



BETWEEN MORAL DUTY AND SOCIAL UTILITY: REASSESSING THE ETHICS OF HUMAN GENETIC MODIFICATION

Hemant Sharma

Research Scholar, Department of Philosophy, University of Rajasthan, Jaipur.

Abstract

Human genetic modification, enabled by recent breakthroughs in genome-editing technologies such as CRISPR-Cas9, has opened unprecedented possibilities for treating genetic disorders and enhancing human capabilities. Yet these advances raise profound moral questions regarding human dignity, justice, and the boundaries of permissible biomedical intervention. This paper reassesses the ethics of human genetic modification through two foundational moral structures: deontology and utilitarianism. The deontological lens emphasizes duty, autonomy, and respect for persons, while the utilitarian approach evaluates outcomes and aggregate welfare. Drawing on recent scholarship, this paper argues that a balanced ethical framework—integrating duty-based constraints with welfare-oriented evaluation—is essential for guiding future genetic interventions. Such synthesis can promote therapeutic progress while safeguarding moral integrity, equity, and human dignity (Doudna & Sternberg, 2017).

Keywords: *Genome editing, CRISPR-Cas9 technology, bioethical issues, Utilitarianism, deontology.*

Introduction

The ability to alter human heredity represents one of the most significant frontiers in modern science. Gene-editing technologies such as CRISPR-Cas9 have evolved from experimental tools to clinically applicable systems, capable of correcting genetic disorders at their molecular source (Ayanoğlu2020). These advancements hold the potential to eradicate diseases such as cystic fibrosis, Huntington's disease, and sickle-cell anemia. However, the same technology also invites possibilities for germline manipulation and enhancement, where interventions may alter traits or capacities beyond therapeutic intent (McGee & Caplan, 2019).

Ethical evaluation of such transformative interventions requires normative clarity. Two philosophical traditions—deontological ethics and utilitarian ethics—offer contrasting yet complementary perspectives on the moral permissibility of genetic engineering (Beauchamp & Childress, 2013). While deontology focuses on duties and intrinsic moral rules, utilitarianism emphasizes outcomes and overall welfare. This paper explores how these frameworks inform moral reasoning about genetic modification and suggests an integrated ethical approach that respects human dignity while pursuing social benefit.

Ethical Context and Contemporary Debates

Recent scholarship demonstrates that ethical debates on genome editing centre on five recurrent themes: risk and safety, autonomy and consent, justice and equality, societal consequences, and regulatory governance (Wiley, 2024). A 2024 systematic review of CRISPR embryo editing revealed deep concern about intergenerational responsibility and distributive justice, particularly in germline interventions. Empirical studies also indicate public ambivalence—support for disease treatment coexists with anxiety over enhancement and inequality (Joseph, 2022).

The controversial case of He Jiankui, who announced the birth of genetically edited babies in 2018, catalyzed global reflection on ethical boundaries and the inadequacy of current oversight mechanisms (The Regulatory Review, 2024). In this context, philosophical inquiry becomes indispensable for



grounding biomedical governance in coherent moral reasoning. The following sections examine the respective contributions of deontology and utilitarianism to this task.

The Deontological Perspective: Duty, Dignity, and Constraint

Deontological ethics-derived from deon, meaning “duty”-judges the morality of actions according to adherence to universal moral principles rather than outcomes (Kant, 1785/2012). This ethical framework, rooted in Immanuel Kant’s *Groundwork of the Metaphysics of Morals*, maintains that human beings possess intrinsic worth and must never be treated merely as means to an end. In the context of human genetic modification, deontology requires moral reflection on the intent, duty, and respect for autonomy guiding scientific action rather than on its potential social or medical benefits alone.

The Moral Law and the Categorical Imperative

Kant’s categorical imperative- “Act only according to that maxim whereby you can at the same time will that it should become a universal law”-implies that an ethical genetic intervention must be universally permissible without contradiction (Kant, 1785/2012, p. 38). If enhancement-oriented genetic engineering were universally practiced, the result could be a society that instrumentalizes human life, undermining equality and respect (Chadwick & Levitt, 2017). Such actions fail Kant’s test of universalizability.

Moreover, Kant’s second formulation-to treat humanity “always as an end and never merely as a means”-prohibits using embryos or potential persons for experiments serving parental or societal ambition. Regardless of intended benefits, treating human life as a means to technological progress violates deontological duty (Beauchamp & Childress, 2013).

Respect for Autonomy and Informed Consent

Deontological bioethics centers autonomy as a moral duty. Competent adults can consent to somatic gene therapy that alleviates suffering, but germline editing presents a moral paradox: it alters the lives of future persons who cannot give consent (Glover, 2006; Wiley, 2024). Acting on behalf of those who cannot choose raises deep ethical tension. National and international guidelines often reflect this reasoning, emphasizing that irreversible germline modifications lack the moral authorization of those affected (World Health Organization [WHO], 2021).

Human Dignity and the Limits of Manipulation

The Kantian concept of *Würde*-human dignity-holds that all persons have absolute moral value. Genetic manipulation for enhancement or social preference risks reducing life to a product of design, a form of “genetic consumerism” (Habermas, 2003). As Habermas argues, designing the genetic identity of another person compromises their autonomy and capacity for moral self-determination. Such practices undermine the moral equality of persons and perpetuate a culture of perfectionism contrary to respect for dignity (Kuhse& Singer, 2013).

Duties of Beneficence and Non-maleficence

Deontological ethics is not blind to welfare; Kant himself acknowledges duties of beneficence and non-maleficence. Gene therapy aimed at curing disease fulfills the moral duty to alleviate suffering, provided it respects autonomy and universal moral law (Joseph, 2022). However, when potential harm outweighs foreseeable good-as in uncertain or irreversible germline editing-deontology imposes restraint. Acting without full understanding of long-term risks breaches the duty to avoid harm (Ayanoglu2020).



Justice, Fairness, and Universalizability

Deontology also frames justice as a duty. If only wealthy populations can access genetic interventions, resulting inequalities violate the principle of moral equality (Buchanan & Powell, 2016). A moral society cannot rationally will a world where worth depends on engineered traits. Therefore, equitable access and protection against genetic discrimination are categorical moral imperatives (McGee & Caplan, 2019).

In brief, Deontology thus establishes non-negotiable moral boundaries: respect for autonomy, preservation of dignity, and commitment to justice. It supports therapeutic interventions that meet these duties-such as somatic gene therapy-but rejects germline or enhancement practices that commodify or instrumentalist human life. As Wiley (2024) observes, deontological reasoning offers “a moral compass that tempers scientific ambition with the enduring principle of human respect.”

The Utilitarian Perspective: Welfare, Consequences, and Collective Good

In contrast to deontology’s rule-based orientation, utilitarianism evaluates moral action through its consequences. Emerging from the works of Jeremy Bentham and John Stuart Mill, utilitarianism defines the right action as that which produces the “greatest happiness for the greatest number” (Mill, 1863/2015). In genetic modification ethics, this framework emphasizes welfare maximization, harm reduction, and the equitable distribution of benefits (Driver, 2016).

Act and Rule Utilitarianism

Act utilitarianism assesses individual cases by their specific outcomes-e.g., a gene therapy that cures a fatal condition is justified if the patient’s increased welfare outweighs risks (Doudna& Sternberg, 2017). Rule utilitarianism, however, judges the morality of general principles or policies. Policies that restrict germline editing to medically necessary contexts might, in the long term, maximize social welfare by preserving trust and minimizing misuse (Wiley, 2024). Thus, utilitarian ethics provides both micro- and macro-level tools for guiding genetic policy.

Maximizing Benefits

From a utilitarian perspective, eliminating severe suffering through therapeutic genetic interventions constitutes a clear moral good. By curing inherited diseases, society enhances both individual and collective well-being (Joseph, 2022). Mill’s qualitative utilitarianism also recognizes higher forms of happiness-those tied to human flourishing and freedom. Genetic therapy that restores autonomy or health satisfies this principle of higher pleasure by enabling individuals to pursue meaningful lives (Buchanan & Powell, 2016).

Managing Risk and Uncertainty

Utilitarian reasoning requires rational calculation of risk and benefit. Germline interventions present uncertain long-term effects, including potential off-target mutations or generational consequences (Ayanoğlu2020). When risks are unknown or catastrophic, precaution becomes a utilitarian duty. The **precautionary principle** aligns with consequentiality thinking when restraint prevents widespread harm or loss of trust in science (Pandos, 2024). Prudence thus becomes a moral necessity rather than a constraint on progress.

Equity and Social Distribution

Although utilitarianism has been criticized for neglecting fairness, modern rule utilitarianism integrates distributive justice as a component of social utility. If only privileged groups access enhancements, resulting inequality reduces collective happiness through resentment and social



division (McGee & Caplan, 2019). Hence, equitable access to safe therapies is essential not merely for justice but for maximizing long-term societal welfare (Beauchamp & Childress, 2013).

Global Welfare and Policy Coordination

At a global level, utilitarian reasoning supports international coordination and transparency in genetic governance. Cooperative oversight maximizes collective good by preventing unethical experimentation and regulatory evasion (The Regulatory Review, 2024). The World Health Organization (2021) and UNESCO (2023) emphasize that shared ethical standards enhance social trust, stability, and global welfare. Utilitarian ethics therefore underwrites policies that balance innovation with safety, justice, and global equity.

Limitations of Utilitarian Ethics

Despite its strengths, utilitarianism faces enduring challenges. A purely outcome-based calculus risks legitimizing coercive or eugenic interventions if they promise aggregate benefits (Kuhse & Singer, 2013). Moreover, measuring “happiness” across generations is epistemically uncertain. Consequently, contemporary ethicists advocate a constrained utilitarianism-bounded by deontological principles of dignity and autonomy (Savulescu & Bostrom, 2009). This synthesis respects both outcome-oriented reasoning and inviolable moral limits.

In short, Utilitarian ethics provides a pragmatic, welfare-based justification for responsible genetic innovation. It endorses interventions that reduce suffering, increase health, and promote equitable prosperity-while requiring caution, transparency, and fairness. Properly constrained, utilitarianism transforms from a permissive calculus into a framework for ethical governance rooted in social welfare and moral accountability (Pandos, 2024; Wiley, 2024).

Conclusion: Synthesizing Duty and Consequence

Human genetic modification compels a re-examination of what it means to act morally in a technologically advanced age. Deontological ethics guards the sanctity of human dignity and autonomy, while utilitarianism demands consideration of tangible outcomes and social welfare. Neither framework alone suffices: an absolute duty-based morality risks paralyzing progress, whereas a purely consequence-based ethic risks moral overreach.

The ethical path forward lies in integrating moral duty with social utility—a synthesis sometimes described as principled consequentialism (Savulescu & Bostrom, 2009). Under this model, scientific action is guided by deontological imperatives—respect for autonomy, justice, and dignity-while outcomes are evaluated through utilitarian reasoning emphasizing welfare, equity, and sustainability.

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