



H·I·S
HARARE INTERNATIONAL SCHOOL

66 Pendennis Rd, Harare, Zimbabwe

ZIMUN XI

The Cost of Innovation:

*Navigating the Ethical Responsibilities of Technological
Advancements and Societal Change for Inclusive, Sustainable
Development in a Globalised World*



World Health Organization

*Evaluating the societal and ethical implications of technologies like
CRISPR and vaccine development in reducing health inequalities*

Committee: World Health Organization (WHO)

Issue: Evaluating the societal and ethical implications of technologies like CRISPR and vaccine development in reducing health inequalities

Student Officer: Yohanna Masresha

Position: --

INTRODUCTION

Biotechnologies, like CRISPR genome editing, and present-day vaccine development, introduce countless transformative opportunities to address evolving global health challenges. However, these kinds of technological innovations also raise complex societal and ethical concerns, especially regarding their impact on health inequalities. CRISPR has an increasing potential to treat severe genetic disorders and newly developed vaccines' play a key role in combating infectious diseases highlighting critical issues in accessibility, equity and the risk of exacerbating existing disparities in third-world countries. Ensuring that these technologies are developed and distributed amongst societies ethically and without inequality requires the creation of robust regulatory frameworks to promote equitable access of these developing biotechnologies.

CRISPR-Cas9 as an emerging technology has significant potential for treating genetic diseases, but also presents certain safety and ethical challenges. Safety concerns include off-target effects, resulting in unintended mutations, and the potential for immunity of certain healing components in CRISPR. Ethical implications of CRISPR are pronounced in germline editing, where changes are hereditary and can have severe impacts on future generations, raising concerns about consent, autonomy, and the long term effects on the human gene pool. Another ethical challenge of

CRISPR is the possibility of use for enhancement purposes, rather than for therapy, which sparks fear for new forms of eugenics and increased social inequality, as access to these biotechnologies may be limited to only affluent communities. This raises the question of the societal inequalities and economic discrepancies that come as a result of the use of such a helpful biotechnology like CRISPR.

The rapid advancement of vaccine development technology in healthcare presents both opportunities and challenges in addressing health inequalities. Innovations like digital healthtools, telemedicine, and developing artificial intelligence have the increasing potential to enhance the access of biotechnologies and medical services to marginalized communities, facing barriers to due factors such as geographical location, socioeconomic status, or systemic inequalities. However, the effectiveness of these technologies in reducing health disparities relies on their equitable implementation and the consideration of possible ethical implications. As healthcare systems begin to integrate these technologies, it is becoming increasingly essential to evaluate their potential impacts on health equity, ensuring that they do not unintentionally reinforce existing health disparities.

DEFINITION OF KEY TERMS

- **CRISPR** - stands for Clustered Regularly Interspaced Short Palindromic Repeats, it is a genetic engineering tool that uses a sequence of DNA and its associated protein to edit the base pairs of a gene
- **Biotechnologies** - the exploitation of biology to develop new products, methods, and organisms to improve human health and society

- **Ethics** - the study of moral principles that govern what may be considered right or wrong in human behaviour and societal decision making
- **Health Inequalities** - the systematic, avoidable, unfair differences in health status between different groups of people, influenced by socio-economic status, wealth, politics, environment, etc.
- **Pleiotropy** - the phenomenon in which a single gene results in two or more unintended, seemingly unrelated, traits

BACKGROUND ON THE ISSUE

- **How did the issue first begin?**

The issue of CRISPR and vaccine development's ethical implications in reducing health inequalities first began just after the first publications showing CRISPR's use in human cells. Concerns were raised about the fairness, justice, and access to these technologies for minority populations. Early discussion began at a conference in Napa Valley, California, in January 2015, organized to discuss the scientific, medical, legal, and ethical issues related to genomic modification. A report on these results was released in March 2015.

- **Has the issue developed over time?**

Based on the report published in March 2015, and more recent research on the topic since then, the ethical issues around CRISPR technology appears to have escalated over time. The rapid rise of CRISPR-Cas9 has led to new, emerging bioethical, social, and legal issues in medicine,

agriculture, livestock and the environment. The increasingly popular usage of CRISPR to genetically modify human germline cells and embryos has also raised extreme concerns about the bioethical issues of the technology, such as undesirable changes in the genome and concerns about abuse of the technology & eugenics.

- **Who is affected by this issue and how?**

Affected populations include:

1. **Minority Populations:** Ethnic or racial minorities may experience greater health burdens and may have limited access to CRISPR technologies and safe, efficiently transported vaccines.
2. **Low-Income Communities:** Due to the high production cost of CRISPR and rising cost of certain vaccines, there is limited access to these biotechnologies for those in poorer communities with lower socioeconomic status, worsening the current health inequalities.
3. **Vulnerable Individuals:** Those with genetic diseases or individuals in resource-limited settings can benefit significantly from CRISPR if access becomes available and equitable.
4. **Future Generations:** The use of CRISPR for germline editing may create disparities if only those of higher socioeconomic status or in more affluent communities can afford to eliminate genetic diseases.

- **Why is this issue pressing/relevant to the international community?**

This issue is relevant to the global community for a number of reasons, but most notably:

1. Unequal Access: Disadvantaged groups may face a ‘gene gap’, due to the barriers they face accessing CRISPR.
2. Widening Disparities: If advancements in gene editing technology and vaccine development primarily benefit more privileged groups, then in the long-term, wider existing health disparities could increase.
3. Ethical Concerns: Historically, mistreatment in medical research may lead to distrust of biotechnologies, such as CRISPR amongst minority populations.
4. Disease Prevalence: CRISPR has the potential to address health issues related to vector-borne diseases and food insecurity across the globe.
5. Economic and Environmental Effects: CRISPR can be used for agricultural applications can help combat food insecurity in developing third-world countries

CURRENT CONTEXT

- What is the current state of the issue?
 - The current state of the issue of the numerous societal and ethical implications of technologies like CRISPR and vaccine development in reducing health inequalities is as follows:
1. Health Equity Concerns: There is an increasing risk that the CRISPR technology and newly developed vaccines may worsen existing health inequalities between developing nations and wealthier communities, as well as exacerbating socioeconomic divisions within communities.

2. **Underrepresentation in Research:** Underrepresentation in genomics research has severely affected minority populations, leading to growing gaps in the effectiveness and equitable distribution of CRISPR-Cas9 tools and therapies for these groups.
3. **Unequal Access:** Unequal distribution of CRISPR therapies and/or newly developed vaccines is predicted to be unequal, available solely to the citizens of higher socio-economic status in developed nations, hindering efforts to eliminate health inequalities.
4. **Ethical Issues:** Ethical concerns, raised by researchers and activists across the globe, about heritable polygenic editing, risks of pleiotropy (unintended effects), and the possible impacts on future generations have recently begun to increase.
5. **Need for Guidelines/Frameworks:** There is an urgent need for an effective framework and worldwide legislation to ensure the safe use of CRISPR, with the careful consideration of diverse opinions from across the globe.
6. **Community Engagement:** Engaging both majority and minority populations from a wide range of nations in gene-editing research through community-based approaches, is essential to promoting equitable access of developing biotechnologies.

Recent Events and Statistics

1. **Underrepresentation in Statistics:** An analysis published in 2016 found that only 4% of participants in genome studies were of African, Hispanic/Latino, or Indigenous ancestry.
2. **International Summits:** The 3rd International Summit of Human Genome Editing in 2024 focused mainly on the importance of equitable access to gene-editing technologies for underrepresented populations and countries.

3. Polygenic Editing Concerns: In January 2025, discussions amongst researchers highlighted that heritable polygenic editing could worsen the current health inequalities.
4. Recent Modelling of Health Inequalities: A 2024 *Nature* Article commented that while genome editing may have a positive outcome regarding individual genetic diseases, it could deepen the pre-existing health disparities.

MAJOR COUNTRIES AND ORGANIZATIONS INVOLVED

- Outline the key actors and organizations that are involved in the issue
- Ensure that you explicitly mention how the actor is involved in the issue
 - Are they affected by the issue?
 - Have they caused the issue?
 - Have they tried to solve the issue?

The major countries and organisations involved in the issue of evaluating the societal and ethical implications of CRISPR-Cas9 technology and vaccine development in reducing health inequalities are:

1. United States of America:

- As of recently, the United States has been a key contributing nation for CRISPR research and development, hosting conferences discussing the concerns about equitable access to therapies for minority groups.
- The National Institutes of Health (NIH) has initiated efforts like the ‘All of Us’ study to promote diversity in genomics research

2. People’s Republic of China:

- Considered to be a forefront of CRISPR development and research of controversial human germline editing experiments
- Concerns have recently been raised regarding possible governance mechanisms for gene editing in China.

3. Western European Nations:

- A number of western European countries have discouraged or completely banned research on germline editing, reflecting the ethical concerns raised regarding CRISPR and germline editing.

The main organizations involved in this issue are:

1. IGI - Innovative Genomics Institute:

- The Innovative Genomics Institute has provided resources and contributed to discussions on CRISPR ethics, calling attention to health disparities in LEDCs and the limited access to biotechnologies such as CRISPR.

2. World Health Organization (WHO)

- The World Health Organization has served and continues to serve as a focal point for examining ethical issues related to human genome editing, fostering positive discussions and debates that encourage a wider, more international view of the issue.

3. National Human Genome Research Institute (NHGRI):

- The National Human Genome Research Institute has highlighted the importance of equitable access and application of gene editing technologies to eliminate health inequalities, and advocating for meaningful engagement of minority populations in research.

4. American Medical Association (AMA):

- The American Medical Association has fostered engaging discussions about the justice concerns related to biotechnologies like CRISPR, focusing on promoting equitable access and representation of minority groups in research.

TIMELINE OF KEY EVENTS

- In chronological order detail the main events that relate to the given issue (dates must be included).
- Chairs can include the dates of:
 - Previous and upcoming International Agreements and Conferences addressing the issue
 - Policies and legislation that was developed by any member states to address the issue
 - The release date of important statistics or research findings
 - UN SDG Goal deadlines if applicable to the issue
 - Terrorist attacks
 - Influential mass international or domestic protests
 - Establishment of organizations addressing the issue

NOTE:

- The date/year as well as the title of the event must be in bold followed by a colon
 - The date and the title of the event must be separated by a single dash (-)
 - the description of the event will be placed in the line directly beneath

January 2015 - Conference in Napa Valley, California:

A conference was organized to discuss the scientific, legal, medical, and possible ethical implications related germline editing

March 2015 - Release of Conference Report:

A report on the results of the aforementioned January 2015 conference was released, emphasizing researcher's and the general public's concerns about fairness, justice, access to CRISPR technologies for minority populations and possible health inequalities that would be exacerbated as a result

Circa 2016 - Statistics Detailing Underrepresentation Published:

An analysis revealed that only around 4% of participants in genome studies were of Indigenous, African, or Hispanic/Latino ancestry, highlighting the recent underrepresentation in genomics research.

Circa 2016 - Canadian Assisted Human Reproduction Act:

Human Germline editing is banned under this act, which reflects efforts by member states to address CRISPR's ethical concerns.

2020 - UN SDG Goal 3 Deadline (Health and Well-being):

Not specifically focusing on CRISPR, but aims to achieve universal health coverage, and attempts to reduce international health inequalities before 2040, in direct alignment with the broader goals of the UN to ensure equitable access to health technologies.

2024 - Third International Summit of Human Genome Editing:

An international summit of genome editing that focused on the importance of equitable access to gene-editing technologies like CRISPR-Cas9 for underrepresented populations and countries.

2024 - Nature Article on Health Inequalities:

A 2024 *Nature* article commented that while genome editing may have positive outcomes for certain individual genetic diseases, it could exacerbate pre-existing health inequalities.

January 2025 - Discussions on Polygenic Editing Concerns:

Researchers have just recently highlighted that heritable polygenic editing has the potential to worsen existing health inequalities across the globe.

RELEVANT UN RESOLUTIONS, TREATIES, & EVENTS

- In chronological order briefly outline any actions that the United Nations has taken to address the given issue
- These UN actions can occur in the form of:
 - Resolutions

- Summits
 - Treaties
 - Aid or grants given to member states
 - Generally, any efforts made by the UN to combat/address the given issue
- All UN actions included in this section must have an attached URL link that takes delegates directly to the source of the said action
 - E.g [“ The Paris Agreement”](#)

There are no specific United Nations resolutions or treaties that directly address the ethical implications in reducing health inequalities of CRISPR and modern vaccine development, there have been a number of other related initiatives, such as:

1. [Universal Declaration on the Human Genome and Human Rights\(1997\)](#)

A declaration that emphasizes the protecting of the human genome as the "heritage of humanity"

2. [The Nagoya Protocol \(2014\)](#)

Promotes the universal access to and benefit sharing of genome-editing resources.

3. [WHO on Human Genome Editing](#)

A guide to the essential information on Genome Editing by the World Health Organization.

1. [United Nations Conventions on Biological and Toxin Weapons](#)

A UN framework to regulate biological weapons, relevant in discussions about biotechnology misuse.

[PREVIOUS ATTEMPT TO SOLVE THE ISSUE](#)

- Briefly describe any efforts made by member states, organizations, and other actors to resolve the issue
- These attempts can occur in the form of:
 - Summits
 - Treaties
 - Aid or grants given to member states
 - Generally, any efforts made by any actors to combat/address the given issue

Efforts to address the ethical implications of CRISPR and vaccine development include but are not limited to the following:

1. International Regulatory Harmonization:

Countries like the U.S., U.K., and China are working to harmonize regulations on genome editing technologies for safe and ethical use.

2. Ethical Guidelines and Frameworks:

Organizations have developed guidelines, such as those from the Association for Responsible Research and Innovation in Genome Editing (ARRIGE), to ensure ethical use.

3. Public Engagement:

Public dialogue has been and will continue to be encouraged to integrate societal values and equitable access into CRISPR development.

4. Research Funding:

Governments and organizations fund research on CRISPR's applications, equitable distribution, and ethical considerations.

5. Biosecurity Initiatives:

Discussions focus on revising international agreements to regulate bio-technologies like CRISPR to prevent the possibility of future misuse..

POSSIBLE SOLUTIONS

- As a chair develop a max of 3 possible solutions that can be used to address the given issue

Solution 1: Establishment of a Global Ethical Framework for CRISPR and Vaccine Development

By collaborating with international organizations and fellow member states, develop and implement a universally accepted ethical framework, outlining guidelines for the use of CRISPR

in vaccine development, detailing the equitable access of these kinds of biotechnologies and aiming to minimize health disparities.

Solution 2: Technology Transfer/Capacity Building Programs

By offering training programs, universal technology transfer agreements and collaborative research grants to support member states, capacity building programs in low/middle-income countries can be developed to utilize CRISPR and distribute vaccines effectively.

Solution 3: Equitable Access Initiatives for CRISPR-Cas9 Technologies and Vaccines:

By implementing programs that provide financial support and facilitating distribution networks, it will be ensured that biotechnologies like CRISPR are accessible to all populations, particularly in third-world countries and amongst minority populations.

WORKS CITED

Adli, Mazhar, and Carolyn Brokowski. "CRISPR Ethics: Moral Considerations for Applications of a Powerful Tool." *Journal of Molecular Biology*, 2018,

<https://www.bu.edu/khc/files/2018/10/CRISPR-Ethics-reading.pdf>. Accessed 25 February 2025.

Barney, Nick. "What is Biotechnology? Definition, Types and Applications." *TechTarget*,

<https://www.techtarget.com/whatis/definition/biotechnology>. Accessed 18 February 2025.

"Bioethical issues in genome editing by CRISPR-Cas9 technology." *PubMed*,

<https://pmc.ncbi.nlm.nih.gov/articles/PMC7129066/>. Accessed 17 February 2025.

"CRISPR: A guide to the health revolution that will define the 21st century." *BBC Science Focus Magazine*, <https://www.sciencefocus.com/the-human-body/crispr-a-guide>. Accessed 18 February 2025.

"CRISPR & Ethics." *Innovative Genomics Institute*,

<https://innovativegenomics.org/crisprpedia/crispr-ethics/>. Accessed 18 February 2025.

"CRISPR in Public Health: The Health Equity Implications and Role of Community in Gene-Editing Research and Applications." *PMC*,

<https://pmc.ncbi.nlm.nih.gov/articles/PMC10323846/>. Accessed 25 February 2025.

“Ethical issues of CRISPR technology and gene editing through the lens of solidarity.” *British Medical Bulletin*, 2017, <https://academic.oup.com/bmb/article/122/1/17/3045812>. Accessed 25 February 2025.

“Ethical Issues Regarding CRISPR Mediated Genome Editing.” *PubMED*, <https://consensus.app/questions/safety-ethical-implications-crispr-gene-editing-humans/>. Accessed 17 February 2025.

“Genome editing in humans.” *European Parliament*, [https://www.europarl.europa.eu/RegData/etudes/STUD/2022/729506/EPRS_STU\(2022\)729506_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/STUD/2022/729506/EPRS_STU(2022)729506_EN.pdf). Accessed 25 February 2025.

Gostimskaya, Irina. *CRISPR–Cas9: A History of Its Discovery and Ethical Considerations of Its Use in Genome Editing*, 15 August 2022, <https://pmc.ncbi.nlm.nih.gov/articles/PMC9377665/>. Accessed 18 February 2025.

“Health Ethics & Governance.” *WHO*, <https://www.who.int/teams/health-ethics-governance/emerging-technologies/human-genome-editing>.

“Human Gene Editing Initiative.” *National Academies*, <https://www.nationalacademies.org/our-work/human-gene-editing-initiative>. Accessed 25 February 2025.

“Human Genome Editing.” *World Health Organization*, <https://www.who.int/teams/health-ethics-governance/emerging-technologies/human-genome-editing>. Accessed 25 February 2025.

“Justice in CRISPR/Cas9 Research and Clinical Applications.” *AMA Journal of Ethics*,
<https://journalofethics.ama-assn.org/article/justice-crisprcas9-research-and-clinical-applications/2018-09>. Accessed 25 February 2025.

McCarthy, Joe. “10 Ways CRISPR (gene-editing) can fight poverty.” *Global Citizen*,
<https://www.globalcitizen.org/en/content/10-ways-crispr-gene-editing-can-fight-poverty/>.
Accessed 18 February 2025.

“The Safety and Ethical Implications of CRISPR and Gene Editing in Humans.” *Consensus Academic Search Engine*,
<https://consensus.app/questions/safety-ethical-implications-crispr-gene-editing-humans/>.
Accessed 17 February 2025.

Subica, Andrew M. “CRISPR in Public Health: The Health Equity Implications and Role of Community in Gene-Editing Research and Applications.” *PMC*,
<https://pmc.ncbi.nlm.nih.gov/articles/PMC10323846/>. Accessed 18 February 2025.

“2023 Human Genome Editing Summit.” *Royal Society*,
<https://royalsociety.org/science-events-and-lectures/2023/03/2023-human-genome-editing-summit/>. Accessed 25 February 2025.

“What are the Ethical Concerns of Genome Editing?” *National Human Genome Research Institute*, 3 August 2017,
<https://www.genome.gov/about-genomics/policy-issues/Genome-Editing/ethical-concerns>.
Accessed 17 February 2025.

“What are the Ethical Concerns of Genome Editing?” *National Human Genome Research Institute*, 3 August 2017,

<https://www.genome.gov/about-genomics/policy-issues/Genome-Editing/ethical-concerns>.

Accessed 25 February 2025.