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Heritable genome editing and cognitive biases: why broad societal consensus is the wrong standard for moving forward

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ABSTRACT

Heritable genome editing (HGE) may one day safely correct mutations that cause serious monogenic diseases. Nevertheless, some scientists and bioethicists argue that HGE should be subject to a moratorium. In their view, no nation should proceed with clinical use absent broad societal consensus in favor of moving forward with HGE and a specific use. This article critiques this plan in light of two cognitive biases. First, human beings favor the status quo. We are primed to favor human reproduction and the human genome in their current forms and resist HGE. Second, human beings also dwell on negative information. Dr He Jiankui's unethical and premature experiment encourages us to judge HGE and its offspring harshly. By reinforcing these biases, the proposed moratorium would make it difficult to achieve broad societal consensus in support of using HGE even to correct dangerous mutations. As an alternative, this article recommends HGE be regulated for safety and efficacy. This approach will keep scientists from using HGE prematurely, while giving society time to discuss this new technology and enact further legislation if necessary.

KEYWORDS: broad societal consensus, heritable genome editing, law, moratorium, negativity bias, status quo bias

Scientists first reported editing the genomes of human embryos in 2015.[1] The US National Academy of Sciences, US National Academy of Medicine, Royal Society of the United Kingdom, and Chinese Academy of Sciences convened an

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1 Puping Liang et al., *CRISPR/Cas9-mediated Gene Editing in Human Tripronuclear Zygotes*, 6 Protein Cell 363 (2015).

International Summit on Human Gene Editing to discuss this development.[2] The Organizing Committee for the International Summit later issued a statement on a statement on heritable genome editing (HGE)—that is, the use of edited human gametes and embryos to produce children.[3] The statement raised several concerns, ranging from safety and efficacy to impacts on future generations, potential for coercion or aggravation of social inequities, and moral and ethical dimensions of changing human evolution.[4] The Organizing Committee concluded that clinical use of the technology should not be made absent broad societal consensus on the propriety of a planned application.[5]

In 2018, the US National Academy of Sciences, US National Academy of Medicine, and Royal Society of the United Kingdom partnered with the Academy of Sciences of Hong Kong to hold the Second International Summit on Human Genome Editing.[6] There, Dr He Jiankui of China announced to a shocked audience that he had edited the genomes of human embryos in an attempt to confer immunity to the human immunodeficiency virus, or HIV-1.[7] He had then transferred these edited embryos to women for gestation.[8] Two baby girls had been born[9] and a third was in utero.[10] In other words, he had made clinical use of HGE.

The Organizing Committee for the Second International Summit condemned this experiment for its absence of medical purpose, badly designed protocol, failure to protect research subjects, and lack of transparency.[11] However, it recognized that HGE could be used to help carriers of dangerous mutations to have healthy children.[12] The Organizing Committee acknowledged that HGE was not yet safe enough for clinical use but called for a transitional pathway toward clinical trials.[13]

This pragmatic approach displeased those who felt that the technology was moving too swiftly and without adequate consideration of broader issues. In 2019, geneticist

2 See National Academies of Sciences, Engineering, and Medicine, *International Summit on Human Gene Editing: A Global Discussion* (2015), https://doi.org/10.17226/21913 [hereinafter NASEM 2015].

3 *Id.* at 6–7.

4 NASEM 2015, *supra* note 2, at 7.

5 *Id.* at 7. See also J. Benjamin Hurlbut et al., *Building Capacity for a Global Genome Editing Observatory: Conceptual Challenges*, 36 Trends Biotechnol. 639, 641, Box 1 (2018) (discussing the need for broad societal consensus on HGE and calling for a cosmopolitan ethic based not only on science but also religion, philosophy, law and culture); cf. Nuffield Council on Bioethics, *Genome Editing and Human Reproduction: Social and Ethical Issues* 53 n. 170 (2018) (noting proliferation of position statements insisting on broad societal consensus for moving forward).

6 See National Academies of Sciences, Engineering, and Medicine, *Second International Summit on Human Genome Editing: Continuing the Global Discussion: Proceedings of a Workshop in Brief* (2019), https://doi.org/10.17226/25343 [hereinafter NASEM 2018].

7 *Id.* at 2. CCR5 is a gene for a receptor that governs the uptake of HIV into T cells. Sean P. Ryder, *#CRISPRbabies: Notes on a Scandal*, 6 CRISPR J. 355 (2018). Human beings born with a natural variant known as CCR5-Δ32 receive some protection against infection with HIV-1. Kerry Lynn Macintosh, *Heritable Genome Editing and the Downsides of a Global Moratorium*, 2 CRISPR J. 272, 273 (2019). However, Dr He had not succeeded in creating this specific variant; rather, he had introduced novel mutations to CCR5 that might or might not confer immunity to infection with HIV-1. Ryder, *supra*, at 357.

8 NASEM 2018, *supra* note 6, at 2.

9 *Id.*

10 *Id.*; see also Antonio Regalado, *A Third CRISPR Baby May Have Already Been Born in China*, MIT Technol. Rev. (Jul. 3, 2019), https://www.technologyreview.com/2019/07/03/134301/a-third-crispr-baby-may-have-already-been-born-in-china/.

11 NASEM 2018, *supra* note 6, at 8.

12 *Id.* at 7.

13 *Id.*

Eric Lander and other prominent scientists and academics proposed an international moratorium on HGE.[14] Nations that joined the moratorium would not allow clinical uses of germline editing for a fixed period, such as 5 years.[15] Thereafter, a nation could make a specific use of HGE after completing these steps: public notice of its intention; international discussion of pros and cons; evaluation of technical, scientific, medical, social, ethical, and moral issues; determination that the use was justified nevertheless; and lastly, conclusion that there was a broad societal consensus on the question of whether to go forward with HGE at all and in favor of the specific use.[16] According to this Lander plan, national authorities would decide whether consensus existed. A simple majority would be insufficient to establish consensus,[17] but the plan did not specify the degree of super-majoritarian support to be required.

The US National Academy of Medicine, US National Academy of Sciences, Royal Society of the United Kingdom, and International Commission on the Clinical Use of Human Germline Genome Editing did not pursue the Lander plan. While acknowledging that HGE should not be used to initiate a pregnancy yet,[18] these organizations nevertheless took a step toward that goal. Their 2020 Report did not attempt to define a transitional pathway for all possible clinical uses of HGE.[19] Instead, it defined a transitional pathway specifically for cases in which couples carried genetic mutations causing serious monogenic diseases, such as Huntington's disease, cystic fibrosis, sickle cell anemia, or beta-thalassemia,[20] and generated either no unaffected embryos or so few that at least one cycle of in vitro fertilization (IVF) with preimplantation genetic testing (PGT) had already failed.[21] The pathway for correcting such mutations had three phases: development of methodology and preclinical evidence to show a proposed use was safe and effective; regulatory decisions and approvals at the national level, supported by international discussions; and finally, clinical use with monitoring and evaluation.[22] Importantly, the pathway required correction to a sequence that did not cause disease and was common in the population.[23] Despite these limited recommendations, critics promptly attacked the 2020 Report, asserting once again that HGE should not proceed until and unless consensus was reached.[24]

In 2021, the World Health Organization (WHO) issued a committee report establishing a framework for the governance of human genome editing.[25] This report

14 Eric Lander et al., *Adopt a Moratorium on Heritable Genome Editing*, 567 Nature 165 (2019).

15 *Id.* at 168.

16 *Id.*

17 *Id.*; see also New Oxford American Dictionary 370 (Angus Stevenson & Christine A. Lindberg eds., 3rd ed. 2010) (defining the term 'consensus' as general agreement without specifying how much agreement is required).

18 National Academy of Medicine, National Academy of Sciences, the Royal Society, and the International Commission on the Clinical Use of Human Germline Genome Editing, *Heritable Human Genome Editing* 92–93 (2020), https://doi.org/10.17226/25665. [hereinafter 2020 Report].

19 *Id.* at 124.

20 *Id.* at 102. Unlike the public opinion polls discussed in Section IV.A, the 2020 Report did not distinguish between diseases that manifested at birth or later.

21 *Id.* at 101–04, 108–10.

22 *Id.* at 121–22.

23 *Id.* at 124.

24 Misha Angrist et al., *Reactions to the National Academies/Royal Society Report on Heritable Human Genome Editing*, 3 CRISPR J. 332, 338, 343, 345 (2020).

recommended strengthened oversight measures for the research and clinical applications of HGE, identified relevant governance measures and processes, and raised questions to be considered.[26] Although the WHO had declared in 2019 that nations should not approve clinical applications of HGE yet,[27] its committee report did not take a position on the moratorium and consensus debate.[28] Meanwhile, also in 2021, President Joe Biden appointed as his scientific adviser Eric Lander, who had demanded a moratorium and consensus before moving forward with HGE.[29] Thus, it is timely to investigate the viability of a moratorium plus consensus approach.

Section I sets forth a discussion model. Focusing on the USA, the model assumes that Congress enacts a moratorium on HGE. This moratorium is set to last for 5 years and may be renewable. The model further assumes that a plausible case for lifting the moratorium could be made for couples who carry mutations causing serious monogenic diseases and generate either no or very few unaffected embryos. The model then identifies constitutional difficulties in requiring super-majoritarian consensus to lift the moratorium and suggests that politicians' sensitivity to public opinion could emerge as an alternative.

Section II builds on this foundation. It describes the status quo bias and negativity bias, two cognitive proclivities that afflict human beings. Section III takes the next step, explaining that these biases predispose human beings to resist HGE. The technology entails change to human reproduction and the human genome and suffers from its negative association with Dr He and his notorious experiment. Section IV then applies those insights from psychology to the discussion model, demonstrating that a moratorium is unlikely to ever be lifted if super-majoritarian consensus is the standard for doing so. Reinforced by the moratorium itself, the status quo and negativity biases will discourage the development of broad societal consensus in favor of HGE in general and even the most sympathetic uses, such as correction of mutations that cause serious monogenic diseases. Section V critiques the claim that societal, ethical, and moral concerns justify the moratorium plus consensus approach.

This article concludes that a moratorium plus consensus approach threatens medical progress and should not be adopted. A conservative yet workable alternative is available in the USA: Congress can allow federal regulators to receive applications for clinical trials. The existing regulatory process will ensure that HGE is not applied in humans before it is safe enough for initial trials. The 2020 Report and its translational pathway will aid scientists in navigating this regulatory process. Because HGE is in its infancy, regulators will not approve clinical trials anytime soon. Thus, this regulatory approach will allow society the time to discuss and evaluate this new technology without biasing the outcome.

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25 WHO Expert Advisory Committee on Developing Global Standards for Governance and Oversight of Human Genome Editing, *Human Genome Editing: A Framework for Governance* (2021) [hereinafter WHO Report], available at https://www.who.int/publications/i/item/9789240030060.

26 *Id.* at 22–25; 49–53.

27 World Health Organization, *Statement on Governance and Oversight of Human Genome Editing*, Jul. 26, 2019, https://www.who.int/news/item/26-07-2019-statement-on-governance-and-oversight-of-human-genome-editing (declaring that nations should not yet approve clinical applications of HGE).

28 WHO Report, *supra* note 25, at 33.

29 Nidhi Subbaraman & Alexandra Witze, *Joe Biden Names Top Geneticist Eric Lander as Science Advisor*, Nature News (Jan. 16, 2021), https://www.nature.com/articles/d41586-021-00118-8.

I. DISCUSSION MODEL

Eric Lander and his colleagues assume that individual nations will impose a moratorium at first. They will lift the moratorium only if a broad societal consensus supports moving forward with HGE and a specific use. In their view, a simple majority in favor does not establish consensus.[30] In evaluating this plan, a discussion model is helpful. This article provides one based on USA and its legal institutions.

In the USA, scientists may not transfer modified human gametes or embryos to women in clinical trials without submitting an investigational new drug application to the Food and Drug Administration (FDA).[31] For the past several years, however, the US Congress has enacted an annual appropriations rider that bars the FDA from acknowledging the receipt of applications to conduct such trials.[32] Thus, HGE cannot be provided to patients as long as the rider persists.[33]

Congress could, at any time, abandon such temporizing and ban HGE outright.[34] However, to establish a more interesting discussion model, let us suppose Congress decides to proceed along the lines Lander and his colleagues have suggested. It enacts a law that imposes an explicit moratorium on the clinical use of HGE for a 5-year term. This law establishes a legal status quo in which HGE is prohibited in the short term. Congress could extend this status quo by renewing the moratorium for successive 5-year terms.

The next step is to identify a specific use of HGE that might justify lifting the moratorium. As noted above, the 2020 Report developed a translational pathway for couples who carry mutations causing serious monogenic diseases and generate either no unaffected embryos or so few that at least one cycle of IVF with PGT has failed. The 2020 Report also specified that the mutated variant must be corrected to a common sequence that is known not to cause disease.[35] This article focuses on the correction of mutations in such rare cases.[36]

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30 See *supra* text accompanying notes 14–17.

31 Kerry Lynn Macintosh, Enhanced Beings: Human Germline Modification and the Law 124 (2018). FDA jurisdiction over HGE rests on the premise that edited gametes and embryos supplied to humans are biological products or drugs as defined in the Public Health Service Act and the Federal Food, Drug, and Cosmetic Act. *Id.* Some may question whether edited gametes or embryos qualify as biological products or drugs. Cf. Elizabeth C, Price, *Does the FDA Have Authority to Regulate Human Cloning?* 11 Harv. J.L. & Tech. 619, 629–41 (1998) (disputing the status of cloned embryos as biological products or drugs). However, the FDA has another possible basis for jurisdiction: perhaps the molecular tools applied to gametes or embryos are drugs or biological products. Henry T. Greely, CRISPR People, The Science and Ethics of Editing Humans 284 (2021).

Even if the FDA has jurisdiction, applying its existing processes to HGE will raise difficult questions. See *Id.* at 284–86. For example, if the FDA approves a molecular tool to eliminate a mutation that causes one disease, can a scientist use that same tool to eliminate another mutation that causes a different disease, or must she seek a new approval? *Id.* at 284. Although many such questions will doubtless arise, as long as the FDA claims jurisdiction, it must do its best to answer the questions and regulate HGE effectively.

32 Macintosh, *supra* note 31, at 124–25; Macintosh, *supra* note 7, at 274; but cf. I. Glenn Cohen, Jacob S. Sherkow, & Eli Y. Adashi, *Gene Editing Sperm and Eggs (not Embryos): Does it Make a Legal or Ethical Difference?*, 48 J. Law, Med. Ethics 619, 620 (2020) (arguing that the rider applies only to edited embryos and not edited gametes).

33 Macintosh, *supra* note 31, at 125.

34 *Id.* at 148–50.

35 See *supra* text accompanying notes 18–23.

36 For a succinct explanation of why so few couples would find themselves in a position where all their embryos would produce children with a serious genetic disorder, see Henry T. Greely, *Human Germline Genome*

Lander and his colleagues believe that moving forward with HGE should require more than a simple majority. However, it would be hard to enforce a super-majoritarian requirement given the way federal legislation works. A future Congress could repeal an original or renewed moratorium by majority vote of both houses. To be sure, one or more Senators could use a filibuster to extend debate and forestall repeal. Three-fifths of Senators, or 60 out of 100, would then have to vote yes to end debate.[37] But Congress could also allow the moratorium to lapse through simple inaction, either at the end of the original 5-year term or a subsequent one.

How, then, could consensus be mandated? Suppose Congress provided that the moratorium would renew itself automatically every 5 years until it was repealed. Could Congress then limit repeal to a two-thirds or three-quarters vote in the House of Representatives and Senate—and further stipulate that this repeal rule itself could be repealed only by a similar super-majority?[38] The answer is no. Such an attempt by one Congress to bind future Congresses would be considered as legislative entrenchment.[39] Legislative entrenchment is unconstitutional because one legislature cannot bind another in the future.[40] To bind future Congresses, a constitutional amendment would be required;[41] and amending the Constitution is a daunting process that requires super-majoritarian support from both Congress and the states.[42]

However, there may be another pathway to super-majoritarian consensus. Congresspeople who vote for the original moratorium can pledge to maintain it until public opinion polls demonstrate strong support in favor of moving forward with HGE and a specific use, such as correcting mutations that cause serious monogenic diseases. Even without such a pledge, Congresspeople who seek reelection may vote to maintain the moratorium until the public strongly favors moving forward with HGE and a specific use. In other words, consensus may be enforced informally through public opinion. Thus, this article next considers factors that may shape public opinion, including cognitive biases.

II. COGNITIVE BIASES

Two cognitive biases are relevant here: the status quo bias and the negativity bias. Various sub-biases may underlie each; however, this section emphasizes only those that are most relevant to the analysis of HGE and the discussion model.

Editing: An Assessment, 2 CRISPR J. 253, 259–60 (2019) [hereinafter Greely, *Human Germline Genome Editing*].

37 See Standing Rules of the Senate, S. Doc. No. 113–18, Rule XXII, at 15–17 (2013), https://rules.senate.gov/imo/media/doc/CDOC-113sdoc18.pdf.

38 Cf. John O. McGinnis & Michael B. Rappaport, *The Constitutionality of Legislative Supermajority Requirements: A Defense*, 105 Yale L. J. 483, 504 (1995) (discussing constitutionality of a repeal rule requiring a super-majority vote to repeal either itself or a three-fifths voting rule that the House of Representatives imposed for tax increases).

39 See John C. Roberts & Erwin Chemerinsky, *Entrenchment of Ordinary Legislation: A Reply to Professors Posner and Vermeule*, 91 Cal. L. Rev. 1773, 1775 (2003).

40 *Id.*; *accord*, McGinnis & Rappaport, *supra* note 38, at 505.

41 Roberts & Chemerinsky, *supra* note 39, at 1776.

42 If two-thirds of both houses of Congress propose an amendment, three-quarters of the states must ratify that amendment through their legislatures or conventions. Alternatively, two-thirds of the states can petition Congress to hold a constitutional convention to propose an amendment which three-quarters of the states must ratify through their legislatures or conventions. US Const. art. V.

II.A. Status Quo Bias

Academics define status quo bias in various ways. In their seminal article, economists William Samuelson and Richard Zeckhauser collect evidence from experiments and field studies and conclude that decision-makers exhibit a bias to do nothing or maintain a current or prior decision.[43] Psychologists Scott Eidelman and Christian S. Crandall define the bias more narrowly as a preference to maintain the status quo.[44] Ethicist Ronald Green describes the bias simply as a tendency to resist change.[45]

Maintenance of the status quo can be rational. Once an initial choice has been made, selecting a new one requires cognitive effort.[46] Implementing a new choice can take time, labor, and money.[47] In a world of imperfect information, there is also a risk that the new choice will lead to a change for the worse.[48]

However, irrational factors can also lead us to favor the status quo. For example, Samuelson and Zeckhauser cite cognitive misperceptions that lead to a status quo preference, such as loss aversion (weighing losses from a new choice heavier than equal gains)[49] and anchoring (taking an initial decision as a starting point and not adjusting it to reach an optimum).[50] They also list factors that reinforce psychological commitment to the status quo, such as sunk costs (justifying prior commitments by maintaining the same course of action),[51] regret avoidance (clinging to the status quo because bad outcomes sting more when they result from action than inaction),[52] drive for consistency (suppressing knowledge of past errors),[53] self-perception (inferring one's own preferences from past actions),[54] and efforts to feel in control (sticking with status quo decisions).[55]

Eidelman and Crandall point to other factors that encourage us to favor the status quo. For example, according to their research, we like things and people better with repeated exposure to them.[56] We are also more likely to perceive statements as true with repeated exposure.[57] Because we experience the status quo regularly, we judge it as desirable and true.[58]

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43 William Samuelson & Richard Zeckhauser, *Status Quo Bias in Decision Making*, 1 J. Risk Uncertainty 7, 8 (1988).

44 Scott Eidelman & Christian S. Crandall, *Bias in Favor of the Status Quo*, 6 Soc. Personal. Psychol. Compass270, 271 (2012); *accord*, Nick Bostrom & Toby Ord, *The Reversal Test: Eliminating Status Quo Bias in Applied Ethics*, 116 Ethics 656, 658 (2006).

45 Ronald M. Green, Babies by Design: The Ethics of Genetic Choice 8–9 (2007).

46 Eidelman & Crandall, *supra* note 44, at 271.

47 *Id.* at 270; see also Samuelson & Zeckhauser, *supra* note 43, at 34–35 (recognizing that transition entails costs).

48 Eidelman & Crandall, *supra* note 44, at 271; see also Samuelson & Zeckhauser, *supra* note 43, at 34 (asserting that uncertainty contributes to status quo maintenance).

49 Samuelson & Zeckhauser, *supra* note 43, at 35–36; *accord*, Eidelman & Crandall, *supra* note 44, at 271.

50 Samuelson & Zeckhauser, *supra* note 43, at 36.

51 *Id.* at 37.

52 *Id.* at 38.

53 *Id.* at 38–39.

54 *Id.* at 39, 40.

55 *Id.* at 40.

56 Eidelman & Crandall, *supra* note 44, at 271–72.

57 *Id.* at 272.

58 *Id.*

Further, Eidelman and Crandall identify two sub-biases that undergird the status quo bias. One is the existence bias, which causes us to assume that existing states are good.[59] The other is the longevity bias, whereby simple duration makes something seem better.[60] They label these biases as heuristics, that is, mental rules of thumb that facilitate quick, subconscious decision-making.[61]

II.B. Negativity Bias

Surveying research across multiple domains, psychologists Roy Baumeister, Ellen Bratslavsky, Catrin Finkenauer, and Kathleen Vohs conclude that harmful, undesirable, or unpleasant things have stronger psychological effects than beneficial, desirable, or pleasant things. [62] For example, bad events have stronger and longer-lasting psychological impacts,[63] receive more mental processing,[64] are better remembered,[65] and are more likely to make news.[66] Stereotypes lean toward the negative.[67] Negative impressions of people are easily formed and hard to dispel.[68] The authors speculate that this negativity bias is adaptive; in other words, we humans pay close attention to bad things because they demand a response if we are to survive.[69]

Psychologists Paul Rozin and Edward Royzman argue that the most robust aspect of the negativity bias is negativity dominance.[70] To explain, suppose an event, object, or person incorporates both positive and negative aspects. One's holistic appraisal of that event, object, or person will be more negative than the sum of one's subjective evaluations of its positive and negative aspects.[71] For example, suppose you experience an event. This event has both good and bad aspects that, when you evaluate them individually and add them up, balance each other out. Nevertheless, when you consider the event as a whole, your appraisal will be negative.

This is not to say that bad always wins over good. As Baumeister and his colleagues note, good can prevail by sheer force of numbers.[72] For example, research on romantic

59 *Id.*

60 *Id.* at 273–74.

61 *Id.*; see also Samuelson & Zeckhauser, *supra* note 43, at 10 (describing the status quo bias as rooted in mental illusion and psychological inclination).

62 Roy F. Baumeister et al., *Bad Is Stronger Than Good*, 5 Rev. Gen. Psychol. 323, 323–25 (2001); *accord*, Amrisha Vaish, Tobias Grossman, & Amanda Woodward, *Not All Emotions Are Created Equal: The Negativity Bias in Social–Emotional Development*, 134 Psychol. Bull. 383 (2008) (negativity bias refers to the human tendency to heed, learn from, and utilize negative information more than positive information).

63 Baumeister et al., *supra* note 62, at 325–28.

64 *Id.* at 340–41.

65 *Id.* at 341.

66 *Id.* at 343. Relatedly, a study conducted with respondents from 17 countries across six continents found that people viewing news videos paid more attention to and were more aroused by negative news. Stuart Soroka, Patrick Fournier, Lilach Nir, *Cross-national Evidence of a Negativity Bias in Psychophysiological Reactions to News*, 116 PNAS 18888, 18891 (2019).

67 Baumeister et al., *supra* note 62, at 344.

68 *Id.* at 344–46.

69 *Id.* at 357–58; see also Soroka, Fournier, & Nir, *supra* note 66, at 18889 (noting that this evolutionary account of the negativity bias has been embraced in multiple disciplines).

70 Paul Rozin & Edward B. Royzman, *Negativity Bias, Negativity Dominance, and Contagion*, 5 Pers. Soc. Psychol. Rev. 296, 299 (2001).

71 *Id.* at 298–99.

72 Baumeister et al., *supra* note 62, at 361.

relationships indicates five acts of kindness are needed to offset one negative act.[73] Similarly, bad reputations can be eased but only with effort. When a person is suspected of having a bad trait, a few negative acts will confirm it but many positive acts are required to refute it.[74]

Lastly, and of particular relevance here, humans consider information to be more accurate when it is presented in a negative frame than in a positive frame.[75] For example, in one German experiment, respondents were told either that 20 per cent of marriages end prior to 10 years (negative frame) or that 80 per cent of marriages last >10 years (positive frame). Even though the substance was the same, respondents judged the negatively framed information as more truthful than the positively framed information.[76]

III. HOW COGNITIVE BIASES COULD AFFECT ATTITUDES TOWARD HGE

Having described the status quo and negativity biases, this article continues by explaining how the biases predispose human beings to resist HGE.

III.A. Status Quo Bias

To deepen the analysis, let us assume that Eidelman and Crandall are correct in positing that the status quo bias is undergirded by the existence and longevity biases and that those sub-biases are heuristics that help people make decisions without much conscious thought. To examine the impact of the status quo bias and its underlying sub-biases, we must first identify the relevant topics. HGE entails modification of the genomes of human gametes or embryos for use in human reproduction; thus, the relevant topics are human reproduction and the human genome.

Suppose the topic is human reproduction. Then, the status quo is reproduction as it presently exists. According to the existence bias, coitus exists; thus, it must be good. Further, coitus has been the primary method of human reproduction since the species emerged; thus, it benefits tremendously from the longevity bias, which makes it seem better than alternatives. Standard assisted reproductive technologies (ARTs), such as IVF, do not benefit from the longevity bias to nearly the same extent; Louise Brown, the first 'test tube' baby conceived through the technology, was not born until 1978.[77] However, these technologies, conducted with unaltered human gametes or embryos, do exist, and their existence marks them as good.

HGE is neither coitus nor a standard ART which patients can access in a fertility clinic. Thus, HGE does not benefit from either the existence or longevity bias, and status quo bias predicts that human beings will resist it. However, if some men and women overcome this cognitive predilection and reproduce with the aid of HGE, the very existence of this new ART will imply its goodness. As the reproductive status quo

73 *Id.*

74 *Id.* at 344.

75 Benjamin E. Hilbig, *Sad, Thus True: Negativity Bias in Judgments of Truth*, 45 J. Exp. Soc. Psychol. 983 (2009).

76 *Id.* at 984–85.

77 *World's First Test Tube Baby Born*, History (Mar. 12, 2010), https://www.history.com/this-day-in-history/worlds-first-test-tube-baby-born.

begins to expand, the bias against this technology will diminish. This article will return to this point in Section IV.B.

Now, suppose the topic is the human genome. The status quo is then the human genome in its present form (although its precise sequence varies from human individual to individual).[78] The existence bias teaches that the human genome is good because it exists. Moreover, because *Homo sapiens* have existed for millennia,[79] the longevity bias implies that the human genome is good. These heuristics incline us to prefer the human genome as it presently exists.

The Universal Declaration on the Human Genome and Human Rights (UDHGHR) is evidence of this preference. Article 1 declares that '[t]he human genome underlies the fundamental unity of all members of the human family, as well as the recognition of their inherent dignity and diversity. In a symbolic sense, it is the heritage of humanity'.[80] By asserting that the human genome unifies our species and undergirds our dignity, the Declaration invests the human genome with normative significance. Further, by describing the human genome as the heritage of humanity, the Declaration subconsciously invokes the longevity and existence biases. As a noun, heritage refers to valued objects and qualities handed down through generations, a definition that conveys longevity and stability over time.[81] As a modifier, heritage signifies a plant that has not been hybridized with another, a meaning that stresses genetic purity and maintenance of that which exists.[82]

If human beings prefer the human genome in its present form, they can be expected to exhibit a bias against HGE. The UDHGHR supports this prediction. In Article 24, it identifies germline interventions as a practice that could be contrary to human dignity.[83] Similarly, Ronald Green attributes resistance to HGE to status quo bias, which encourages us to believe that the human genome is at its peak.[84]

This bias against HGE may be subject to exceptions. For example, the 2020 Report accepts HGE in cases of mutations causing serious monogenic diseases[85] but stipulates that such mutations be corrected to common sequences known not to cause disease.[86] In effect, the translational pathway seeks to enable scientists to replace such mutations with existing, long-standing sequences.

Still, the 2020 Report has drawn strong criticism, and the question is why. Since time immemorial, the human genome has been defined not only by its sequences

78 Judith L. Fridovich-Keil, *Human Genome*, Encyclopedia Britannica (Feb. 15, 2019), https://www.britannica.com/science/human-genome. For a discussion of the variability of the human genome, see Greely, *Human Germline Genome Editing*, *supra* note 36, at 256–57.

79 Anthropologists have found *H. sapiens* remains that are 100,000–200,000 years old. Robert Jurmain et al., Introduction to Physical Anthropology 409 (15th ed. 2018).

80 UNESCO Gen. Conf. Res. 29 C/Res. 16, art. 1, reprinted in Records of the General Conference, UNESCO, 29th Sess., 29C/Res. 19, at 41 (1997); adopted by the U.N. General Assembly in the UDHGHR, G.A. Res. 53/152, U.N. GAOR, 53d Sess., 152d mtg., U.N. Doc. A/RES/53/152 (Mar. 10, 1999) [hereinafter UDHGHR].

81 New Oxford American Dictionary, *supra* note 17, at 814.

82 *Id.*

83 See UDHGHR, *supra* note 80.

84 Green, *supra* note 45, at 12; see also Bostrom & Ord, *supra* note 44, at 657–58 (arguing that status quo bias accounts for much of the opposition to genetic cognitive enhancement).

85 2020 Report, *supra* note 18, at 101–04, 108–10.

86 *Id.* at 124.

but also by its origin in the fertilization of unaltered eggs with unaltered sperm. The 2020 Report challenges this origin by creating a translational pathway to facilitate the creation of children through altered gametes and embryos. However, if the pathway is implemented and healthy children are born, the genomic status quo will increase slightly to include this novel mode of origin and the bias against HGE will diminish. This article will revisit this point in Section IV.B.

In sum, the reproductive status quo biases us against HGE, but that bias may weaken if and when reproductive practices change. Further, the genomic status quo prejudices us against modification of gametes or embryos in general. However, if the 2020 Report and its translational pathway are implemented, we may come to accept applications that replace mutations with standard genetic variants.[87]

III.B. Negativity Bias

As this article previously explained in the Introduction, Dr He has admitted using HGE in assisted reproduction, and a handful of children have been born from his efforts. Scientists and bioethicists have condemned him for conducting an unethical experiment.[88] Chinese authorities have gone farther, convicting him of a crime and sending him to prison.[89] These negative judgements focus on Dr He and his conduct; unfortunately, however, the reasons for condemning him implicate HGE and the children as well. Critics assert that Dr He applied HGE at a time when it was unperfected and dangerous and worry that the children may have suffered physical harm.[90] Indeed, two researchers suggested that persons born with two copies of the genetic variant Dr He attempted to provide would die young[91]—until they discovered flaws in their research and retracted their own article.[92]

Dr He and his experiment have been evaluated and judged in extremely negative terms. The negativity bias predicts that people who have heard these accounts will pay attention to them, remember them for a long time,[93] and believe they are true.[94] Moreover, given the reasons for these negative judgements and the power of the bias, people may conclude that HGE is inherently dangerous and persons born through it are inevitably flawed.

A positive counternarrative does exist. According to the 2020 Report, HGE is not yet ready for human use; yet, the technology holds the potential to correct mutations that cause serious monogenic diseases, thereby sparing people from suffering and death.

87 See Macintosh, *supra* note 31, at 93 (suggesting that status quo bias may cause human beings to embrace therapies that restore normal health but not enhancements).

88 See, eg NASEM 2018, *supra* note 6, at 8; Henry T. Greely, *CRISPR'd Babies: Human Germline Genome Editing in the 'He Jiankui affair'*, J. L & Biosciences 111, 151–69 (2019) [hereinafter Greely, *CRISPR'd Babies*]; Lisa Rosenbaum, *The Future of Gene Editing—Toward Scientific and Social Consensus*, 380 N. Engl. J. Med. 971 (2019).

89 Jon Cohen & Dennis Normille, *China Delivers Verdict on Gene Editing of Babies*, 367 Science 130 (2020).

90 See, eg Greely, *CRISPR'd Babies*, *supra* note 88 at 153–55 (discussing risks to the babies).

91 Xinzhu Wei & Rasmus Nielsen, *CCR5-Δ32 Is Deleterious in the Homozygous State in Humans*, 25 Nat. Med. 909 (2019).

92 Ewen Callaway, *Geneticists Retract Study Suggesting First CRISPR Babies Might Die Early*, 574 Nature 307 (2019).

93 See Baumeister et al., *supra* note 62, at 341 (citing research indicating that bad events are better remembered).

94 Hilbig, *supra* note 75.

The National Academy of Medicine, National Academy of Sciences, Royal Academy, and International Commission on the Clinical Use of Human Germline Genome Editing were confident enough in this potential to establish a translational pathway for the correction of such mutations.[95] However, a report on something good that might happen in the future is unlikely to outweigh the bad press that Dr He and his experiment have received in the present. To overcome the negativity bias, multiple instances of positive outcomes—such as the birth of healthy children conceived through HGE—will be necessary.[96] Given the backlash against Dr He and ongoing safety concerns about the technology, such births are unlikely to occur in the near future.

IV. COGNITIVE BIASES COULD MAKE IT DIFFICULT TO ELIMINATE LEGAL BARRIERS TO HGE

Section I of this article discussed how Congress could enact a moratorium and establish super-majoritarian consensus before allowing HGE to proceed. Section I concluded that a rule imposing a super-majority requirement for repealing the moratorium would be unconstitutional. However, much the same effect could be achieved if Congress declined to eliminate the moratorium until public opinion strongly supported such a step.

This section picks up this thread. It discusses public opinion polls related to the correction of mutations that cause serious monogenic diseases. This section then argues that therapeutic applications of the technology could counteract the status quo and negativity biases. However, implementing the Lander plan would make it nearly impossible to build societal consensus to a point where lifting a moratorium is politically feasible.

IV.A. Public Opinion Polls

Several public opinion polls are relevant here. The first poll, which surveyed adults in the USA, was published in July 2018, 4 months prior to Dr He's announcement of his experiment at the Second International Summit on Human Genome Editing.[97] It did not reference HGE specifically, but asked respondents how they felt about changing the genes of unborn babies—an end that could be accomplished via HGE. Seventy-two per cent approved altering an unborn baby's genes to treat a serious disease or condition the baby would otherwise have when born. Sixty per cent thought it was appropriate to edit genes to diminish a baby's odds of developing a serious disease or condition later in life.[98] The data also showed that the public harbored reservations: 58 per cent thought that gene editing would lead to increased inequality because only the wealthy could afford it; 54 per cent believed that some would use gene editing technology in morally unacceptable ways; and 46 per cent anticipated that gene editing technology would be used before its health effects were fully understood.[99]

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95 See *supra* text accompanying notes 18–23.

96 See Baumeister et al., *supra* note 62, at 361 (discussing how to overcome the negativity bias).

97 Cary Funk & Meg Hefferon, *Public Views of Gene Editing for Babies Depend on How It Would Be Used*, Pew Research Center (Jul. 26, 2018), https://www.pewresearch.org/science/2018/07/26/public-views-of-gene-editing-for-babies-depend-on-how-it-would-be-used/.

98 *Id.* at 3.

99 *Id.* at 11.

A second poll surveyed US adults in mid-December 2018, soon after Dr He's announcement, but perhaps before most respondents were aware of it.[100] This poll asked respondents specifically about editing the genes of embryos. Seventy-one per cent favored HGE to prevent a heritable disease that was incurable or fatal, such as cystic fibrosis or Huntington's. Sixty-seven per cent approved of using HGE to decrease the risk of diseases that could emerge later in life, like cancer. However, 69 per cent of respondents opposed HGE to enhance intelligence or athletic ability and 72 per cent opposed alteration of physical traits like eye color or height.[101] And once again, respondents had reservations: for example, 52 per cent said gene editing would very likely be used for unethical reasons, 45 per cent speculated that the technology would very likely have unintended impacts on human evolution, and 76 per cent thought gene editing would not likely be affordable for most people.[102]

The third poll, which surveyed adults in multiple countries around the world, was published in December 2020, 2 years after Dr He's announcement. Like the first poll, this one did not reference HGE specifically but asked respondents how they felt about changing babies' genes—a goal that could be achieved via HGE. For purposes of this article, the US data are of greatest interest. Sixty-six per cent of respondents approved altering a baby's genes to treat a serious disease or condition at birth.[103] Fifty-seven per cent agreed that a change could be made to decrease the baby's risk of developing a serious disease or condition later in life.[104] And when asked whether scientific research into gene editing was appropriate or a misuse of technology, 66 per cent of respondents said it was a misuse.[105]

A majority of respondents in these polls favored helping babies to avoid devastating diseases. However, the degree of support that the Lander plan requires to achieve consensus is unclear. If consensus requires three-quarters of the public to approve of a specific use of HGE, two-thirds approval is not enough. Moreover, given the tendency of human beings to pay more attention to negative than positive information, Congress could easily focus on the respondents who oppose the technology. For example, members could read the third poll results to indicate that one out of every three voters 'opposes' correction of mutations associated with a serious disease or condition at birth and that two out of every five 'oppose' changes that could decrease the risk of a serious disease or condition later in life.

These polls also bring into question the consistency of public opinion. For example, consider the first and third polls that were published in 2018 and 2020, respectively. Support for gene editing to treat a serious disease or condition at birth declined by 6 per cent from 66 to 72. Support for gene editing to reduce the risk of developing a serious disease or condition later in life declined 3 per cent from 60 to 57. The third poll does

100 AP-NORC, *Human Genetic Engineering*, APNORC.Org, https://apnorc.org/projects/human-genetic-engineering/, (accessed Jul. 12, 2021).

101 *Id.*

102 *Id.*

103 Cary Funk et al., *Biotechnology Research Viewed with Caution Globally, but Most Support Gene Editing for Babies to Treat Disease*, Pew Research Center (Dec. 10, 2020), at 9, https://www.pewresearch.org/science/2020/12/10/biotechnology-research-viewed-with-caution-globally-but-most-support-gene-editing-for-babies-to-treat-disease/.

104 *Id.*

105 *Id.*

not provide any explanation; however, by 2020, Dr He's unethical experiment had been widely publicized. His misdeeds may have provoked some people or soured them on the technology. Whatever the reason, the negativity bias ensures that a downward trend will attract notice. Congress would likely refuse to repeal the moratorium unless public opinion improved.

Finally, under the Lander plan, it is not enough that the public finds a specific use of HGE appealing; there must be broad societal consensus on the question of whether to move forward with HGE at all.[106] This requirement presents a serious stumbling block, as its proponents no doubt intend. The reservations expressed in the above polls suggest that some people who like the idea of helping babies avoid disease might nevertheless resist HGE due to concerns about other potential uses of the technology.

IV.B. Status Quo Bias

That the public has not yet embraced HGE is not entirely surprising. As Section III.A explained, the status quo of human reproduction includes only coitus and standard ARTs, and the status quo of the human genome is the genome in its present form, without modification. The status quo bias can be expected to anchor public opinion in favor of human reproduction and the human genome as they currently exist. The key question is whether other factors might counteract this bias and increase public support for HGE, particularly correction of mutations that cause serious monogenic diseases.

IV.B.i. Changing the Status Quo

Repeated exposure makes human beings like things and people better.[107] This tendency helps to explain why we prefer the status quo; but it also suggests that repeated exposure can facilitate changes in decisions. The history of IVF offers an example. As noted above, Louise Brown, the first baby conceived through the technology, was born in 1978.[108] Public polls conducted in the 1970s indicated that 85 per cent of respondents wanted the technology banned.[109] However, as the years passed and millions of babies were born through IVF,[110] opinion shifted. In 2010, Robert Edwards won the Nobel Prize in Physiology or Medicine in recognition of his work developing IVF.[111] Twelve years later, companies pay for employees to freeze their eggs[112] and patients

106 Lander et al., *supra* note 14, at 168.

107 Eidelman & Crandall, *supra* note 44, at 271–72.

108 *World's First Test Tube Baby Born*, *supra* note 77.

109 Mark D. Eibert, *Human Cloning: Myths, Medical Benefits and Constitutional Rights*, 53 Hastings L.J. 1097, 1102 (2002).

110 Susan Scutti, *At Least 8 Million IVF Babies Born in 40 Years Since Historic First*, CNN (Jul. 3, 2018), https://www.cnn.com/2018/07/03/health/worldwide-ivf-babies-born-study/index.html.

111 Press Release, The Nobel Prize (Oct. 4, 2010), https://www.nobelprize.org/prizes/medicine/2010/press-release/. Edwards developed IVF together with Dr Patrick Steptoe, who died prior to 2010 and thus could not receive the Nobel Prize. For more information on the development of IVF, see Robert Edwards and Patrick Steptoe, A Matter of Life (1980).

112 Chris Weller, *What You Need to Know about Egg-freezing, the Hot New Perk at Google, Apple, and Facebook*, Business Insider (Sept. 17, 2017), https://www.businessinsider.com/egg-freezing-at-facebook-apple-google-hot-new-perk-2017-9.

discuss their fertility treatments publicly.[113] Although the Roman Catholic Church still rejects IVF,[114] imposition of a moratorium or legal ban would be unthinkable today.

HGE could enjoy the same trajectory, evolving over time from outrage to blessing. As Section III.A explained, once people procreate via HGE, their conduct and children will expand the public's perception of human reproduction and the human genome. However, if Congress enacts a moratorium, parents will not employ HGE and children will not be born through the technology. As a result, the public will not be exposed to such parents and children, attitudes will not change, and there will be no consensus in favor of repeal.

Furthermore, statutes may also be difficult to change due to the status quo bias.[115] As this author has noted previously, the Congressional appropriations rider that currently prevents the FDA from acknowledging receipt of applications to conduct clinical trials of HGE has been renewed year after year perhaps due to status quo bias.[116] If Congress abandons this indirect approach and enacts legislation that explicitly imposes a moratorium for 5 years or more, that moratorium will become the legal status quo and will benefit from a bias against eliminating it.[117] This legal status quo bias, when coupled with existing reproductive and genomic status quo biases, would make it even more difficult to build public support for ending the moratorium.

IV.C. Negativity Bias

Status quo bias is not the only psychological factor that could impede the consensus necessary to lift a moratorium. This section explains that the negativity bias is also relevant for two reasons. First, Dr He's unethical experiment made a bad first impression. Clinical trials that deliver offspring free of monogenic diseases could counter this bad impression; each healthy birth would build public acceptance. However, a moratorium will prevent such trials. Second, by implying that HGE is bad, the moratorium will recruit the negativity bias to ensure its own continuation.

IV.C.i. From Bad to Good

As Section III.B explained, the public's experience with HGE to date has been limited to Dr He's reckless experiment and the ensuing scientific, bioethical, and media uproar. The negativity bias predicts that this experiment and its sequelae will be long remembered and will color attitudes toward HGE and persons born through it. Indeed, as the polls discussed above suggest, the experiment may already have caused public support

113 Eg Tanya Selvaratnam, The Big Lie: Motherhood, Feminism, and the Reality of the Biological Clock (2014); Sheila Wijayasinghe, *As a Doctor, I Helped Women Trying to Conceive. Then I Became a Patient*, The Globe and Mail (May 16, 2017), https://www.theglobeandmail.com/life/health-and-fitness/health/what-one-doctor-has-learned-as-an-infertility-treatmentpatient/article35006673/.

114 The Roman Catholic Church considers IVF unacceptable for two reasons: embryos are lost in the process; and the technology disassociates procreation from the conjugal act (sexual intercourse). Congregation for the Doctrine of the Faith, *Instruction Dignitas Personae on Certain Bioethical Questions*, Vatican City paras. 14–16 (Sept. 8, 2008), https://www.vatican.va/roman_curia/congregations/cfaith/documents/rc_con_cfaith_doc_20081208_dignitas-personae_en.html.

115 Cf. Samuelson & Zeckhauser, *supra* note 43, at 45 (noting that public and private policies tend to persist due to status quo bias).

116 Macintosh, *supra* note 7, at 274.

117 *Id.*

for therapeutic HGE to decline. But again, the key question is whether other factors might counteract this bias and increase public support for HGE, especially correction of mutations that cause serious monogenic diseases.

As Section I noted, good can overcome bad through force of numbers.[118] Let us consider how that principle may apply here. Suppose Congress drops the appropriations rider that currently prevents the FDA from receiving applications for clinical trials. Suppose further that HGE technology is perfected and the FDA greenlights its use to correct mutations that cause serious monogenic diseases. Then, children who would have died prematurely will instead be born healthy and enjoy normal lifespans. The more such children are born and the more stories the media publish on them and their happy parents, the greater the odds that public opinion will shift in favor of HGE, or at least, that particular use.

Again, however, if Congress enacts a 5-year moratorium, children will not be born through HGE during that period. The public will not be exposed to happy parents and healthy children, public opinion will not change, and consensus in favor of correcting mutations that cause serious monogenic diseases will not emerge.

Moreover, as Section II.B explained, we consider information more truthful when it is presented in a negative frame rather than in a positive frame. Legislation that prohibits use of HGE, even temporarily, places the technology in a negative frame by marking it as problematic for the reasons legislators articulate. The negativity bias predicts that the public will believe this negative judgement and the reasons for it. Such beliefs will, in turn, make it harder to improve public attitudes toward HGE and correction of mutations.

Another theory that is distinct from the negativity bias but leads to a similar conclusion should be mentioned here. As Richard McAdams has suggested, in a democracy, legislators who wish to maintain their elected positions have an interest in accurately determining the values of their constituents; thus, laws they enact reflect their private information about such values. The laws then signal the values to the public, which, in turn, updates beliefs and behavior to align with those values.[119] In this sense, laws serve an expressive function, at least when they are publicized (ie legislative activities or outcomes are widely reported so that legislators have reason to fear public opinion.)[120]

The existing 'de facto' moratorium on HGE, imposed via an obscure rider to appropriations bills, has not been widely publicized and thus may not correlate with or signal constituent values. However, suppose Congress openly debates a bill to impose a 5-year moratorium on HGE. The topic—altering human gametes or embryos for the purpose of conceiving children with specific traits—will be controversial enough to draw media and public attention. Congresspeople who vote for the bill will signal to observers that they have private information that their constituents support it. Further, the reasons they give for supporting the bill will serve as the justifications for shutting the technology down. Once the bill becomes law, the expressive theory predicts that the public will amend its beliefs and behavior to align with the law and

118 Baumeister et al., *supra* note 62, at 361.

119 Richard H. McAdams, *An Attitudinal Theory of Expressive Law*, 79 Or. L. Rev. 339, 358–59 (2000).

120 *Id.* at 362.

its justifications. Opposition to HGE will harden, making it more difficult than ever to develop a consensus in favor of moving forward with the technology.

V. COGNITIVE BIASES AND THE ROOTS OF THE MORATORIUM PLUS CONSENSUS APPROACH

Before this article concludes, it will consider and address likely counterarguments. As explained previously, the Lander plan requires that a nation establishes supermajoritarian consensus in favor of proceeding with HGE and the specific use. In justification, Lander and his colleagues raise not only safety and efficacy issues but also social, ethical, and moral concerns. They cite the stigmatization of disabled persons, pressure on parents to enhance children, psychological harm to children with edited genomes, moral objections to redesigning our biology, unequal access that increases inequality, genetic enhancement that leads to subspecies, and harm to future generations.[121]

Lander and his colleagues did not originate these concerns. Rather, over the past 20 years, certain academics and bioethicists have promoted them[122] while others have critiqued them.[123] Although this brief article cannot address these concerns at length, a few observations are warranted. Certain concerns, like parental pressure or redesigning human biology, apply only to genetic enhancements. Others, such as social stratification, speciation, and harm to future generations, are speculative and biologically implausible.[124]

Few of these concerns apply to correcting mutations that cause serious monogenic disease to common sequences that do not cause disease. To be sure, correcting mutations could result in fewer persons with serious monogenic diseases; but rather than condemn future children to sicken and die, governments could prevent the stigmatization of existing persons with those diseases through education and anti-discrimination laws.[125] And substitution of common sequences for deleterious mutations may affect future generations but only by making them healthier.

In short, the Lander plan falls into the very trap that the 2020 Report sidestepped. Just as one cannot reasonably define a translational pathway for all possible uses of HGE, one cannot reasonably block all possible uses until society reaches a supermajoritarian consensus on the appropriateness of using HGE at all. HGE's potential uses are too diverse and the concerns are too wide-ranging, speculative, and contestable for a blanket approach.

However, when viewed through a psychological lens, the Lander plan is familiar. By claiming the human genome is a basic feature of humanity and insisting on supermajoritarian consensus before anyone changes it,[126] the authors jealously guard what

121 Lander et al., *supra* note 14, at 167.

122 See, eg Francis Fukuyama, Our Posthuman Future: Consequences of the Biotechnology Revolution (2003); President's Council on Bioethics, Beyond Therapy: Biotechnology and the Pursuit of Happiness 44–57 (2003); George J. Annas et al., *Protecting the Endangered Human: Toward an International Treaty Prohibiting Cloning and Inheritable Alterations*, 28 American J.L. Med. 151, 173 (2002); Maxwell J. Mehlman, *The Law of Above Averages: Leveling the New Genetic Enhancement Playing Field*, 85 Iowa L. Rev. 517 (2000).

123 See, eg Green, *supra* note 45; Macintosh, *supra* note 31.

124 Macintosh, *supra* note 31, at 52–54; 73–76.

125 *Id.* at 67.

126 Lander et al., *supra* note 14, at 167.

they apparently perceive as the status quo of the human genome. And by listing so many concerns, the authors not only betray a telltale fascination with bad but also exploit negativity dominance.

To explain the latter point, suppose that in the near future, regulators become confident that scientists can correct mutations that cause serious monogenic diseases safely and efficaciously. Public opinion polls also show support for using HGE in this specific way. Legislators may still hesitate to lift a moratorium on HGE. Even if they have never heard of negativity dominance, they may instinctively fear that constituents will blame them if the technology harms a single child even if it also spares other children from sickness and death.

Further, suppose these legislators follow the Lander plan and agree not to lift the moratorium unless there is broad societal consensus on the question of whether to move forward with HGE at all. Accordingly, they commission another public opinion poll on that question. Respondents understand that HGE can deliver benefits in specific situations (pros) but have also heard that the technology may impose costs in other situations (cons), as discussed in Section IV.A. The principle of negativity dominance predicts that respondents will deliver a holistic appraisal of HGE that is more negative than the sum total of their subjective evaluations of the pros and cons. Thus, poll results may indicate general opposition to the technology despite support for correcting mutations that cause serious monogenic diseases. Legislators may then decide to maintain the moratorium without realizing that hidden psychological factors affected the poll.

VI. CONCLUSION

As psychologists Eidelman and Crandall note, human beings act on the assumption that the future will be similar to the past.[127] When it comes to human reproduction and the human genome, HGE poses a challenge to this notion. This challenge has provoked a backlash from critics who have raised social, ethical, and moral concerns and demanded suspension of HGE until there is broad societal consensus to move forward.

However, this policy prescription ignores the power of cognitive biases that tilt the psychological playing field against HGE. The status quo bias primes us to prefer human reproduction and the human genome as they currently are. The negativity bias ensures that we remember Dr He and his unethical experiment rather than the as yet untapped potential of HGE to do good in the world. These biases already present barriers to implementing HGE even in its most benign and therapeutic forms. If a legal moratorium is imposed, it will bring those same biases into play in its defense. By blocking use of the technology, the moratorium will prevent healthy births that could expand the reproductive and genomic status quo and counteract the negative impression that Dr He and his experiment have made. Furthermore, a formal moratorium will itself become a legal status quo to be defended and will further bias the public against HGE by placing the technology in a negative legal frame. As a result of these subconscious psychological influences, it will become difficult, if not impossible, to build the super-majoritarian consensus that critics of the technology demand to lift the moratorium.

127 Eidelman & Crandall, *supra* note 44, at 277.

This article concludes that the Lander plan, or any other proposal that blocks HGE until broad societal consensus is achieved, threatens medical progress and should not be adopted. Rather, Congress should drop the annual rider on appropriations and allow the FDA to receive applications for clinical trials. Federal regulation will then ensure that HGE is not used in the USA before it is safe enough for initial trials, while reassuring scientists that basic research is worthwhile because it holds the potential to bear clinical fruit. The 2020 Report, with its carefully delineated translational pathway, will guide scientists as they amass the data needed to submit a successful application. Regulators who implement the pathway will find that their decisions align with polls indicating public support for altering an unborn baby's genes to treat a serious disease or condition the baby would otherwise have. If healthy offspring are born, public support for HGE will strengthen, just as public support for IVF once did. Thus, federal regulation will expand the reproductive paradigm through positive outcomes.

Some readers may fear that a regulatory approach will provoke backlash from conservatives who will characterize it as an arrogant privileging of scientific expertise over traditional values and public sentiment. This concern is reasonable given how politicized scientific issues have become, particularly when human embryos are involved. For example, in 2001, President George W. Bush, a Republican, adopted a policy limiting federal research funds to a handful of existing human embryonic stem cell lines. Scientists and their Democrat allies in Congress tried and failed to overturn this policy.[128] After President Obama, a Democrat, took office in 2009, the National Institutes of Health issued more generous funding guidelines. Conservatives challenged these guidelines in court, and the suit dragged on until it was finally rejected in 2013.[129] However, unlike embryonic stem cell research, HGE has the rare potential to harmonize scientific and moral objectives. If the technology can be perfected, scientists may be able to 'treat' embryos by correcting genetic mutations. Women who believe in the right to life can then receive and carry those embryos to term rather than discarding them.[130]

Other readers may argue that allowing HGE to proceed subject only to safety and efficacy regulation deprives society of its voice and violates democratic norms. However, HGE is already subject to democratic controls in the form of the federal statutes that mandate such regulation. It will take years to perfect HGE and convince the FDA that a specific application is safe enough for clinical trials to begin.[131] In the meantime, society will have ample opportunities to discuss the pros and cons of this new technology; and if this discussion identifies harmful uses, lawmakers can enact further legislation as needed. But by treating HGE like any other new technology, this regulatory approach will signal that positive change is possible and will soften the effect of the status quo and negativity biases. And by softening the effect of the biases, this approach will promote rather than hinder the democratic process.

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128 Kerry Lynn Macintosh, *Psychological Essentialism and Opposition to Human Embryonic Stem Cell Research*, 18 J. Tech. L. Policy 229, 254–58 (2013).

129 *Id.* at 258–61.

130 See Macintosh, *supra* note 31, at 13–14 (noting that some prospective parents who cherish human life may prefer HGE to discarding affected embryos).

131 Greely, *supra* note 31, at 82.

Finally, in reaching its conclusion, this article benefits from the 2020 Report and its transitional pathway for cases in which couples carry genetic mutations causing serious monogenic diseases. This article also draws support from the United Kingdom, where the Nuffield Council on Bioethics has called for debate rather than consensus.[132] In this nascent medical field, adopting policies that load the psychological dice against HGE could discourage researchers from entering the field, or unnecessarily slow the development of a technology that could spare the children of carriers of dangerous mutations from suffering and death. To be sure, these children may be few in number; but in a compassionate society, that fact does not diminish, let alone negate, the urgency of finding a solution.

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132 Nuffield Council on Bioethics, *supra* note 5, at 141.