statutes, including, for example, a Texas statute that effectively sets the deadline at 5 weeks and a just-passed Oklahoma statute that bans abortion any time after fertilization.[14] Once 'viability' as a line is breached, would there be any statutes drawing lines earlier than 15 weeks that the Chief Justice would seek to strike down?

Professor Aaron Tang has raised one possible route to striking down statutes with earlier time limits.[15] He argues that an originalist could find in most of American history before the adoption of the Fourteenth Amendment a widely accepted 'liberty' for a woman to have an abortion before 'quickening,' the moment when she feels the child move within her. This generally happens around the 15th week. It's a clever position and, by a Court so inclined, might form the basis for the kind of right 'deeply rooted in history and tradition'[16] that some originalists, including Justice Alito as set out in his *Dobbs* draft, believe the substantive side of the Fourteenth Amendment's Due Process Clause protects.

13 Josh Gerstein Alexander Ward, and Ryan Lizza, *Alito's Draft Opinion Overturning Roe Is Still the Only One Circulated inside Supreme Court* (May 11, 2022), https://www.politico.com/news/2022/05/11/alito-abortion-draft-opinion-roe-00031648.

14 Kate Zernike, Mitch Smith, and Luke Vander Ploeg, *Oklahoma Legislature Passes Bill Banning Almost All Abortions*, New York Times (May 19, 2022), https://www.nytimes.com/2022/05/19/us/oklahoma-ban-abortions.html. As of May 21, Oklahoma's governor had not yet signed this bill, but was expected to do so. Two weeks earlier he had signed a bill imposing a ban on abortion after about 6 weeks, modeled on the Texas statute. Thomas Fuller, *Oklahoma Bans Abortions After About Six Weeks of Pregnancy*, New York Times (May 3, 2022),

15 Aaron Tang, *The Originalist Case for an Abortion Middle Ground*, SSRN (Sept. 13, 2021), http://dx.doi.org/10.2139/ssrn.3921358. Tang has also made the argument in an opinion article: Aaron Tang, *A Middle Ground on Abortion that Originalists Should Embrace*, Wash. Post (Oct. 26, 2021), https://www.washingtonpost.com/opinions/2021/10/26/middle-ground-abortion-that-originalists-should-embrace/.

16 *Washington v. Glucksberg*, 521 U.S. 702, 720–21 (1997).

The problem with this, or any similar compromise, is that it would require five justices of the current Supreme Court to affirm that there is *some* constitutionally protected right to an abortion, not as a matter of being forced by *stare decisis* to follow an old precedent, but on its own merits. It is clear that Justices Thomas and Alito would not accept that. I do not believe that Justices Barrett, Gorsuch, or Kavanagh would either.

Neither, to be honest, do I expect such a stance from Chief Justice Roberts. Roberts *is* an originalist (as his dissenting opinion in the gay marriage case makes clear[17]) but one with a strong commitment to the institution of the Supreme Court. That institutional commitment might make him reluctant to overrule *Roe* for two reasons. First, it would undermine to some extent the power of precedent, because it involves the Court actively (rather than passively through following precedent) in a deeply divisive political issue. Neither Chief Justice Roberts nor any Supreme Court justice believes the Court must always follow its own precedents, but he is more reluctant to overturn past decisions, and to risk the Court's public standing, than Justices Thomas or Alito. Second, given recent Senate maneuvers around the Supreme Court,[18] it makes the Court's judgments appear blatantly responsive to political maneuvering, over and above just 'follow [ing] the election returns.'[19] Those might be good prudential reasons for this Court not to overturn *Roe*, at least now. But they are not powerful reasons for it to assert that there is a Constitutional right to an abortion on different grounds.

If I am right, the only question is whether *Dobbs* will kill the federal constitutional abortion right outright (as the February 10 draft opinion by Justice Alito does) or merely put it into a persistent vegetative state, knowing that the Court will turn off its ventilator within a year or so. Neither result would end all legal rights to an abortion in the United States, just federal constitutional rights. [20] Fifteen states and the District of Columbia include the right to abortion in their statutes or their constitutions.[21] But already at least five states have existing statutes banning abortions that have been

17 *Obergefell v. Hodges*, 576 U.S. 644, 686–713 (2015).

18 Specifically, I mean the then Republican-majority Senate's refusal for 293 days to grant even a hearing to President Obama's nominee to replace Justice Scalia, compared with the 27 days the still-Republican controlled Senate took 4 years later to confirm Justice Ginsburg's replacement, Justice Barrett, 1 week before the 2020 presidential election.

19 The original version of this, by Peter Finley Dunne, was written as though said by Mr. Dooley, his fictional Irish-American bartender, complete with an effort to spell out his accent, commenting on one of the Insular Cases, important for deciding the reach of Constitutional rights into overseas U.S. territories: "No matter whether th' Constitution follows th' flag or not, th' Supreme Coort follows th' illiction returns." The particular case involved whether Congress could levy import duties on goods from Puerto Rico once it became an American possession; it had been an issue in the 1900 election where the Democrats said "no" and the Republicans said "yes." The Republicans won the election, and, by a five to four vote, the case. *Downes v. Bidwell*, 182 U.S. 244 (1901). *See* Kal Raustiala, *Does the Constitution Follow the Flag? The Evolution of Territoriality in American Law*, OpinioJuris (July 27, 2009), http://opiniojuris.org/2009/07/27/does-the-constitution-follow-the-flag-the-evolution-of-territoriality-in-american-law/.

20 There has been some discussion about whether FDA approval of mifepristone, the main 'abortion pill,' might preempt state laws banning its use. *See* Patricia J. Zettler and Ameet Sarpatwari, *State Restrictions on Mifepristone Access—The Case for Federal Preemption*, N. Engl. J. Med. (Jan. 12, 2022), https://www.nejm.org/doi/pdf/10.1056/NEJMp2118696. That's a plausible, though not certain, application of the preemption doctrine and the federal Supremacy Clause, but it would only work against state laws that banned that as a method of otherwise legal abortion. If a state banned abortion entirely, the fact that federal agency had approved a drug for that use would no more preempt the state ban on abortion than FDA approval of a drug for euthanasia (presumably in animals) would preempt state laws against using that drug to murder humans.

enjoined under the authority of *Roe* and another 12 have so-called 'trigger' laws, that will ban all or almost all abortions if *Roe v. Wade* is overturned.[22] The Alan Guttmacher Institute predicts that 27 states will ban all or most abortions should *Roe* be overruled.[23]

In sum, after the end of the federal abortion right, states are likely to have a range of laws on abortion: some protecting it, others banning it entirely, and a range of positions between those extremes, as well as varying regulations on how it is practiced. If that's the landscape, what are the foreseeable effects of such a changed environment on uses of *ex vivo* human embryos?

II. INITIAL EFFECTS ON THE PRACTICE OF ASSISTED REPRODUCTION

One early effect, at least in states with restrictive anti-abortion laws, should be an increase in parental interest in using preimplantation genetic testing (PGT) during the course of *in vitro* fertilization (IVF) to screen out embryos that those parents would want to abort before any transfer to a uterus for possible pregnancy and birth. These are mainly embryos that would have a predictable bad disease, but it is possible that some parents would do this for other reasons, such as to avoid having a male or a female baby.

Today, parents committed to not having a child with a serious disability can be confident that if they can get pregnant 'the old fashioned way,' they can do prenatal testing to determine whether the fetus[24] carries DNA that is very likely to lead to such a disability (or to the 'wrong' type of sex organs). At that point they can decide to continue or to terminate the pregnancy. In at least some states after the end of *Roe*, that choice will disappear.

21 *See Abortion Policy in the Absence of Roe*, Guttmacher Institute, https://www.guttmacher.org/state-policy/explore/abortion-policy-absence-roe (last visited Jan. 28, 2022). See, eg California statute: Cal. Health & Safety Code § 123462(b) ('Every woman has the fundamental right to choose to bear a child or to choose and to obtain an abortion....'); Illinois statute: 775 Ill. Comp. Stat. Ann. 55/1–5 ('This Act sets forth the fundamental rights of individuals to make autonomous decisions about one's own reproductive health, including.. . the fundamental right of an individual who becomes pregnant to continue the pregnancy and give birth to a child, or to have an abortion, and to make autonomous decisions about how to exercise that right.'); Montana constitutional abortion right: *Jeannette R. v. Ellery*, 1995 Mont. Dist. LEXIS 795 ('This Court concludes that the right to privacy [as guaranteed in the Montana constitution] encompasses a woman's choice of whether or not to end her pregnancy.'); Kansas constitutional abortion right: *Hodes & Nauser, MDS, P.A. v. Schmidt*, 309 Kan. 610, 613, 440 P.3d 461, 466 (2019) ('[D]o the substantive rights [guaranteed in the Kansas constitution] include a woman's right to make decisions about her body, including the decision whether to continue her pregnancy? We answer these questions, "Yes."').

22 *Abortion Policy in the Absence of Roe*, *supra* note 21. A close but slightly different count can be found in Caroline Kitchner, *Republican-led States Rush to Pass Antiabortion Bills before Supreme Court Rules on Roe,* Wa. Post (Jan. 29, 2022), https://www.washingtonpost.com/politics/2022/01/29/abortion-supreme-court-roe-texas-mississippi/.

23 *Id.*

24 An embryo changes its name to a fetus at the end of the 8th week after fertilization. That is about the same time, maybe a little earlier, than one can get results back from any prenatal genetic test. So test results will (almost?) always be about fetuses, not embryos.

But something equivalent can be obtained through PGT.[25] This procedure, first used in human embryos in 1990 and in wide clinical use ever since, performs genetic tests on embryos when they are still outside a uterus. It can, with high but not perfect accuracy, determine whether the embryo would turn into a baby with any of a large number of single gene conditions—or be male or female. The decision not to transfer an embryo with genes that would cause a disability, condition, or trait (including sex) is not illegal anywhere in the United States, even in states that have attempted to ban abortions on some of those grounds.

Indeed, PGT is, apart from general regulations on clinical laboratories and the practice of medicine, completely unregulated in the U.S. That is not true everywhere. It is much more tightly regulated in the United Kingdom, where the Human Fertilisation and Embryology Authority (HFEA) decides what conditions can and cannot legally be tested for—though some parents denied PGT in the U.K. go to the U.S. to get the procedure.[26]

PGT has not been very widespread in the past because it requires that prospective parents use IVF. IVF is expensive and, thanks to egg harvest, unpleasant and risky for women. (Sperm harvest is rarely either.) I have written a book about what might happen if eggs did not need to be harvested but instead could be derived from skin cells, avoiding the hardest and most expensive part of IVF, but that approach remains in the undetermined future.[27] Still, slightly over 2 percent of babies born in the U.S. in recent years have been the result of IVF and about 200,000 American women go through egg harvest each year for IVF. The rates in other developed countries are not much different.

Typically one does not go through IVF to establish a pregnancy for light reasons. Infertility is the usual reason, but for some unknown number of people, drawn especially from those who would like to avoid terminating a pregnancy, the risk of a genetic or chromosomal disease is sufficient. That number will, no doubt, increase if a federal

25 For purposes of this paper, I refer to this procedure at 'PGT' but the 'proper' name for it is complicated. From its inception, this procedure was generally referred to as preimplantation genetic *diagnosis* or PGD. In recent years its uses have been differentiated as not just for diagnosis but for 'screening' for chromosomal abnormalities and so some changed the acronym to PGS. More recently still, Preimplantation Genetic Testing (PGT) has come into broader user. PGT has then been divided into PGT-A (testing for aneuploidy, an abnormal number of chromosomes, relevant not just for Down syndrome and some rare conditions but also for the likelihood of a successful pregnancy at all) and PGT-M (testing for single gene—'monogenic'—conditions, such as, for example, cystic fibrosis or Tay-Sachs disease). Some have also distinguished PGT-SR for 'structural rearrangements' where the embryos' cells have the right number of chromosomes—are 'euploid' and not 'aneuploid'—but some of the chromosomes have been scrambled, with known or possible harmful consequences.

26 *See Embryo Testing and Treatments for Disease*, Human Fertilisation & Embryology Authority, https://www.hfea.gov.uk/treatments/embryo-testing-and-treatments-for-disease/ (last visited Jan. 28, 2022). *See also* Shaoni Bhattacharya, *Banned 'Designer Baby' Is Born in UK*, New Scientist (June 19, 2003), https://www.hfea.gov.uk/treatments/embryo-testing-and-treatments-for-disease/ (discussing U.K. family's decision to seek U.S. care to conceive a baby with compatible stem cells to treat their child with Diamond Blackfan anaemia following the HFEA's refusal to authorize the procedure because there was some risk to the embryo with the only benefits accruing to the family's first child).

27 Henry T. Greely, The End of Sex and the Future of Human Reproduction (2016).

abortion right disappears and states either ban all abortions or abortions based on fetal disabilities.[28]

On the other hand, how much will it increase by? How many couples committed to avoiding a child with a disability (or of the 'wrong' sex) will decide to undergo the hassles of IVF, and pay $20,000 or more for IVF with PGT, especially when the chance of success from any IVF cycle is typically below 50 percent? That number may be low, especially in light of the option for those with the option to get pregnant on their own, get prenatal testing, and, if necessary, go to a state with strong abortion protections to terminate the pregnancy.

The end of the federal constitutional abortion right would likely bring some more interest in, and some more business to, ART clinics. But not much—at least as long as PGT requires IVF (which remains expensive, unpleasant, and risky) *and* as long as travel to another jurisdiction to have an abortion remains easy (at least for people with the money to travel—and note that only people with substantial funds are able to use IVF in the United States[29]).

III. ENCOURAGING GREATER LEGISLATIVE PROTECTIONS FOR *EX VIVO* EMBRYOS

The next two effects would not follow directly from the overruling of *Roe* but rather from its political consequences, especially at the state level. No U.S. courts have ruled that IVF, in full or in part, is an aspect of the liberty protected by the federal constitution, whether inside the federal constitutional right or parallel to it—but then, no courts have had to face this issue, as no states have passed such laws. It does seem safe to say that the current Supreme Court is not likely to embrace this federal constitutional protection for IVF. The death of *Roe* does not open legal approaches for advocates of embryo protection that *Roe* was currently, as a practical matter, foreclosing, but it may lead to more political momentum for laws to protect embryos, both those being used clinically and those used in research.

To some extent, the Alito draft of February 10, 2022, if it became the Court's opinion, might encourage this as it relies upon the destruction of embryonic life to distinguish this case from other decisions protecting individual rights as part of the Fourteenth Amendment's liberty.

> What sharply distinguishes the abortion right from the rights recognized in the cases on which *Roe* and *Casey* rely is something that both those decisions acknowledged: Abortion destroys what those decisions call 'potential life' and what the law at issue in this case

28 Interestingly, the use of PGT among couples going through IVF has skyrocketed in recent years. In 2015 only about 8% of IVF cycles used PGT; in 2019 it was over 43%. *Compare* Ctrs. for Disease Control and Prevention, 2015 Assisted Reproductive Technology: Fertility Clinic Success Rates Report 5 (2017), *with* Ctrs. for Disease Control and Prevention, 2019 Assisted Reproductive Technology: Fertility Clinic Success Rates Report 24 (2021). We have no good data since then, but, anecdotally, at least in coastal IVF clinics, the percentage is well above 50% and may be close to 80%. Most of this is not using PGD to look for specific genetic conditions but to try to improve the efficiency of the IVF process by quickly identifying (and not transferring) embryos with no chance of development to a live birth. (Ironically, it is not at all clear how effective this PGT-A is at improving pregnancy rates.)

29 See the compelling case that our 'financing system' for IVF is effectively eugenics against the poor, or, at least, the poor who need IVF to have genetic children. Judith Daar, The New Eugenics (2017).

> regards as the life of an 'unborn human being.' None of the other decisions cited by *Roe* and *Casey* involved the critical moral question posed by abortion. They are therefore inapposite.[30]

The political momentum built by the eventual result in *Dobbs* may, in turn, lead to more restrictive laws in some states.

Of course, I do not know how the American public will react to the end of *Roe v. Wade*. I am confident that some will be exultant—polling consistently puts support of banning all abortion at about 15–20 percent of the population. Some will be appalled—the same polls regularly assess support for a woman's broad right to an abortion at about 25–30 percent.[31] That leaves a majority somewhere in between, usually supporting limited right to abortion, at some developmental stages or for some kinds of pregnancies, such as those involving rape, incest, maternal health risks, or a likely disabled baby.

But the national averages, while useful, are not that helpful in predicting the political future. One big question involves not just people's views but also how strongly they hold them. Those at either end of the debate clearly care more than those in the middle. Will the end of *Roe*, as some supporters of abortion rights hope, motivate more of those in the middle to become stronger supporters of abortion and trigger a backlash against restrictive abortion statutes, especially the most rigorous? After all, it has been easy for state legislators to vote for extreme statutes, banning all or almost all abortions, when the courts would not let those potentially unpopular laws go into effect. Will those legislators, or the laws they passed, pay a political price post-*Roe*? Perhaps, although my guess is 'not much.'

National opinion polls are unhelpful in another way. Abortion laws in the U.S. have overwhelmingly been, and are likely to remain, state laws, not federal ones. The ease of blocking legislation in the federal government, coupled with the relative balance of conservative and liberal decision-makers in Congress and the White House, means that federal abortion legislation is relatively uncommon.[32] I suspect the end of the federal constitutional abortion right, barring a major change in the partisan make-up of Congress (in either direction), is unlikely to change this.

Unlike this rough balance at the federal level, abortion laws, liberal or restrictive, often garner sweeping majorities for one side or the other in many states. A backlash against the death of the federal constitutional abortion right may be felt strongly in

30 Draft Opinion of the Court, supra n. 11, at 32.

31 *See Abortion*, Gallup, https://news.gallup.com/poll/1576/abortion.aspx (last visited Jan. 28, 2022).

32 There are two major exceptions. *See* Partial-Birth Abortion Ban Act of 2003, 18 U.S.C. § 1531 (2003) (criminalizing so-called partial-birth abortions) and Consolidated Appropriations Act, 2021, Pub. L. No. 116–260, 134 Stat. 1182 tit. 5, § 506 (the so-called Hyde Amendment, forbidding the use of federal funds to pay for abortion). The Biden Administration's budget proposal for fiscal year 2022, introduced in 2021, did not contain the Hyde amendment's exclusion. *See* Sarah McCammon, *Biden's Budget Proposal Reverses Decades-Long Ban on Abortion Funding*, NPR (May 31, 2021), https://www.npr.org/2021/05/31/1001881788/biden-budget-proposal-reverses-a-decades-long-ban-on-abortion-funding. Eventually the Hyde amendment language was put back into the 2022 spending bills as a result of Congressional negotiations but it is not contained in Biden budget proposal for fiscal year 2023.The appropriations bill, and the fate of this ban, remain unsettled at the time of writing. Alexandra Martinez, *Biden's Proposed Budget Left Out the Hyde Amendment, and Advocates Hope It Stays That Way*, Prism (April 22, 2022), at https://prismreports.org/2022/04/06/biden-2023-budget-hyde-amendment/.

solidly pro-choice states and might move a few roughly neutral states towards protecting abortion rights. And it might lead to some more time-based or condition-based exceptions in states that have passed complete or near complete bans. But we are already seeing a wave of legislative activism for further abortion restrictions in many states with the end of the federal constitutional right merely in sight.[33] I suspect its actual disappearance will lead to increased efforts in some states to protect *ex vivo* embryos in clinical IVF practice or in research.

III.A. Embryo Protection in Clinical Practice

How could new state laws restrict IVF after the death of the federal constitutional abortion right? I think this might happen in two ways: through laws banning the destruction of any IVF embryos or through laws limiting parental embryo selection (or 'de-selection') practices.

i. Bans on Destroying Viable IVF Embryos

Organizations concerned about the destruction of embryos have long opposed discarding unused embryos. (I will henceforth refer to such organizations as 'embryo protection groups.'). Some have sponsored 'embryo adoption' efforts, including the Snowflake program, through Nightlight Christian Adoptions.[34] Thus far, few embryos have been donated through this or other programs.[35] Others would go farther and would require that any embryos that are created be transferred. This may sound extreme but it has been the law in Italy since 2004.[36] In IVF cycles there, only one or two eggs are fertilized and all apparently viable embryos (those that are still dividing and developing) are transferred for possible pregnancy: no viable embryos can be discarded.

Thus far, even though no U.S. cases have given constitutional protection to IVF or to the use of *ex vivo* embryos for reproduction, the U.S. has, effectively, seen no substantive federal or state legislation about IVF. This is very different from the experience in most other developed countries. Although I know of no jurisdiction that has flatly banned

33 *See* Caroline Kitchner, *supra* note 22.

34 Snowflakes Embryo Adoption Program, https://nightlight.org/snowflakes-embryo-adoption-donation/ (last visited Jan. 28, 2022). The term 'adoption' isn't quite accurate as the donation of an embryo for transfer into someone else's uterus does not go through any legal adoption procedures in any state. The embryo, if born alive, just becomes (in many places de jure, in others de facto) the child of the mother and usually her spouse or partner.

35 *See* Caroline Lester, *Embryo 'Adoption' Is Growing, but It's Getting Tangled in the Abortion Debate*, NY Times (Feb. 17, 2019), https://www.nytimes.com/2019/02/17/health/embryo-adoption-donated-snowflake.html ('Of the two million transfers of embryos to a woman's uterus recorded by the C.D.C. from 2000 to 2016, only 16,000 were donor embryos.').

36 *See V. Fineschi* et al., *The New Italian Law on Assisted Reproduction Technology (Law 40/2004)*, 31 J. Med. Ethics 536 (2005) ('In article14 the law goes as far as establishing the highest number of embryos to be used in one "only and simultaneous implant", forbidding, at the same time, the cryopreservation of embryos.').

IVF,[37] many regulate, frankly or through funding limitations,[38] who can and cannot use IVF, in what manner, and for what purposes. Some restrict the procedure to married couples, some to 'stable' heterosexual couples, and some to women under a particular age, among many other restrictions. Not so in the U.S.: only one U.S. jurisdiction has imposed any substantive limits on IVF. At the federal level, the only regulation is a requirement (without any penalties for violation) that clinics report their results every year to the Centers for Disease Control and Prevention (CDC). At the state level, although several states have passed laws limiting or prohibiting research with *ex vivo* human embryos, only one has regulated any significant IVF activity: Louisiana.

The Louisiana statute, passed in 1986, explicitly protects an *ex vivo* human embryo (called in this statute a fertilized human ovum):

A viable in vitro fertilized human ovum is a juridical person which shall not be intentionally destroyed by any natural or other juridical person or through the actions of any other such person. An in vitro fertilized human ovum that fails to develop further over a thirty-six hour period except when the embryo is in a state of cryopreservation, is considered non-viable and is not considered a juridical person. [39]

This statute is aimed at embryos created through IVF that the prospective parents have not chosen to have transferred into a uterus for possible implantation and pregnancy. The standard of care today is that, normally, no more than two embryos should be transferred into a woman's uterus at a time, to minimize the chances of multiple pregnancies.[40] Most cycles of IVF produce more than two eggs, and hence (usually) more embryos than will be transferred at any one time. The prospective parents can generally choose to have the extra embryos frozen for possible later use, donated for 'adoption,' donated for research, frozen for possible future use (for themselves, for adoption, or for research), or destroyed and discarded.

Louisiana's statute limits those choices to adoption or freezing for possible future use by the prospective parents or others. As a result, clinics in Louisiana have been storing frozen but unused embryos for over 35 years. In 2005, during Hurricane Katrina, which killed nearly 1200 people in Louisiana, more than1000 frozen embryos, stored in four 80 pound cannisters, were rescued from a flooded hospital in East New Orleans.[41] Some of these embryos were later thawed and transferred into a women's uterus for possible implantation and pregnancy. Several of them made news again, when

37 It seems likely that the Vatican City State would not allow IVF but I have not been able to find an express prohibition. Of course, there are no fertility clinics located in that jurisdiction's 109 acres and it is unlikely that its roughly 800 to 900 citizens, almost all officials of the Catholic Church, would have much interest in this procedure, which the Church condemns as sinful. (The 135 Swiss Guards who live in the Vatican City are also citizens while assigned there; presumably some of them might want to use IVF in their families.)

38 In many countries with broad public health coverage, IVF is covered, and hence free or close to free, for covered patients. These financial limitations may have the effect of making the otherwise expensive IVF procedure unavailable for people who are not covered.

39 La. Rev. Stat. Title 9, §129.

40 Practice Comm. of the American Soc'y for Reprod. Med. & the Practice Comm. for the Soc'y for Assisted Reprod. Techs., *Guidance on the Limits to the Number of Embryos to Transfer: A Committee Opinion*, 116 Fertility & Sterility 651 (2021).

41 Marc Lallanilla, *Katrina Rescue Team Saves Abandoned Embryos*, ABC News (Nov. 1, 2005), https://abcnews.go.com/Health/HurricaneKatrina/story?id=1145996&page=1; *Baby is Born from Embryo Rescued After Katrina*, ABC News (Jan. 16, 2007), https://www.nbcnews.com/health/health-news/baby-born-embryo-rescued-after-katrina-flna1c9470923.

they eventually were born. The first of them was born in January 2007; his parents gave him the flood-related name 'Noah'.

Unlike Italy, Louisiana neither requires transferring all viable embryos, nor prohibits freezing embryos; its only prohibition is on destroying viable embryos, fresh or frozen. This statute has not stopped IVF in Louisiana. According to the CDC annual report, in 2017 it had five IVF clinics, which performed 1823 IVF cycles. The U.S. as a whole had 284,000 cycles; Louisiana holds about 1.5 percent of the U.S. population but only performed about 0.6 percent of IVF cycles.[42] Whether this difference is the result of the Louisiana law or other characteristics of the state, such as its relative poverty, is unknown. The statute has led to a growing, but unknown, number of frozen embryos in indefinite storage. Presumably, similar laws in other states would not end IVF, just make clinics invest more in facilities to store frozen embryos for an indefinite period and face somewhat higher legal risks if viable embryos are inadvertently harmed.

Will any states follow Louisiana and ban the destruction of embryos, whether fresh or frozen, created for IVF? I think it is unlikely but not impossible—although I think it *is* likely that such legislation will be at least introduced in some places. Three factors that might influence such decisions merit discussion.

First, pro-life advocates have largely avoided confronting IVF. One reason may be that IVF has become normalized. When Louise Brown was born in July 1978, the headlines screamed 'test tube babies' and some people expressed great concern about discrimination against children born through IVF. Today, most people, in most ethnic and socio-economic groups, will have friends or relatives who have used IVF; many will know that some people they know were conceived through IVF. With somewhere over 1 million Americans alive born from IVF, many in the general public will find it hard to dislike the process. But I also suspect many pro-life advocates like IVF. They like babies and that is what IVF provides. They may not be happy with surrogacy (commercial or otherwise) or with egg or sperm donation, or with the use of IVF by people other than married heterosexuals, but their cause is built on 'saving babies.'

Second, and in a partial exception to the first point, embryo protection groups have tried this before, in a somewhat roundabout fashion. It did not turn out well for them. Starting in 2008, a group called Personhood USA began advocating for states to say, in legislation or constitutional amendments, that 'personhood' begins at conception (or, in some versions intended to avoid a 'cloning' loophole, at the beginning of the development of a human biological organism.)[43] These, like the Louisiana statute, declared *ex vivo* embryos persons, entitled under the state's laws, to all the rights of persons, and, presumably, would have forbade their destruction. State voters were

42 Ctrs. for Disease Control and Prevention, 2017 Assisted Reproductive Technology: Fertility Clinic Success Rates Report (2019).

43 This site has a useful timeline for the personhood movement it the timeline ends in 2014: The Personhood Movement, https://www.propublica.org/article/the-personhood-movement-timeline (last visited Jan. 28, 2022). At one point the group organizing the movement was called Personhood USA, but that no longer seems to be active. (The Personhood USA website is now celebrity 'news.' Celebs Net Worth Today, https://www.celebsnetworthtoday.com (last visited Jan. 28, 2022).)

asked to pass on such constitutional amendments in at least six states: [44] Colorado (2008, 2010, and 2014) [45]; Florida, Nevada, and Missouri (2010); Mississippi (2011); and North Dakota (2014)[46]. In addition such a provision was put on the ballot in Oklahoma but removed by the Oklahoma Supreme Court, on the ground that it would violate the federal constitution.[47] In none of the states did the measure pass. It had been expected to pass in Mississippi but went down to an apparent last-minute surge of 'no' voters, gathering only about 42 percent of the vote.[48]

These amendments were aimed at abortion, but their language promised broader embryo protection. Commentators noted that the arguments that the amendments would make IVF and even some contraception illegal led to many 'no' votes. This history cannot make embryo protection groups very optimistic about their chances once stopping abortion is no longer part of the appeal of such legislation or amendments.

On the other hand, one can argue that the most recent Oklahoma bill, passed on May 19 and currently awaiting signature by the governor (discussed above), does ban the destruction of IVF-generated embryos. The bill, H.B. 4327, bans abortions from the time the egg is fertilized.[49] It contains express exceptions for Plan B, the so-called 'morning after pill' and for contraception generally.[50] There is no mention of IVF and the law does not specifically ban the destruction of embryos (or fertilized eggs)—just their abortion. At least one Democratic legislator publicly raised the question of IVF:

> "Looking at the language, it's hard to see how it wouldn't affect in vitro fertilization because it talks about as soon as the ovum and the sperm meet, and the egg is fertilized,

44 *See Personhood USA*, Ballotpedia, https://ballotpedia.org/Personhood_USA (last visited Jan. 28, 2022). For the North Dakota effort, see *North Dakota 'Life Begins at Conception' Amendment, Measure 1 (2014)*, Ballotpedia, https://ballotpedia.org/North_Dakota_%22Life_Begins_at_Conception%22_Amendment,_Measure_1_(2014) (last visited Jan. 28, 2022). *But see* Sarah Kliff, *Abortion Opponents Have Lost 5 out of 5 Personhood Votes,* Vox (Nov. 5, 2014), https://www.vox.com/2014/11/5/7158779/north-dakota-abortion-ban (counting only four states).

45 The Colorado efforts were constitutional amendments that were on the general election ballot to be accepted or rejected by the voters. The 2008 and 2010 amendments were quite similar with slight wording changes in the second (the first defined persons as everyone from after fertilization of an egg, the second, to avoid a possible cloning loophole, included 'every human being from the beginning of the biological development of that human being'). The first failed 73.2%–26.8%; the second 70.5%–29.5%. Opponents argued that the amendments would ban IVF and some forms of birth control. https://en.wikipedia.org/wiki/2010_Colorado_Amendment_62

46 North Dakota's effort was the subject of a good law review article: Steven R. Morrison, *Personhood Amendments after Whole Women's Life v. Hellerstadt,* 67 Case West. Rsrv. L. Rev. 447 (2016). Interestingly, Morrison argues that the Supreme Court's decision striking down two Texas statutes as causing an undue burden on the right to an abortion would shift the anti-abortion movement from pushing so-called TRAP laws (Targeted Regulation of Abortion Providers) to more direct assaults on *Roe v. Wade*, through personhood amendments. This article suggests that the success of the anti-abortion in finally erasing *Roe v. Wade* may lead to a rise in personhood efforts as ways to extend rights (as the Personhood Amendments in effect did) to *ex vivo* embryos.

47 *In re Initiative Petition No. 395*, 2012 OK 42, 286 P.3d 637.

48 *Mississippi Anti-Abortion "Personhood' Amendment Fails at Ballot Box,* Wash. Post, https://www.washingtonpost.com/politics/mississippi-anti-abortion-personhood-amendment-fails-at-ballot-box/2011/11/09/gIQAzQl95M_story.html (last visited Jan. 28, 2022).

49 The bill can be found at https://legiscan.com/OK/text/HB4327/2022.

50 Rebekah Riess, Jeremy Grisham, and Devan Cole, *Oklahoma Lawmakers Pass One of Nation's Strictest Abortion Bills Banning Procedure 'from Fertilization,'* CNN (May 20, 2022), https://www.cnn.com/2022/05/19/politics/oklahoma-abortion-ban-hb-4327-passed/index.html.

> that means that's a person," Rep. Emily Virgin (D) said, according to KOKH News. "That's what happens with in vitro fertilization, you create embryos."[51]

This bill's sponsor, however, Representative Wendi Stearman, is quoted saying 'IVF was not included in the bill, as it "would be tough" to prove that an abortion had occurred in that situation.'[52]

The law's coverage would apparently depend on the meaning given the term 'abortion,' which it defines as follows:

> 'Abortion' means the act of using, prescribing, administering, procuring, or selling of any instrument, or prescription of any instrument, medicine, drug, or any other substance, device, or means with the purpose to terminate the pregnancy of a woman, with the knowledge that the termination by any of those means will with reasonable likelihood cause the death of an unborn child. It does not include the use, prescription, administration, procuring, or selling of Plan B, morning after pills, or any other type of contraception or emergency contraception.[53]

This does not seem to include destruction of an ex vivo embryo, but the point might be argued.

The third point cuts in the other direction. Technological advances have made the idea of transferring every viable embryo more plausible. Although sperm freezing has long been routine, methods for freezing eggs have only become generally accepted in the past decade. After several years as an experimental procedure (during which egg freezing was still used to some extent, as its use did not require approval by the U.S. Food and Drug Administration ("FDA")), in 2013 it began to be viewed as clinically appropriate.[54] As a result, one can now harvest, say, 15 eggs, fertilize two and transfer them, freeze the remainder, then thaw and use the rest, one by one or two by two, until a pregnancy results.

What does it all mean? My guess is that we will not see any attempts in the U.S. to ban IVF. We may see some serious efforts to ban the destruction or discarding of leftover IVF embryos. Excited by their victory in abortion, pro-embryo groups might move to the protection of *ex vivo* embryos in IVF as their next frontier. After all, most organizations want to survive; when one goal is achieved, another may have to replace it. On the other hand, shorn of the connection to abortion, substantial political support may not exist for broad efforts to protect IVF embryos. My own guess is the second,

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51 Amy B. Wang, Felicia Sonmez, and Caroline Kitchener, *Oklahoma Lawmakers Pass Bill Banning Abortion After "Fertilization,"* Wash. Post (May 19, 2022), at https://www.washingtonpost.com/politics/2022/05/19/oklahoma-abortion-ban-fertilization/.

52 *Id.*

53 Oklahoma Statutes, Title 63, §1–730(A)(1) (2014).

54 In 2013 the American Society for Reproductive Medicine and the Society for Assisted Reproductive Technology published a guideline broadly endorsing its use. Practice Comms. of the American Soc'y for Reprod. Med. & Soc'y for Assisted Reprod. Techs., *Mature Oocyte Cryopreservation: A Guideline*, 99 Fertility & Sterility 37 (2013). The American College of Obstetricians and Gynecologists accepted that position in 2014 and reaffirmed it in 2020. Am. Coll. Of Obstetricians & Gynecologists Comm. on Gynecologic Practice, Oocyte Cryopreservation, Committee Opinion 584 (2014), available at https://www.acog.org/clinical/clinical-guidance/committee-opinion/articles/2014/01/oocyte-cryopreservation.

but I cannot exclude the possibility of renewed efforts at something like personhood amendments.

ii. Bans on Selecting Clinical Embryos on Particular Grounds

Rather than broad efforts to ban the destruction of any embryos produced for IVF, embryo protection groups might try to ban prospective parents from using certain reasons to choose particular embryos to be discarded and destroyed—notably, discrimination based on sex, race, disability, 'cosmetic' traits, or for enhancement purposes. The anti-abortion movement has supported, often successfully, legislation to ban abortions motivated by the sex, race, or disability status of the fetus.[55] (We have not yet seen legislation banning abortion based on cosmetic or 'enhancement' traits.) At least 11 states passed laws banning abortion based on sex, four on race, and six on the fetus's disability status. Several states have passed legislation specifically banning abortion based on the prediction that the fetus would become a baby with Down Syndrome;[56] in at least one of them, Ohio, an appellate court has allowed the law to go into effect.[57] Typically, these statutes made it a crime for health care personnel to abort a fetus when they knew that the reason, sometimes expressly the 'sole' reason, for the abortion was the fetus's membership in one of the protected groups.

In some states, sex and race bans have not been challenged by plaintiffs and have been in effect, although there are no reports of any prosecutions under them. In most states, though, federal courts enjoined the statutes for violation of the federal constitutional right to an abortion. In one of those cases, from Indiana, *Box v. Planned Parenthood of Indiana and Kentucky*,[58] the Supreme Court declined to decide on the constitutionality of such statutes until other appellate courts rule on them. This prompted a long concurrence by Justice Thomas in which he detailed the ugly history of American eugenics and urged that the Indiana statute was aimed at preventing a return of eugenics and that the Court would have to address the issue eventually. He left little doubt what he thought: 'Enshrining a constitutional right to an abortion based solely on the race, sex, or disability of an unborn child, as Planned Parenthood advocates, would constitutionalize the views of the 20th-century eugenics movement.'[59]

If the federal constitutional abortion right is overturned, some states will ban (or already have banned) all abortions, necessarily including those done based on sex, race, disability, or cosmetic status or enhancement, but some others might choose to allow abortions for some reasons but not others. I see no remaining federal constitutional right to prevent those actions.

But I am more interested in the step beyond abortion: some states may take the step of banning decisions to transfer particular embryos in IVF for possible implantation

55 *See Abortion Bans in Cases of Sex or Race Selection or Genetic Anomaly*, Guttmacher Institute, https://www.guttmacher.org/state-policy/explore/abortion-bans-cases-sex-or-race-selection-or-genetic-anomaly (last visited Jan. 31, 2022).

56 *See* David Crary and Iris Samuels, *Down Syndrome Abortion Bans Gain Traction After Court Ruling*, AP News (May 19, 2021), https://apnews.com/article/us-supreme-court-donald-trump-down-syndrome-abortion-courts-ab09552bd57aa5306f0341189f70b1cb, https://www.pbs.org/newshour/nation/down-syndrome-abortion-bans-gain-traction-after-court-ruling.

57 *Preterm-Cleveland v. McCloud*, 994 F.3d 512 (6th Cir. 2021).

58 139 S. Ct. 1780 (2019).

59 *Id.* at 1792.

and pregnancy based on sex, race, disability, cosmetic status, or enhancement. Again, as with bans on embryo destruction in clinical practice, states would not need the end of the federal abortion right to pass such legislation. Even before the decision in *Dobbs*, no such right had been held to exist with respect to IVF. The late Professor John Robertson argued for such a constitutional 'procreative liberty' in articles and books beginning in 1983.[60] A Supreme Court sympathetic to the reproductive liberty of would-be parents could easily find such a right stemming from its other cases involving conception, abortion, marriage, and family matters. But the Court did not do so in the past (in part because it was never presented with such a ban) and the existing Court certainly will not.

And, in any event, the federal constitutional abortion right has had at least something to do with the pregnant woman's right to control what was happening in her *body* and not just with people's plans and hopes for creating their families. IVF, at least until transfer for implantation, does not raise those issues—although women's bodies are involved in IVF, both in egg harvest and in the much simpler procedure for transferring the embryo into the uterus, those invasions are both temporary and fully voluntary.

Even though the federal constitutional abortion right has not been held to apply efforts to ban discrimination in IVF and assuredly would not be held to do so after the death of *Roe*, that court decision might both free up political energy that has been consumed with abortion and encourage the victors in the long abortion battle to press on. I can see two somewhat different motivations. For some people, preventing this kind of discrimination would be major motivation, especially those in the disability community.[61] For others, these might be seen as a first step to total protection of embryos, saving some embryos now but also opening up the possibility for tighter and tighter restrictions on embryo destruction in future legislation.

Pushing such laws has an added benefit for the pro-life forces: the bills may deeply embarrass pro-choice supporters. I think it is safe to assume that most pro-choice supporters are opposed to sex, race, and disability discrimination in general. Some of those supporters would find it difficult, if not impossible, to campaign to allow women to choose their children based on these sensitive criteria.

Two general truths about these choices in the context of IVF are also important here. First, such laws would only affect a small number of embryos, women, or prospective parents. Sex determination for *ex vivo* embryos requires the existence of *ex vivo* embryos, which requires IVF. Around 80,000 of the roughly 3.7 million babies born in the U.S. in recent years were conceived through IVF—about 2 percent. That percentage may well grow (potentially in part because of the death of *Roe*, as suggested above) but unless various breakthroughs make IVF much cheaper and easier, it is unlikely to grow

60 John A. Robertson, *Procreative Liberty and the Control of Conception, Pregnancy, and Childbirth*, 69 Va L. Rev. 405 (1983). *See also* I. Glenn Cohen, *The Right(s) to Procreate and Assisted Reproductive Technologies in the United States*, in The Oxford Handbook of Comparative Health Law (Tamara K. Hervey and David Orentlicher eds., forthcoming), available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3516094; I. Glenn Cohen, *Regulating Reproduction: The Problem with Best Interests*, 96 Minn. L. Rev. 423 (2012).

61 *See* Erik Parens & Adrienne Asch, *Disability Rights Critique of Prenatal Genetic Testing: Reflections and Recommendations*, 9 Mental Retardation & Developmental Disabilities Res. Revs. 40 (2003).

much. How much will advocacy groups, on either side, care about such a small slice of reproduction?

Second, the current laws banning abortion based on race, sex, or disability status are difficult to enforce. They penalize people who perform abortions who *know* that the reason for the abortion was to discriminate. Proving *that*, especially beyond a reasonable doubt for criminal cases, may be close to impossible. That would be especially true if the medical personnel inform the pregnant woman beforehand that they are not allowed to perform an abortion if they know that it is for that sole reason. Many reasons are likely to be involved in an abortion decision and because it will almost always involve just one fetus, there will rarely be a situation where a pregnant woman can be shown to have chosen to abort a fetus with a protected trait and not one without it.[62] In IVF, however, the choice will usually be between several embryos. Someone is going to have to ask the prospective parents, 'which one or ones do you want transferred?' Proving 'sole purpose' may still be difficult, especially after a legal warning, and yet, a couple that, say, picked one male embryo for transfer and not six female embryos may find it hard to provide other convincing explanations.

There is another, perhaps more easily enforceable way to prevent prospective parents from choosing among embryos for banned reasons—prevent the embryos from being tested for, or the prospective parents from being informed about the test results for, those traits. This would raise some potentially difficult issues under the First Amendment, which I have discussed briefly in earlier work.[63] It also might give rise to some interesting interstate questions if, for example, the IVF clinic was in a state with a restrictive law but it sent the embryo biopsies to a genetic laboratory in a state without such a law. I also suspect that a restriction on medical information would prove politically unpalatable.

Some of these bases for discrimination seem likely to be attacked more strongly than others. For people concerned primarily about racial discrimination, an attack on embryo selection discrimination, in which prospective parents choose their potential babies based on their races, is unlikely to evoke much passion. Those people will almost certainly view other forms of racism as having higher priority. It is hard to see the Black Lives Matters movement spending much effort on whether the relative handful of people who use IVF can use race to choose among embryos.

It is also hard to see how such discrimination would happen. Why would a couple have the need, or the chance, to choose between embryos of different races (however race is determined)?[64] If the embryos came from their own egg and sperm, presumably they would know what race or races the embryos would develop into. If the embryos were produced using donor egg or donor sperm, the same should be true. And trying to ban this choice gets dangerously close to questions of people making decisions on

62 On occasion, and often for health reasons, pregnancies will undergo so-called 'selective reduction' where one or more—but not all—of multiple fetuses in the pregnancy will be aborted. In that case it might be likely there will be evidence supporting the idea that the abortion clinicians knew that the fetus or fetuses selected for abortion were chosen for a banned reason.

63 Greely, The End of Sex, *supra* note 27, 290–291. (I thank one of the peer reviewers for reminding me of this possible enforcement method.)

64 It is possible that PGT could reveal aspects of the embryo's future physical characteristics that would be associated with race. I will discuss that briefly with regard to cosmetic discrimination.

marriage, having children, choosing sperm donors, and many other very personal things based, at least in part, on race. Those are conversations that are both genuinely difficult and politically explosive—and not necessarily just among white people.

People opposed to sex discrimination may feel more strongly. Unlike racial discrimination in selecting from a couple's embryos, on average, half of the embryos produced through IVF will be male and half female. The opportunity for discrimination will always be present unless all of the couple's embryos are one sex or the other. And, we know, from female infanticide and disproportionately female abortion in many countries, in some cultures that opportunity will be taken to discriminate against future women. Whether that is true in the U.S. is unclear. Good studies are limited but generally do not show a consistent bias, except for a few studies looking at new immigrants from countries with a strong history of bias against female fetuses and babies. And at least some anecdotal reports assert that American women and couples have a slight preference *for* females.[65]

Will crusaders for sex and gender equality care enough about this kind of discrimination to campaign for statutes banning it? Or will supporters of reproductive liberty care so little, or be so conflicted, as to not oppose such statutes, or to not oppose them strongly? And how strongly will pro-life groups care? Those groups have pushed with some success for statutes to ban abortion for such reasons, but arguably as a way to get some abortion restrictions, *any* abortion restrictions, upheld in the courts. Would they care as much about embryo selection? I know of no good evidence about how the political winds will blow, other than to suspect that they will blow differently in different states.

The third category is disability status. The political forces are likely to be different here. Various parts of the disability community will be very strongly opposed to embryo selection decisions that discriminate against embryos that would become people with disabilities and would be eager to assist embryo protection groups—or even to lead them—to push for these statutes. This motivation will be stronger for some disabilities than for some others.

I have long remembered a panel I was part of in the early 2000s that included a young women, a Stanford graduate, with Spinal Muscular Atrophy (SMA), a genetic condition of variable severity. She already needed a wheelchair in her 20s and faced additional future deterioration. In a discussion of PGT she said, 'What you are saying is that I should never have been born.' I certainly did not want to agree with that and so I tap-danced: 'No, I just think your parents might have chosen a "you" without this condition.' She was too smart for that and shot back, accurately: 'A "me" without SMA would not be me.' I could not argue.

65 *See* Claire Cain Miller, *Americans Might No Longer Prefer Sons Over Daughters*, NY Times (Mar. 5, 2018), https://www.nytimes.com/2018/03/05/upshot/americans-might-no-longer-prefer-sons-over-daughters.html ('While having a daughter versus a son used to make American parents more likely to keep having children, theoretically to try for a son, now the opposite is true: Having a daughter makes it less likely that they keep having children. Some data from adoptions and fertility procedures that allow parents to choose the sex of their baby also shows a preference, to varying degrees, for girls.').

Down Syndrome is a more common disabling genetic condition.[66] People with Down Syndrome have many strong advocates from among some of the parents and siblings of people with the condition. I have heard many such people talk about what wonderful people their affected relatives are, extolling their happiness and how they have enriched their whole family's lives. I believe them, although I also suspect there are other Down Syndrome relatives with very different views, especially those with their affected family members with more severe mental or physical effects. Advocates for people with Down Syndrome have already been able to get laws passed specifically banning abortion for the sole reason of Down syndrome in Ohio, Arizona, and South Dakota.[67]

Bans on selecting against some other genetic conditions are less likely to gain political support. Consider a condition like Tay-Sachs disease, where babies born healthy lose their brain neurons, their normal functioning, and, by the age of three or four, their lives. Their lives look very different than those of people with Down syndrome. There are many terrible genetic conditions, thankfully all rare, which hold out hope for nothing beyond suffering and an early death. Political support for banning PGT for those diseases should be harder to find. How a statute might try to distinguish between genetic conditions 'bad enough' to warrant embryo selection and others is hard to envision. (The HFEA in the United Kingdom does permit PGT for some conditions, but it generally draws its line between diseases, on the one hand, and things like sex, cosmetic traits, or 'enhancements' on the other.[68])

Finally, we come to possible bans on what I am calling cosmetic traits and 'enhancements.' I put scare quotes around 'enhancements' for two reasons. One is that an enhancement may often be in the eye of the beholder: to one parent, an increased chance of high ability in mathematics may be an enhancement; to others, not. The second, more important, is that we know basically nothing about DNA variations that can create enhancements. This may not prevent some companies from eventually trying to sell such enhancements, but they do not seem likely to be able to deliver in any meaningful way.

66 Depending on your definition, Down Syndrome, or trisomy 21, and its related conditions, trisomy 13 and 18, may not be genetic as they do not involve the sequence of structure of the genes or DNA but rather its amount. People with these conditions have an extra copy of chromosome 21. Two copies are essential for life, but a third copy causes disabling conditions of widely varying severity. It is a disease 'of DNA' and I will count it as 'genetic.' And whether it is so counted or not, it is probably the condition that is most looked for in prenatal or preimplantation testing. It may affect as many as 0.5% of embryos and is found in about one in 600–800 live births. (Fetuses with Down Syndrome are at higher risk of miscarriage or stillbirth as well.)

67 *See* David Crary and Iris Samuels, *supra* note 56; *Preterm-Cleveland v. McCloud*, *supra* note 57. For a sympathetic discussion of people with Down Syndrome and their families, see also Sarah Zhang, *The Last Children of Down Syndrome*, The Atlantic (Dec. 2020), https://www.theatlantic.com/magazine/archive/2020/12/the-last-children-of-down-syndrome/616928/ . Activism around Down Syndrome is not limited to the United States. In an interesting 2021 British decision, plaintiffs argued, unsuccessfully, that the law allowing abortion of fetuses with Down Syndrome violated the Human Rights Act because it was incompatible with various provisions of the European Convention on Human Rights. *Crowter v Secretary of State for Health and Social Care* [**2021**] EWHC 2536 (Admin). The case is discussed in Zoe L. Tongue, *Crowter v Secretary of State for Health and Social Care* [**2021**] *EWHC 2536: Discrimination, Disability, and Access to Abortion*, 30 Med. L. Rev. 177–187 (2022).

68 For a list of conditions approved for PGT-M by the HFEA, see *PGT-M Conditions*, Human Fertilisation & Embryology Authority, https://www.hfea.gov.uk/pgt-m-conditions/?page=42 (last visited Jan. 28, 2022).

But we can predict some 'cosmetic' traits with reasonable accuracy. We can determine dark hair or light, dark eyes or light, with good accuracy, although not the various shares of dark or light. We can already make some predictions for physical traits associated with race, such as skin color;[69] we will probably be able to predict more such traits, with more accuracy, in the future. We can make some (weak) predictions about height, though probably not as good as can be made from looking at the genetic parents' adult heights.

Statutes banning embryo selection for cosmetic traits or 'enhancements' may be politically attractive and not just to conservatives and embryo protection groups. Liberals also worry about genetic trait selection.[70] Voting against 'designer children' or 'super babies' is likely to be popular. And, equally important, no strong opposition is likely. People who believe in the principle of reproductive liberty would contest such laws but even they may not care about cosmetic traits. And any significant ability to predict serious 'enhancement' traits is likely to remain impossible for many years. Banning things when they are impossible is one way to limit minimize to the ban.

Weighing the acceptance of the techniques and the political forces on both sides, I think bans on IVF in the U.S. are unlikely but not impossible. Bans, like Louisiana's, on discarding any embryos created for IVF are possible, but unlikely and may not ultimately prove very important except to producers of freezers used to store embryos. Bans on embryo selection based on race, sex, disability status (in general or for some selected disabilities), or on cosmetic or 'enhancement' bases could well pass in some states. I think bans on embryo selection against embryos that would become babies with Down Syndrome will provoke the greatest controversy, both in favor and against such laws. Bans on sex selection would probably be almost as controversial and might be closely fought. Laws on cosmetic and 'enhancement' selection, as well as racial selection, may pass because they seem unimportant to many, but they would still need to seem important enough for some reasons, possibly symbolic, for some groups to push for them.

III.B. Embryo Protection in Research

Although U.S. governments have been reluctant to legislate about the treatment of *ex vivo* embryos created for reproductive purposes, many of them have passed laws concerning the use of *ex vivo* human embryos for research.

I will not recite the entire history of more than 40 years of federal government thought and action on human embryo research. For this article it is sufficient to say that in 1995, two Republican legislators, Representative Dickey and Senator Wicker, offered an amendment to an appropriations bill that banned the Department of Health and Human Services, which encompasses NIH, from spending money for research in which human embryos are destroyed. The kind of legislation, known as an 'appropriations rider,' is added late to an appropriations bill, which usually must be passed, and 'rides along' with it to become law, typically without any committee hearings or debate on the floor of Congress. Appropriations riders last only as long as the appropriations statute,

69 Nicholas G. Crawford et al., *Loci Associated with Skin Pigmentation Identified in African Populations*, 358 Science 887 (2017).

70 See, eg Ctr. for Genetics & Soc'y, https://www.geneticsandsociety.org/ (last visited Jan. 28, 2022).

for one fiscal year, and then they expire—but they can reintroduced in succeeding years. The now famous 'Dickey-Wicker amendment' has been added to, and passed with, funding bills every year since 1995. Although the language has changed slightly over the years, the current version reads

None of the funds made available in this Act may be used for—.

(1) the creation of a human embryo or embryos for research purposes; or

(2) research in which a human embryo or embryos are destroyed, discarded, or knowingly subjected to risk of injury or death greater than that allowed for research on fetuses in utero under 45 CFR 46.208(a)(2) and Section 498(b) of the Public Health Service Act.[71]

The Dickey-Wicker amendment was first passed 3 years before James Thomson published, in 1998, his discovery of how to create and preserve human embryonic stem cells. These extremely exciting research tools—and potentially important clinical tools for so-called 'regenerative medicine'—quickly became hugely controversial because to create the cells (and cell lines they gave rise to), one has to destroy human embryos, typically those that have developed about 5 or 6 days to the 'blastocyst' stage.

The Clinton Administration decided that the Dickey-Wicker Amendment forbade the use of federal funds to create human embryonic stem cells because that would require destroying embryos, but that the provision allowed the federal government to fund research done with human embryonic stem cells that someone had created without using federal funds. President George W. Bush then decided that his administration would only fund research with *some* human embryonic stem cells, those from cell lines that had been created before the start of the press conference where he announced the new policy. The Obama Administration changed the policy and although there was a hiccup in funding during litigation that alleged even this funding violated the Dickey-Wicker amendment,[72] that position continued through the Trump Administration to the present—as has the Dickey-Wicker ban.

So, the federal government has refused to fund research that 'destroys, discards, or knowingly subject[s] to risk of injury of death' embryos, but continues fund research using the products of destroyed embryos, to a limited extent during the George W. Bush Administration and more broadly before and after it. The federal government has never acted to limit or ban the research itself; its actions have solely been about research it funds.[73]

States have been much more active in responding to the use of human embryos for research, but in both directions. At least 11 states have banned (or effectively banned) human embryo research.[74] Some of the state laws predate the Dickey-Wicker

71 Consolidated Appropriations Act, 2021, Pub. L. No. 116–260, 134 Stat. 1182 § 508. The exceptions mentioned in the statute allow such research when it is intended to benefit directly the embryo involved.

72 *See Sherley v. Sebelius*, 689 F.3d 776 (D.C. Cir. 2012) (discussing the four year history of the litigation).

73 It is the case, however, that at some points in the Bush Administration laboratories were very worried about whether they could do research, without federal funding, on non-approved embryonic stem cell lines, using laboratory equipment, personal computers, or lighting and heating that was in part paid for by the federal government.

74 Kirsten Matthews & Daniel Morali, *Can We Do That Here? An Analysis of U.S. Federal and State Policies Guiding Human Embryo and Embryoid Research*, J. Law & the Biosciences (forthcoming) (compiling information from *Embryonic and Fetal Research Laws*, National Conference of State Legislatures, https://www.ncsl.org/research/health/embryonic-and-fetal-research-laws.aspx (last visited Jan. 31, 2022)).

Amendment and the development of human embryonic stem cells; others came about in reaction to it. Some focus on the protection of the embryos; others extend to limiting human embryonic stem cell research in that state, even cells created from embryos destroyed somewhere else. (One, South Dakota, makes such research a felony.)

On the other hand, other states have passed laws making it clear that human embryos can be used for research and research on human embryonic stem cells. California, Connecticut, Michigan, Montana, and New York explicitly allow such research.[75] California is the most notable. In 2004 and again in 2020, California voters passed propositions to provide first $3 billion and then $5 billion of state bond funding for research.

Except for 2020s Proposition 14 in California, though, the state actions concerning human embryo research, either favoring it or opposing it, are largely old. The issue peaked in the 2000s when it became a partisan wedge issue for both Republicans and Democrats. Since then, only the failed 'Personhood Amendments' have been substantial efforts to limit embryo research and, in those, it would have been just one effect of changes aimed primarily at abortion.

Will that change after the disappearance of a federal constitutional abortion right? Again, there is no legal reason why it should change. No court has ever held that *ex vivo* human embryo research is connected to a woman's right to end her pregnancy. Numerous courts have had to rule on 'custody' of frozen embryos in divorces or after the death of a prospective parent, but the relation to this question is weak. And, in any event, those cases are a mess, usually reaching the same result but with wildly different rationales. More than 30 years ago one court, a federal district court in Illinois, found a federal constitutional right to do embryonic research under the First Amendment,[76] but its decision has never been followed (or rejected).

But, again, my question is whether the stimulus from successfully overturning the federal constitutional abortion right will propel embryo protection groups to seek new legislation further restricting research that destroys or damages human embryos. I think this is more likely than further restrictions on clinical use of *ex vivo* embryos, for four reasons.

First, unlike IVF or PGT, embryo research does not directly implement people's desires to have children, or to have healthy children or children with traits they want. One could argue that, by improving our understanding of embryonic development, it could lead to more people being able to have 'genetic' children, but that is very speculative. This takes away the most compelling arguments against such restrictions when applied to IVF or PGT. Similarly, patients could say the use of embryonic stem cells, created by destroying embryos, provides the best hope of saving them from a deadly disease, but, again, they cannot say with confidence that the research has a strong chance of leading to such a good result (particularly in time to help them).

Second, scientific progress has muddied the waters around research with embryos. On the one hand, the development of induced pluripotent stem cells (iPSCs) has provided a way of possibly avoiding the use of human embryonic stem cells in research. In 2007, Shinya Yamanaka developed a method to turn regular body cells into cells that,

75 *Id.* The authors note further that an additional 13 states 'allow research on embryos by virtue of either vague or overly specific legislation.'

76 *Lifchez v. Hartigan*, 735 F. Supp. 1361 (N.D. Ill. 1990).

like human embryonic stem cells, can become any cell type in the human body. When examined closely, iPSCs are not quite the same as human embryonic stem cells, but they are quite close—and they have the further advantage of sharing the same DNA as the patient from whom they are taken, thus avoiding an immune response if transplanted back into that patient. Human embryonic stem cells are left as almost afterthoughts—things to measure the performance of iPSCs against and possibly things to be taken up again if the induced cells hit unexpected obstacles.

That speaks to the human embryonic cell line aspect of *ex vivo* human embryo research but not, directly, to the questions of research on embryonic development that might lead to ways to help couples succeed in having babies. And yet iPSCs may play a role here, too. Scientists have increasing been creating 'embryo-like things,' starting with iPSCs (as well as hESCs). These entities go by a wide range of names: 'embryoids' 'blastoids,' 'gastruloids,' 'simbryos,' 'SHEEFs' (synthetic human entities with embryo-like features), or 'SHELEs' (synthetic human embryo-like entities).[77] The International Society for Stem Cell Research (ISSCR), in its latest guidelines for stem cell research in June 2021, referred to them blandly as 'embryo models,' the term I will adopt. Starting often with iPSCs, these embryo models develop into things that look—sometimes more, sometimes less—like human embryos.

Scientists are pursuing this research in the hope that embryo models will provide researchers with more information about what goes right—and what goes wrong—in human embryonic development. Although researchers will still want to do research with 'real' human embryos to provide a baseline, and reality check, for their models, others may view the rise of embryo models as another reason that research with real embryos is not necessary. It may also convince some people that this whole area of research, with human embryos or human embryo models, is going too far, perhaps by pointing toward a dystopian future of babies developed in a laboratory without any clear parents.

Third, the public—or at least that part of it that wants to protect embryos—may be alienated from embryo research by another change. For nearly 40 years, researchers adhered to guidelines against pursuing research with human embryos that have developed for more than 14 days. For almost all of that time, this was not hard—no one knew

77 For embryoids, see Jianping Fu et al., *Stem-cell-based Embryo Models for Fundamental Research and Translation*, 20 Nature Materials 132 (2021). For blastoids, see Heiner Niemann & Bob Seamark, *Blastoids: A New Model for Human Blastocyst Development*, 6 Signal Transduction and Targeted Therapy 239 (2021). For gastruloids, see Susanne C. van den Brink et al., *Single-Cell and Spatial Transcriptomics Reveal Somitogenesis in Gastruloids*, 582 Nature 405 (2020) ('Gastruloids are three-dimensional aggregates of embryonic stem cells that display key features of mammalian development after implantation, including germ-layer specification and axial organization.'). For simbryos, see Julian Hitchcock, *The Entelechy Test: Embryos and Simbryos*, BioNews (Mar. 29, 2021), https://www.bionews.org.uk/page_155584. For SHEEFs, see John Aach et al., *Addressing the Ethical Issues Raised by Synthetic Human Entities with Embryo-Like Features*, 6 eLife e20674 (2017). The term SHELEs was used by George Church at a meeting I attended. George Church & John Aach, Stem Cells, Engineered Tissues, and Synthetic Embryo-Like Entities at The Petrie-Flom Center for Health Law, Policy, Biotechnology, and Bioethics at Harvard Law School Event: The Ethics of Early Embryo Research & the Future of the 14 Day Rule (Nov. 7, 2016), slides available at https://www.slideshare.net/petrieflom/george-church-and-john-aach-stem-cells-engineered-tissues-and-synthetic-embryolike-entities. One of the people in the audience was the renowned science and technology studies scholar, Sheila Jasanoff, who objected (I'm not sure how seriously) to this use of her name; the Church lab later changed its name for the objects to SHEEFs.

how to keep human embryos alive in a laboratory for 14 days. In 2016, however, two different groups announced that they had been able to go to 13 days. Each said that it may have been able to go longer, but had destroyed the embryos to comply with the so-called 14-day rule.

This has set off a wave of lobbying in favor of abandoning that rule so that researchers can understand embryonic development after 14 days. The high point of this campaign thus far has been the ISSCR guidelines from summer 2021, which encouraged legislatures and guidance bodies to allow research beyond 14 days. Unfortunately, they did not propose an alternative developmental cutoff, thus leaving open the possibility that an embryo might develop in a laboratory to the 8-week mark (when it changes its name to a 'fetus'), the 20- or 21-week mark of viability, or even to 38 weeks (full term).[78] Although we currently have no idea whether these 14-day-plus embryos would develop the same way as normal embryos and no idea how to extend their '*ex vivo* lives' to later stages of pregnancy—the 'artificial womb' is nowhere near a reality—this prospect may well alarm many people.

Fourth, and finally, embryo research may have become an easier target because its results, so far, have been disappointing. Great hopes attended the announcement of hESCs; as the issues became increasingly political, the claims for such research grew larger and larger. I think those claims were sincere and many of them were reasonable at the time, in the early 2000s. But although human embryonic stem cell research has produced valuable scientific information and has led to some interventions that are in or approaching human clinical trials, they have not produced cures or even any FDA-approved treatments. The hoped-for 'low hanging fruit,' which I thought would be a quick treatment for insulin-dependent (also known as type 1) diabetes, did not materialize. The narrow passage of Proposition 14 in California in 2020, extending the state's investment in stem cell research, is some evidence that the public, at least in California, has not given up hope. Nevertheless, the argument that we need to use human embryos in research because of the medical breakthroughs they will provide is a bit bedraggled. And although the issue of embryo research to provide treatments for infertility or miscarriages has been lower profile, it too has failed so far to produce any treatments to help people have babies.

I suspect the result may well be that embryo protection groups, energized by their victory over the federal constitutional abortion right, will push for increasing restrictions, or bans, on embryo research. And developments (and the lack of breakthroughs) over the past two decades will make that research an easier target. Because federal legislation is so difficult to pass, I do not expect to see such efforts lead to federal law (although they could lead to more restrictive non-statutory policies under a Republican president), but more serious efforts at state restrictions or bans seem to me likely—and some of them will succeed.

How important will that be for medical and scientific research? It is hard to know. The most solidly anti-abortion states are not known for hosting major biomedical research institutions (although they do have medical schools that may do some impor-

78 I have written about the 14-day rule and this regrettable oversight in the ISSCR Guidelines, as well as my own proposal for extending the limit to 28 or 35 days, in Henry T. Greely, *The 14-Day Embryo Rule: A Modest Proposal*, Hous. J. Health L. & Pol'y (forthcoming).

tant work in these fields). The most interesting case is likely to be Texas, a place with a very pro-life legislature but also with major universities and medical schools. Ohio may also be an important test. Research in this field from, say, Arkansas, Mississippi, and North Dakota would likely not be much missed.

IV. CONCLUSION

The U.S. has lived for nearly 50 years with a federal constitutional right to an abortion. Its death, or evisceration, will undoubtedly have ramifications, some expected, some surprising. Some of those will be the direct result of individuals' reactions to new and newly enforceable state restrictions on abortions. But others will not follow directly from the constitutional space its overruling will create for legislation, but rather from the public, advocacy, legislative, and broadly political reactions in related areas. This article has tried to sketch some of those possible implications with regard to IVF, PGT, and, in general, *ex vivo* human embryos—*none* of which existed when *Roe v. Wade* was decided.

I have occasionally suggested how I think these issues will play out but with genuine humility. After all, it really *is* always hard to predict things accurately, especially the (political) future.