Human Germline Enhancement Technology and the Zulu Ontology on the Sanctity of Life: An Ethico-Cultural Inquiry

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DECLARATION

I, Nothando Happy-Girl Shandu, declare that:

i. The research in this thesis, except otherwise indicated, is my original work.

ii. This thesis has not been submitted for any other degree or examination at any other university.

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Date: 04/12/2025

DEDICATION

I dedicate this work first and foremost to the Almighty God, whose grace, wisdom, and unwavering presence carried me through every moment of this journey. Without His guidance and mercy, this accomplishment would not have been possible.

To my beautiful and supportive family: Your love has been my anchor, your encouragement my strength, and your faith in me the light that kept me moving forward. You have walked each step of this path with me, in spirit and in sacrifice.

To my people, *Shandu kaNdaba, Sontshikazi, Ndabezitha, akangakanani, nasentendeni yesandla uyenela. Mthiya ngenkomo abafokazana bethiya ngamahlahla.* Your resilience and pride have shaped the person I am. This victory is yours as much as it is mine.

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My heartfelt thanks go to the University of KwaZulu-Natal for providing me with this invaluable opportunity to pursue and complete my doctoral studies.

I close with Proverbs 3:5-6: *Trust in the Lord with all your heart and lean not on your own understanding; in all your ways acknowledge Him, and He will make your paths straight.* May His guidance continue to lead my path forward.

ABSTRACT

Human germline enhancement is one of the most transformative yet controversial scientific developments of the twenty-first century. By enabling the modification of genetic material in human reproductive cells, this technology introduces the possibility of producing heritable and potentially irreversible biological changes. While germline enhancement offers prospects such as eliminating inheritable diseases and improving human traits, including intelligence, physical appearance, and longevity, it simultaneously raises profound ethical, cultural, and existential concerns about the nature and future of humanity. These concerns become even more pronounced in societies where cultural and spiritual worldviews shape understanding of life, identity, and continuity of generations. In South Africa, for instance, the Zulu community's conception of life as sacred and intrinsically connected to ancestors and future generations provides a unique moral framework for evaluating germline enhancement. Unfortunately, global bioethical discussions often overlook such perspectives, resulting in ethical discussions that are detached from African ontologies.

This study critically examines how the Zulu understanding of the sanctity of life shapes ethical and cultural responses to human germline enhancement. Using a qualitative research design, the study collected primary data through one-on-one interviews supported by secondary literature. The study's theoretical framework combines Principlism and African Communitarian Ethics, offering a dual perspective for interpreting ethical and cultural responses to human germline enhancement. The findings indicate that participants had diverse opinions, expressing concerns about social inequalities, threats to genetic diversity, and potential compromises to human dignity, ancestral relationships, and Christian beliefs about creation. At the same time, they recognize the potential benefits for community health and the collective good that could arise from enhanced cognitive abilities. The analysis explored how participants interpreted germline enhancement in relation to Zulu cultural values, identifying areas of alignment and tension.

A key contribution of the study is the development of a culturally grounded ethical paradigm for human germline enhancement that integrates African communitarian values to guide responsible and culturally sensitive governance of emerging genetic technologies.

TABLE OF CONTENTS

List of Tables

List of Figures

Abbreviations

AfSHG – African Society of Human Genetics

ARM – Alliance for Regenerative Medicine

ASGCT – American Society of Human Genetics

CRISPR-Cas9 – Clustered, regularly interspaced, short palindromic repeat-associated protein 9

GFC-HE – Global Future Council on Human Enhancement

H3Africa – Human Heredity and Health in Africa

HHGE – Human Heritable Genome Editing

HPCSA – Health Professions Council of South Africa

NHREC – National Health Research Ethics Council

HREC – Health Research Ethics Committee

IAAF –International Association of Athletics Federations

ICTRP – International Clinical Trials Registry Platform

ISCT – International Society for Cell and Gene Therapy

IVF – In Vitro Fertilization

MIT – Massachusetts Institute of Technology

MRC – Medical Research Council

NORC – National Opinion Research

PPB – Principle of Procreative Beneficence

PGD – Pre-Implantation Diagnosis

SIENNA – Stakeholder-informed ethics for new technology with high socio-economic and human rights impact

SUSTech – South University of Science and Technology

TALENs –Transcription activator-like effector nucleases

UDBHR – Universal Declaration on Bioethics and Human Rights

UNESCO – United Nations Educational, Scientific, and Cultural Organization

ZFN – Meganucleases, zinc finger nucleases

CHAPTER ONE
GENERAL INTRODUCTION TO THE STUDY

1.0 Introduction

This chapter introduces the entire study. It presents the background and motivation for the research, the research problem, and outlines the research questions and objectives. It also offers a preview of the theoretical framework and the methodology used in the study. Additionally, it discusses the significance of the study and provides an overview of the chapters that follow.

1.1 Background and Motivation

Human germline enhancement is one of the most transformative and controversial advancements in modern science. It entails the alteration of genetic material in human reproductive cells (sperm, eggs, or embryos) in ways that aim to produce heritable changes that are potentially irreversible (Furtado, 2019: 224). This technology holds the promise of eliminating inheritable diseases and enhancing human traits such as intelligence, physical appearances, and longevity (Veit, 2018: 2; Hersch, 2020: 3). However, it simultaneously raises profound ethical, cultural, and existential questions regarding the nature and future of humanity.

Since the early 1960s, genetic research has made significant progress in treating diseases through somatic cell enhancement, which focuses on modifying non-reproductive cells, such as blood, lung, and skin cells (Almeida & Diogo, 2019: 183). These therapies, which solely affect the treated individual, have shown promise in clinical trials for diabetes, sickle cell disease, and cystic fibrosis (Cavaliere et al., 2019: 77; Shozi, 2020: 62). However, germline editing introduces significant ethical concerns because the changes not only affect the individual but also their descendants. Cancer, heart disease, and HIV, all of which are prevalent and burdensome in African contexts, are among those considered suitable for germline intervention (Mboowa & Sserwadda, 2019: 01).

While germline enhancement may offer substantial medical benefits, the associated concerns are equally significant. The ability to select or modify traits such as intelligence, appearance, or immunity raises the prospect of "designer babies" and socially driven eugenics (Friedmann, 2019: 352). These possibilities raise critical questions about human dignity, inequality, and intergenerational justice. Since such modifications are heritable, any unintended consequences

or lack of ethical oversight may result in irreversible changes to the human species, which could weaken widely held beliefs about the sanctity and uniqueness of human life (Hersch, 2020: 6).

The prevalence of Western ethical frameworks in global bioethical discussions makes it particularly important for this study to explore how these ethical issues are understood, interpreted, or responded to within an African worldview. These perspectives, especially their moral, cultural, and spiritual beliefs, are often underrepresented and underexplored in conversations about human genetic enhancement (Andoh, 2017: 34; Okyere-Manu, 2021: 06). This disparity is particularly concerning given the relevance of these technologies to Africa's ongoing burden of genetic and infectious diseases (Shozi, 2020: 62).

Africa is not simply a recipient of technological progress; it is a continent rooted in complex traditions, ontologies, and value systems that inform how life, health, and suffering are understood. In many African cultures, illness is not only viewed through a biomedical lens. For instance, among the Zulu people of South Africa, illness and healing are deeply intertwined with spiritual beliefs and ancestral relationships (Nwoye, 2017: 47). The Zulu cosmology emphasizes a deep connection between the living, the ancestors (amadlozi), and the divine (uMvelinqangi). Within this worldview, suffering may be viewed as a form of spiritual communication, and the birth of a child is not merely a biological event but a sacred gift believed to be mediated by the ancestors. In this context, technologies that interfere with reproduction or alter the genetic makeup of future generations have significant ethical and cultural implications that extend beyond medical benefits or risks. For example, where Western science may offer genetic gender selection, Zulu traditions already include ritual practices for appealing to ancestors regarding gender preferences, practices that, while not guaranteed, are spiritually acceptable and culturally meaningful. Introducing biotechnology into such a cultural space may disrupt long-held practices, displace ancestral authority, and compromise the ontological and moral frameworks that ground human life and community in African thought.

This study, therefore, seeks to critically examine the ethical implications of human germline enhancement through the lens of Zulu ontology, particularly its understanding of the sanctity of life. By engaging with both global biomedical ethics and African bioethics, and using the Zulu community as a focal point, the study aims to assess whether and how genome editing technologies might challenge, reshape, or reinforce core cultural values, moral responsibilities,

and spiritual beliefs about human existence and the preservation of intergenerational continuity. The motivation for selecting the Zulu context is both personal and scholarly. As a Zulu researcher with lived experience and cultural familiarity, the researcher is well-positioned to engage with the rituals, moral expectations, and cultural beliefs that inform everyday life in Zulu communities. Given the Zulu people's cultural and demographic significance within South Africa, their perspectives can offer a critical and illustrative case study for broader African engagement with the ethics of human germline interventions.

Against this backdrop, the study aims to contribute to the African bioethical discourse by examining whether editing the human genome aligns with or challenges African ontological and moral frameworks. It examines whether emerging biotechnologies, designed to modify human traits, are compatible with an African ethic that deeply values ancestry, spirituality, and the sacredness of natural processes. In doing so, the study addresses a scientific and ethical issue of global importance while also reclaiming space for African perspectives in shaping the moral future of humanity.

1.2 Research Problem

The introduction of human germline enhancement technologies into societies with deeply embedded cultural and spiritual worldviews raises complex questions about how such innovations might be ethically navigated. In the South African context, the Zulu community's conception of life as sacred and deeply connected to both ancestors and future generations provides a distinctive moral lens through which to assess these technologies. However, global discussions on germline enhancement rarely incorporate such perspectives, resulting in an ethical discourse that is largely detached from African ontologies.

This lack of cultural inclusion in bioethical debates risks framing regulations and policies in ways that fail to resonate with, or even directly conflict with, local values. In communities where identity, morality, and the meaning of life are deeply tied to intergenerational continuity, ancestral relations, and religious beliefs, altering the human genome at its most fundamental level is not simply a scientific intervention but a potential redefinition of what it means to be human. These tensions highlight the need for a culturally contextualized ethical inquiry that situates human germline enhancement within the moral frameworks of the community it affects. This study explores these tensions by engaging directly with Zulu ontology on the sanctity of life, offering a culturally grounded ethical perspective that contributes to both

African bioethics and global discourse. Therefore, it moves beyond simple cultural preservation to advocate for biotechnological evaluation frameworks that respect moral diversity and reflect the lived realities of African communities facing these technologies.

1.3 Key Research Question

How does the Zulu ontological understanding of the sanctity of life shape ethico-cultural responses to human germline enhancement?

1.4 Research Sub-Questions

1. What is the nature of human germline enhancement?
2. What are the key ethical issues associated with human germline enhancement?
3. What ethico-cultural challenges does human germline enhancement pose to the Zulu ontology?
4. How can insights from Zulu ontology on the sanctity of life, together with Principlism and African Communitarian Ethics, guide the development of a culturally grounded bioethical framework for human germline enhancement in Africa?

1.5 Key Research Objective

To critically examine how the Zulu ontological understanding of the sanctity of life shapes ethico-cultural responses to human germline enhancement.

1.6 Research Sub-Objectives

1. To determine the nature of human germline enhancement.
2. To explore the key ethical issues associated with human germline enhancement.
3. To examine the ethico-cultural challenges that human germline enhancement poses to the Zulu ontology.
4. To assess how insights from Zulu ontology on the sanctity of life, together with Principlism and African Communitarian Ethics, can guide the development of a culturally grounded bioethical framework for human germline enhancement in Africa.

1.7 Preview of the Theoretical Framework

This study's theoretical framework is based on two ethical theories: Principlism and African Communitarian Ethics. These theories were selected for their ability to jointly address the biomedical and cultural implications of human germline enhancement. Principlism provides a structured and widely recognized approach for evaluating ethical issues in healthcare, while African Communitarian Ethics offers culturally grounded moral insights rooted in African philosophical traditions. Together, they enable a balanced assessment of how human germline enhancement interacts with both universal ethical principles and the Zulu conceptions of life. This framework guides the study toward its main objective: to critically examine how the Zulu ontological understanding of the sanctity of life shapes ethical and cultural responses to human germline enhancement technologies. Below is a preview of these ethical theories, which are discussed in detail in Chapter 3.

Principlism

Principlism, developed by Tom Beauchamp and James Childress (1979), is built on four key principles: autonomy, beneficence, non-maleficence, and justice. It is valued for its conceptual clarity and practical application in healthcare decision-making (Ginghină, 2023: 120). In this study, Principlism is used as an evaluative tool to measure the ethical challenges of human germline enhancement against each of its principles.

Autonomy emphasizes respect for individuals' capacity to make their own choices. While decisions to use human germline enhancement might appear to be a matter of personal autonomy, they inevitably carry broader societal implications, especially when parents choose genetic traits for their children. These choices could significantly reduce genetic diversity (Cavaliere et al., 2019: 80). Beneficence requires promoting the well-being of others, while non-maleficence emphasizes avoiding harm (Beauchamp and Childress, 1994: 259). In this context, beneficence involves weighing potential benefits, such as disease prevention and improved human capabilities, against the associated risks and irreversible consequences. Non-maleficence entails the deliberate avoidance of harms that could arise from such interventions. Justice is concerned with equity and fairness (Lindsay, 2005: 5). One of the major ethical concerns surrounding germline enhancement is that it could widen social inequalities if only the wealthy can access it.

African communitarian ethics

African communitarian ethics is a theory that prioritizes collective well-being, emphasizing harmonious relationships, solidarity, and a sense of belonging over individualism (Metz, 2014; Akpa-Inyang & Chuma, 2021). Moral judgements consider both immediate and long-term effects on communal cohesion and (Husien & Kebede, 2017: 60). Early contributors to African Communitarian Ethics, such as John Mbiti, Ifeanyi Menkiti, Kwame Gyekye, and Kwasi Wiredu note that many African societies share common moral values, including the belief that personhood is earned through moral conduct that strengthens communal life (Gyekye, 2004: 90). Social welfare is understood as the flourishing of the community as a whole, grounded in shared values, such as peace and stability. Thus, from an African perspective, morality addresses the dual nature of the self: as a communal being and as an autonomous individual (Husien & Kebede, 2017: 58).

Applied to human germline enhancement, African Communitarian Ethics questions whether altering the human genome protects or weakens the moral bonds of community, intergenerational continuity, and the shared understanding of life's sanctity. This makes it especially relevant for exploring Zulu perspectives, where life is considered deeply interconnected across generations. In this study, African Communitarian Ethics functions both descriptively and prescriptively. Descriptively, it explains and interprets the moral worldview of Zulu communities, and prescriptively, it offers culturally grounded guidance for assessing and responding to whether germline enhancement aligns with or violates that worldview.

1.8 Preview of the Research Methodology

To achieve its main objective of critically examining how the Zulu ontological understanding of the sanctity of life shapes ethical and cultural responses to human germline enhancement, the study will adopt a qualitative research design. Primary data will be collected through one-on-one interviews, supported by secondary sources including books, peer-reviewed journal articles, and other credible online materials. The interview findings will be analyzed in relation to the literature on Zulu cultural values, allowing the identification of key areas of convergence and divergence that address the study's research questions.

The study's population is the Zulu people of South Africa. A sample size of a total of twenty (20) respondents was selected and divided into two equal groups. The first group, referred to as the 'Rural respondents', consisted of closely-related Zulu individuals residing in Nongoma, Zululand. This location was chosen because its residents are widely regarded as active

practitioners of traditional Zulu customs and cultural values. The second group, labeled 'Urban respondents', comprised Zulu individuals residing in the urban areas of South Africa, specifically Pietermaritzburg, Durban, and Johannesburg. These locations were selected because the residents are more exposed to the influences of globalization and formal education, which often shape and transform cultural perspectives. In doing so, the study aimed to compare and contrast perspectives considered traditional with those regarded as contemporary. That is, to determine whether the two groups of Zulu respondents shared similar views on human germline enhancement and the reasons underlying their agreements or disagreements.

To interpret and analyze the data, the study used the grounded theory strategy of inquiry. This theory, developed by Glaser and Strauss (1967)[1], is based on the principles of constant comparison and theoretical sampling, where the researcher derives a general, abstract theory of a process, action, or interaction grounded in participants' views (Fouché & Schurink, 2011: 318; Creswell, 2009: 13). Additionally, the analysis and interpretation of data will be done thematically, guided by pre-selected themes that address key gaps in current discussions on human germline enhancement.

1.9 Significance of the Study

The significance of the study lies in its contribution to understanding the ethical and cultural implications of human germline enhancement within an African context. By examining the Zulu understanding of the sanctity of life, the study offers an African-centered perspective that is underrepresented in existing literature, which is largely informed by Western ethical frameworks. The study focuses on how emerging biotechnologies interact with African values, beliefs, and social norms, providing insights that can inform ethical guidelines, policies, and public discourse. Beyond preserving cultural legacy, the study seeks to develop frameworks for evaluating germline enhancement that respect moral diversity and reflect the lived realities of African communities, thereby promoting more inclusive and contextually relevant bioethical decision-making.

1.10 Structure of the Study

[11] I recognise that the source is outdated; however, because this study aims to develop a culturally grounded bioethical paradigm for human germline enhancement in Africa, grounded theory remains valuable and appropriate for guiding this process.

The study comprises eight chapters, outlined as follows:

Chapter 1: General Introduction to the Study

This chapter introduces the study, providing the background and motivation for the research. It articulates the research problem, presents the research questions and objectives, and discusses the significance of the study. The chapter also provides a preview of the theoretical framework, research methodology, and the study's structure.

Chapter 2: Literature Review

This chapter presents relevant literature that informs the study. It outlines the historical background of human germline enhancement and discusses recent developments in this area. The chapter further examines the current and potential applications of human germline enhancement, highlighting key global ethical debates. Additional themes include contemporary African perspectives on human germline enhancement, South Africa's current ethical and regulatory standing on the technology, and the predominant ethical concerns. Finally, the chapter discusses the ontological and ethical beliefs of the Zulu people, identifying the research gap that the study addresses.

Chapter 3: Theoretical Framework

This chapter details the theoretical framework that guides the study: Principlism and African Communitarian Ethics. Principlism helps the study evaluate the potential benefits, risks, and broader societal implications of human germline enhancement. In contrast, African Communitarian Ethics provides culturally grounded moral insights that describe the values, beliefs, and communal priorities of African societies. It also prescribes how values can inform ethical responses to the technology. This theoretical framework allows for a balanced assessment that integrates universal biomedical principles with culturally specific moral traditions. The chapter further discusses the various strengths and limitations of these ethical frameworks.

Chapter 4: Research Methodology

This chapter outlines the research methodology adopted for the study, detailing the qualitative research design and empirical approach. It describes the study population, the purposive sampling of rural and urban Zulu respondents, and the rationale for their selection. The data collection methods, comprising one-on-one interviews and the use of secondary sources, are

explained, along with the processes of transcription and analysis. The chapter further discusses the strategy of inquiry, including the application of grounded theory and thematic analysis.

Chapter 5: Presentation of Findings

This chapter presents the empirical findings of the study, organized thematically to reveal patterns, similarities, and differences between rural and urban Zulu respondents. It captures the participants' perspectives on human germline enhancement while emphasizing their ethical concerns. The data is presented systematically to align with the study's primary objective, drawing on predefined themes identified in the literature review, such as the potential applications of human germline enhancement, safety and efficacy concerns, and its socio-cultural and religious implications. In addition, the chapter incorporates themes that emerged during the interviews, including the perceived impact of parental genetic choices on future generations and the parallels between Zulu cultural practices and human germline enhancement. These themes form the central points of discussion in the broader discourse on human germline enhancement.

Chapter 6: Discussion and Analysis of Findings

This chapter discusses the study's findings in relation to existing literature and the theoretical framework used in the study. It critically evaluates and interprets the perspectives and ethical concerns expressed by the rural and urban respondents on human germline enhancement. The analysis is thematically organized within the context of the relevant ethical frameworks, highlighting both the potential benefits and the perceived risks of the technology. This thematic structure enables a deeper exploration of how the respondents' views are shaped by cultural, religious, and societal contexts, while assessing whether the findings align with or challenge established theories and literature.

Chapter 7: Towards a Holistic Ethical Paradigm for Human Germline Enhancement from an African Communitarian Perspective

This chapter uses the study's analysis of the respondents' views to propose a holistic ethical paradigm for evaluating human germline enhancement through the lens of African Communitarian Ethics. The paradigm integrates two complementary frameworks: (1) the ethical incorporation of African communitarian values into biomedical assessments, ensuring that evaluations of germline enhancement are inclusive, contextually grounded, and sensitive to African realities; and (2) the development of an independent African bioethical model rooted

in culturally specific worldviews, with particular emphasis on the ontological and moral perspective of the Zulu people in South Africa. The chapter further shows how these combined approaches can guide the responsible adoption of germline enhancement in African settings, while addressing the ethical concerns identified in the study's findings.

Chapter 8: Summary and Conclusion

This chapter provides a summary and conclusion of the study's findings, emphasizing how the research has met its stated objectives and addressed its research questions.

1.11 Conclusion

This chapter introduced the study by outlining its background and motivation, presenting the research problem, and stating the main and supporting research questions and objectives. It provided an overview of the theoretical framework, research methodology and highlighted the significance of the study. The chapter also outlined the structure of the following chapters.
The next chapter presents the study's literature review.

CHAPTER TWO
LITERATURE REVIEW

2.0 Introduction

The previous chapter provided an overview of the entire study, demonstrating the importance of this research, including the research questions, objectives of the study, a brief account of the methodology used in the research, and the theories that will be employed, concluding with a breakdown of each chapter. The current chapter presents the literature review for the study. It is guided by the work of key scholars whose contributions shape the conceptual and ethical foundations of this research, including Cletus Andoh, Bonginkosi Shozi, Donrich Thaldar, Loe Igwe, and Augustine Nwoye. Since the focus of the study is human germline enhancement, the chapter begins by tracing the historical development of the broader field of human genetic enhancement, the field from which germline enhancement technologies emerged. It then outlines the various methods and terminologies often used within genetic enhancement and examines the different categories of enhancement technologies. The chapter then discusses recent advancements and emerging applications, such as efforts to extend life expectancy, physical and cognitive enhancement, and the contentious prospect of designer babies.

The discussion also highlights key ethical concerns raised by these technologies. These include issues of safety and efficacy, the challenge of obtaining consent from future persons, and socio-cultural and religious objections to embryo research. While many countries remain silent or vague on how germline enhancement technologies should be regulated, this chapter considers debates such as the call for a global moratorium on their clinical use (Li et al., 2019: 35). It then examines African perspectives on human germline enhancement, with a focus on South Africa's stance regarding the permissibility of these technologies. Since this study specifically investigates Zulu perceptions of human germline enhancement, the chapter examines the Zulu ontological and ethical beliefs, particularly their understanding of the sanctity of life. It explores how these beliefs shape ethical and cultural responses to germline enhancement. The chapter concludes by emphasizing the gap that the study aims to address.

2.1 Historical Background of Human Enhancement

Since the early 1960s, significant progress in biomedical interventions has transformed efforts to restore and enhance deficient human functions such as hearing, vision, or mobility (Almeida

& Diogo, 2019: 183). Hearing aids, for instance, have evolved into highly sophisticated devices capable of processing auditory information within nanoseconds, faster than the human brain can detect (Bose, 2022: 3). Vision enhancement, however, has a much longer trajectory, tracing back to the invention of spectacles in the 13th century. In the 21st century, scientists developed artificial retinal implants designed to restore partial sight in individuals who are blind. Although this technology has thus far been tested only in virtual simulations, researchers have awaited authorization to commence clinical trials (Henderson, 2022: 01). Additionally, scientists have successfully linked a computer chip to the brain of a paralyzed man, enabling him to regain some mobility in his previously non-responsive limbs. While this breakthrough has been achieved in laboratory settings, researchers are working on making this technology portable for wider use (Ganzer et al., 2020: 4). Collectively, these advances illustrate how biomedical technology offers hope for restoring diverse human functions.

Over time, various technologies and pharmaceutical products originally developed for therapeutic purposes have also been used to enhance normal human abilities. These include "drugs to boost brain power, nutritional supplements, brain-stimulating technologies to control mood or growth hormones for children of short stature" (Almeida & Diogo, 2019: 183). Mark Stern (2013) notes that the current generation often struggles to recognize certain technologies as enhancements because these technologies have become so deeply integrated into everyday life. In his article "You Are Already Enhanced," Stern argues that our everyday technologies have already enhanced us, equipping us with "superpowers" that would make our ancestors question whether we were entirely human. He emphasized that "medical and technological innovations have made us stronger, faster, smarter-often in ways we no longer notice" (Stern, 2013: 1). A prime example is In Vitro Fertilization (IVF), a process that assists couples who cannot conceive naturally. In IVF, a woman takes fertility drugs to stimulate her ovaries to produce multiple eggs, which are then extracted using a hollow needle. These eggs are placed in a petri dish with the partner's sperm, allowing for fertilization. Once the embryos are ready, they are inserted into the uterus, and the pregnancy continues as normal (Almeida & Diogo, 2019: 183). About a hundred years ago, the concept of humans reproducing through artificial means would have been unimaginable.

Cognitive-enhancing drugs such as modafinil, adrafinil, and Alpha Brain are other examples of innovations that emerged in the early 1990s. Commonly referred to as "smart drugs," these pills are primarily used by students, office workers, and soldiers to enhance their memory and

cognitive functions. They promote alertness, concentration, and the ability to reason, which ultimately leads to improved fluid intelligence scores (Moyer, 2016: 16; Manning, 2020: 2). Another example discussed by Stern is plastic surgery. While it may not be considered an everyday technology, it has gained immense popularity and has largely moved into mainstream acceptance. Its origins can be traced to World War I, when surgeons first developed reconstructive procedures to repair the severe facial injuries of soldiers disfigured by chemical weapons (Clark, 2022). After the war ended, many French and British doctors stopped performing plastic surgery. However, American surgeons identified a new market for the practice and began offering it to the general public. Shortly after, plastic surgery procedures were showcased in front of audiences to demonstrate their ease and speed. According to Kaitlin Clark (2022), the number of patients undergoing plastic surgery continues to grow, with 2021 being regarded as the "heyday" of the industry, surpassing previous revenue records. What started as a desperate measure for disfigured soldiers has evolved into a standard practice for anyone seeking a boost in self-confidence. This transformation illustrates how a life-saving technology can, over time, develop into a means of human enhancement.

2.2 Defining Human Enhancement

Human enhancement encompasses a broad spectrum of practices that can be broadly categorized into three main categories: physical, reproductive, and cognitive. These include established medical and technological interventions such as plastic surgery, contraceptive devices, fertility treatments, and gene therapy. Furthermore, human enhancement also extends to emerging prospective areas such as increased life expectancy, physical and cognitive enhancement, mood or personality enhancement, and pre- or perinatal genetic interventions (Bostrom & Roache, 2007: 122), which are discussed in greater detail later in this chapter (pages 24-27). When defining human enhancement, it is essential to distinguish between interventions designed for therapeutic purposes and those aimed at improving or augmenting human capabilities (Menuz et al., 2013: 164). However, this distinction often becomes ambiguous, as therapeutic interventions can sometimes lead to, or be inherently linked with, genetic enhancements (Gaspar et al., 2019: 711).

One of the most widely cited definitions of human enhancement in biomedicine is described as "interventions designed to improve human form or functioning beyond what is necessary to sustain or restore good health" (DeGrazia, 2005: 262). Christian Coenen et al. (2009: 13) define it as:

> a modification aimed at improving individual human performance and brought about by science-based or technology-based interventions in the human body. This definition includes "strong", second-stage forms of human enhancement with long-term, effective or permanent results, as well as "temporary" enhancements. Because it is not related to a specific definition of health, this is a non-medical concept of human enhancement.

Thomas Douglas (2008: 228) defines human enhancement as "the use of biomedical technologies to alter the characteristics of already healthy persons". Similarly, Allen Buchanan describes it as "the natural, artificial, or technological alteration of the human body to enhance physical or mental capabilities" (Buchanan, 2009: 142). All these definitions highlight that human enhancement, facilitated by advanced technology, extends beyond mere therapy or treatment aimed at restoring one's attributes to a healthy state. The range of these practices has expanded due to technological developments, from biomedical or pharmaceutical interventions, which focus on treating specific pathologies and improving well-being, to enhancements that aim to improve human traits, capacities, and dispositions. This includes engineering, modifying, and making alterations to the genetic material of the human body, a process known as human genetic enhancement.

2.3 Methods of Human Genetic Enhancements

The following section discusses the various methods commonly associated with human genetic enhancement:

2.3.1 Genetic Editing

Gene editing is a highly precise technique within the broader field of genetic engineering. Unlike earlier genetic methods that made broad or unpredictable changes, gene editing enables targeted alterations at specific locations within the genome. It allows scientists to deliberately delete, repair, or replace particular DNA sequences with greater accuracy (Furtado, 2019: 224). The term "editing" is metaphorically derived from textual editing, where letters or words can be removed and rewritten. This analogy reflects the precision and intentionality that characterize this method (Furtado, 2019: 224). By focusing on specific genomic sites rather than broad or random alterations, gene editing represents a significant advancement in efforts to correct disease-causing mutations or introduce beneficial genetic traits.

2.3.2 Genetic Engineering

Genetic engineering, by contrast, is a wider discipline that encompasses any intentional manipulation of genetic material, including but not limited to gene editing. Historically, genetic engineering relied on less precise methods, such as the random insertion of foreign or modified DNA sequences, which often produced unpredictable outcomes (Furtado, 2019: 224). According to Bak et al. (2018), the field has progressed considerably since the 1970s, evolving from these early, untargeted techniques toward more sophisticated forms of genetic manipulation. This broader technological development has also made it possible to create genetically altered organisms containing human-like cells, tissues, or organs, which serve as valuable systems for studying gene behaviour. In certain cases, once these engineered organs closely resemble human organs, they may even be considered suitable for transplantation into humans (Cunningham, 2015: 11).

2.3.3 Genetic Modification

Another method often confused with genetic engineering is genetic or genome modification. Although both involve changing genetic material, genetic modification focuses on altering an organism's existing DNA rather than introducing genes from another species. It relies on techniques that adjust, silence, or enhance certain already present in the genome to produce desirable traits (Lakna, 2018: 1). This method represents a combination of techniques applied to achieve an altered genome. Initially explored in agriculture, genetic modification enabled plants to become more nutritious, pest-resistant, and require less water to thrive. As the field progressed, researchers extended these techniques to animals. Initially, animals were genetically modified to develop more quickly and produce healthier meat for human consumption.

These applications highlight the central advantage of genetic modification, which is its ability to strengthen an organism's resilience to environmental stresses, pests, and diseases. In contrast, genetic engineering offers broader possibilities by enabling the creation of traits that do not naturally exist in the organism. Through these capabilities, genetic engineering can be used to produce valuable biological substances, such as antibiotics, vaccines, and hormones, greatly expanding its impact across medical and industrial fields (Ansori et al., 2023: 2). Genetic modification, therefore, remains primarily an optimisation tool, while genetic engineering operates as a transformative technology capable of introducing wholly new biological functions.

While gene editing, genetic engineering, and genetic modification provide the technical foundation for altering genomes, certain methods are not explicitly designed for human enhancement yet are noteworthy because of their potential to induce either temporary or permanent changes to the human genome. For example, pre-implantation genetic diagnosis (PGD) is a procedure that involves removing cells from early-stage embryos, examining their genomes, and selecting the most viable embryos for implantation (Maia et al., 2015: 53). Although PGD is commonly performed during IVF to detect defects and reduce the risk of miscarriage, some companies have explored its use for selecting embryos based on desired traits such as intelligence, effectively venturing into "designer" offspring territory (Melillo, 2017: 759).

A related approach with primarily therapeutic intent is gene therapy. As the name implies, gene therapy treats or prevents diseases by correcting underlying genetic issues. This technique allows clinicians to alter a person's genetic makeup instead of relying on drugs or surgery (MedlinePlus Genetics, 2021: 1). Gene therapy repairs mutations at their source by adopting any of the different approaches discussed above (genetic editing, engineering, modification) (Banoon et al., 2022). While gene therapy targets disease prevention or the cure of genetic diseases, gene editing, engineering, and modification aim to enhance traits beyond normal capabilities. The primary difference between gene therapy and enhancement lies in their purpose; therapy aims to correct defects, whereas enhancement seeks to improve abilities (Almeida & Diogo, 2019: 185).

2.3.4 Human Augmentation

The final method discussed is human augmentation. Lisa Magloff (2020: 2) defines human augmentation as "a field of research that aims to enhance human abilities through the use of medicine or technology. This may include genetic modification, implants, or the use of external tools, such as eyeglasses, bionic limbs, or other wearable devices". Historically, human augmentation was achieved by ingesting chemical substances that enhanced a selected ability or by implanting devices that required medical operations. Modern techniques, such as exoskeletons and prosthetic limbs, can enhance human performance beyond natural limits (Coenen et al., 2009: 13). A notable example is the Oscar Pistorius controversy, where the former South African professional sprinter attempted to qualify for non-disabled international competitions, despite the International Association of Athletics Federation's (IAAF) raising concerns that his prosthesis provided him with an unfair advantage. Pistorius eventually won

the legal dispute, becoming the first amputee to win a non-disabled global track medal at the 2011 World Championships (Rushgrove, 2012: 6). Additionally, augmentation methods can enhance cognitive, physical, or sensing capabilities, including vision, hearing, taste, smell, and haptic perception (Menuz et al., 2013: 131). However, since human augmentation primarily involves non-invasive enhancements, which are interventions that enhance human capabilities without surgical or genetic modification (Menuz et al., 2013: 131), it will be excluded from further discussion.

The following section is dedicated to answering the study's first research question: What is the nature of human germline enhancement? It will define human germline enhancement, differentiate between the different types, and discuss the technologies used to administer these enhancements. Additionally, the chapter will examine the controversial aspects of human germline enhancement that have raised significant ethical concerns.

2.4 Defining Human Germline Enhancement

The desire to enhance human abilities is as old as civilization itself. Throughout history, people have sought to overcome their natural limitations, whether through myths of superhuman powers, religious visions of immortality, or philosophical ideals of perfection (Comfort, 2012: 10; Almeida & Diogo, 2019: 183). These aspirations eventually inspired scientific inquiries into the human body, laying the foundation for modern biomedical research. The systematic study of genetics began in the 1950s, following the discovery of the double helix structure of DNA by Watson and Crick (Watson & Crick, 1953). Genetics, as a field, examines how traits and conditions are passed down through generations. This breakthrough marked a turning point in the scientific understanding of heredity and disease (Watson et al., 1954: 309). The Human Genome Project, launched in 1990 and completed in 2003, provided the first complete sequence of the human genome, accelerating medical science and reshaping approaches to health and disease (National Human Genome Research Institute, 2015). These milestones established a foundation for more ambitious interventions in human biology, particularly the prospect of genetic enhancement.

Human germline enhancement involves the modification of reproductive cells (sperms, eggs, or embryos) in ways that not only affect an individual's traits but also pass on these changes to future generations (Hersch, 2020: 3). Unlike somatic gene therapy, which targets non-reproductive cells and does not alter inheritance, germline enhancement is intergenerational

and permanent. This approach goes beyond simply curing disease; it may also be used to enhance desirable traits such as intelligence, strength, or longevity (Buchanan, 2011). As a result, germline stands at the intersection of therapy and enhancement, blurring the lines between healing and improvement.

The use of human germline enhancement technologies is likely to grow rapidly in the coming years. However, the ethical implications of utilizing these biomedical technologies for enhancement remain controversial. Advocates, commonly known as transhumanists, support this development. Transhumanism is a techno-oriented movement that promotes the use of advanced technologies to enhance human capacities and overcome biological limitations, including through genetic interventions such as germline enhancement. From this perspective, enhancing certain traits such as intelligence, lifespan, and physical strength is seen as a means of advancing human well-being (Douglas, 2008; Baltimore et al., 2015; Ferrando, 2020). In contrast, bioconservatives express skepticism and believe that enhancement technologies should be approached with caution or even avoided altogether (Habermas, 2003; Lanphier et al., 2015). They argue that such technologies could undermine human dignity, exacerbate inequality, and lead to discrimination against those who are unenhanced, while posing a threat to the very essence of what it means to be human (Baylis, 2019).

2.5 Recent Developments in the Field of Human Germline Enhancement

2.5.1 CRISPR and Technological Advances

A significant breakthrough in the field of genome editing emerged in 2012 with the discovery of the clustered, regularly interspaced, short palindromic repeat-associated protein 9 (CRISPR-Cas9) system by American scientist Jennifer Doudna, in collaboration with French scientist Emmanuelle Charpentier (Almeida & Diogo, 2019: 187). This technology marked a paradigm shift from earlier gene editing techniques by offering unprecedented improvements in accuracy, efficiency, cost-effectiveness, and accessibility. Unlike earlier methods, such as meganucleases, zinc finger nucleases (ZFN), transcription activator-like effector nucleases (TALENs), which required several months or even years to achieve precise modifications, CRISPR-Cas9 enables targeted gene editing within a matter of weeks, making it a revolutionary tool in modern molecular biology (Aliouche, 2019: 1).

According to Samira Kiani (2020: 10), CRISPR can be likened to “a genetic surgeon with a sharp scalpel” capable of locating genetic defects within the native genome and correcting them

in specific cells of an organism. One of its unique features is its capacity to edit multiple genes simultaneously, which broadens its potential applications in treating complex polygenic disorders (Aliouche, 2019: 1). Additionally, what distinguishes CRISPR from its predecessors is the relatively minimal technical expertise required for its application. Hidaya further posits that basic laboratory training is often sufficient to operate the system, making it more accessible than the previously mentioned highly specialized alternatives (Aliouche, 2019: 2).

One of the most striking aspects of CRISPR is the accessibility of its molecular tools. As Itziar De Lecuona et al. (2017: 675) highlight, many of the components necessary for its use can be purchased online, provided the research is for academic or non-profit purposes. This has contributed to what is described as the democratization of gene editing, broadening the scope of potential users and accelerating global research efforts. However, this same accessibility raises regulatory and ethical concerns, as the widespread availability of the technology increases the possibility of unregulated or inappropriate use outside controlled laboratory environments (De Lecuona et al., 2017: 675).

Despite its revolutionary potential, CRISPR is not without limitations. Empirical studies have shown that the system can occasionally generate unintended genetic modifications, known as off-targets (Alexiou et al., 2020: 63). While these errors are often minor, their presence in germline applications is a significant concern, as unintended edits could be transmitted to future generations. Moreover, even in cases where no off-targets are detected, there remains the possibility of latent or undetected errors manifesting later, which highlights the importance of long-term monitoring and cautious implementation (Alexiou et al., 2020: 64). Today, CRISPR dominates research laboratories worldwide and is the leading genome-editing platform in both academic and clinical contexts (Kiani, 2020: 13). Nevertheless earlier technologies such as meganucleases, ZFNs, and TALENs continue to be employed in certain agricultural, industrial, and medical research applications, particularly where high precision applications are required (Kiani, 2020: 13). This demonstrates that while CRISPR has revolutionized the landscape of genetic engineering, it coexists alongside older methodologies, each with distinct advantages and challenges.

In 2020, Dr. Doudna and Dr. Charpentier received a Nobel Prize in Chemistry for their pioneering work on CRISPR. This recognition highlighted the profound scientific and medical potential of this technology (Dockrill, 2020). The excitement surrounding its promise, however, has also reignited long-standing ethical and social debates regarding the boundaries

of human germline enhancement. Questions that were once speculative have now become urgent and practical: should genetic interventions be confined strictly to therapeutic purposes, such as correcting mutations responsible for disease, or might they be extended to non-therapeutic forms of enhancement like beauty, intelligence, and even life expectancy? (Soni, 2019: 2). With the increasing efficiency and accessibility of technologies like CRISPR, those questions are no longer theoretical, and the answers to them stand to have very real impacts on society (Hewings-Martin, 2017: 8).

From a biomedical perspective, the therapeutic use of gene-editing technologies, particularly in the form of gene therapy, has gained considerable ethical and clinical legitimacy when directed toward the prevention or treatment of disease (Hewings-Martin, 2017: 8). Yet, beyond therapeutic applications lies the more contested domain of genetic enhancement, where interventions are aimed not at curing diseases but at intentionally redesigning human traits. As Theodore Friedmann (2019: 351) observes, this shift from therapy to enhancement introduces distinct ethical, social, and policy dilemmas that challenge existing frameworks of medical practice and human rights. These issues, which touch on intergenerational responsibility, social justice, and the very definition of what it means to be human, will be examined in greater detail later in this chapter.

2.5.2 Early Human Applications and Ethical Controversies

According to Ekaterina Pak (2014: 2), in the years immediately following its discovery, CRISPR was only applied to non-viable human embryos to avoid ethical controversies related to reproduction. This approach was supported by recommendations from the First International Summit on Human Gene Editing, held in Washington, DC., in 2015. The Summit was jointly organized by the United States National Academy of Sciences, the National Academy of Medicine, the Chinese Academy of Sciences, and the Royal Society of the United Kingdom (Baltimore et al., 2015). It gathered global experts to discuss the ethical, social, and scientific implications of human gene editing. The discussions highlighted the great potential of CRISPR to modify the human germline, while also emphasizing the risks and uncertainties that accompany such interventions (Baltimore et al., 2015).

Despite the cautionary recommendations, experimental applications soon followed. In 2016, researchers at Guangzhou Medical University in China attempted to genetically modify 213 human embryos with the goal of making them resistant to HIV infection (Westcott & Pinghui,

2016). Although the embryos were fertilized, they were deemed unsuitable for implantation in in vitro fertilization procedures due to the detection of multiple off-target mutations. Out of the 213 embryos, only four were successfully edited, and all were subsequently destroyed within three days. The researchers clarified that their intention was not reproductive, but rather to test the technical feasibility of germline modification. However, this experiment raised international alarm, highlighting both the potential benefits and risks of applying CRISPR technology in human reproduction (Westcott & Pinghui, 2016).

The global debate intensified in late 2018 when the MIT (Massachusetts Institute of Technology) Technology Review revealed the birth of the world's first genetically edited babies (Greely, 2019: 111). Chinese scientist He Jiankui, who was then affiliated with the Southern University of Science and Technology (SUSTech) in Shenzhen, announced that he had used CRISPR to edit a gene (CCR5) in human embryos in an effort to make the babies resistant to HIV. The embryos were implanted, resulting in the birth of twin girls, publicly known by the pseudonyms Lulu and Nana (Greely, 2019: 111). The twins were born in October 2018, and the following month, at the International Human Genome Editing Summit in Hong Kong, Jiankui explained that the experiment was conducted on a couple where the father was HIV positive and the mother was negative. He stated that the parents had been given the option of using either edited or unedited embryos and that the twins appeared to be healthy in every way. He also mentioned that he had performed the same experiment on a second woman, who was still in the early stages of pregnancy (Alonso & Savulescu, 2021: 563). Jiankui and his team suggested establishing a special facility to monitor the children, acknowledging that the long-term consequences of the gene-editing remained uncertain.

This case marked the first documented use of CRISPR on viable human embryos brought to term (Greely, 2019: 111). Initially, the announcement drew praise in some Chinese media. For instance, *The People's Daily* hailed it as a "historical breakthrough in the application of gene editing technology for disease prevention" (Li et al., 2019: 33). *Time* magazine also included Jiankui among its most influential people in 2019. However, the global scientific community swiftly condemned the experiment for lack of transparency, disregard for established guidelines, and potential harm to future generations (Li et al., 2019: 33; Macintosh, 2022: 290). Bioethicist Ren-Zong Qui considered Jiankui's work to be "a practice with the least degree of ethical justifiability and acceptability" (Li et al., 2019: 33) since the research was done on healthy embryos, meaning that the embryos were not in any medical danger, therefore, deeming

the experiment a genetic enhancement under the guise of a medical purpose. Geneticist Eric Topol echoed this caution, stating that the experiment was "far too premature…We're dealing with the operating instructions of a human being. It's a big deal" (Topol, 2018: 1).

The backlash also triggered a swift legal response in China. In December 2019, a Shenzhen court found Jiankui guilty of conducting illegal medical practices, sentencing him to three years in prison and imposing a fine of RMB 3million (Greely, 2019: 113). Two of his collaborators received lesser sentences. The court ruled that Jiankui had deliberately violated national regulations by forging ethical approval documents and misleading medical staff into unknowingly assisting with the procedures (Liu, 2020: 2). His conviction marked a pivotal turning point in global regulatory discussions, underscoring the urgent need for robust international governance in human germline editing and highlighting the consequences of pursuing such modifications without adequate oversight (Wang et al., 2023: 3).

2.6 Present and Potential Applications of Human Germline Enhancement

Much of the current understanding of human germline enhancement technologies stems from research into genetic diseases, focusing on identifying the various genes responsible for certain diseases and exploring how these genes may be modified to benefit human health and capabilities. As noted by Benjamin Bakondi (2016: 397), CRISPR can be employed in human applications through two primary approaches: ex vivo and in vivo. In the ex vivo approach, target cells, such as blood or bone marrow cells, are extracted from the body, genetically modified in the laboratory, and then reinfused into the patient. This approach is similar to that used for most gene therapies that are currently available. However, it can become quite expensive, as each treatment requires a customized process tailored to the individual patient.

In the in vivo approach, the CRISPR technology containing the desired gene is injected into the patient's body. Here, the gene encodes itself into the rest of the body's DNA. Cavaliere et al. (2019: 84) note that scientists have raised concerns regarding this approach, as it has the potential to cause unintended and irreversible harm to genetically modified individuals and their descendants. These include the potential for off-targets, which often result in a genetic disruption elsewhere in the genome. This remains a concern for users of CRISPR as it adds an element of uncertainty. This is of particular importance when considering its use especially for clinical applications because even a single off-target site could have a major and deleterious effect on the patient (Hersch, 2020: 9; Hewings-Martin, 2017: 11). Due to this concern,

scientists delayed the application of this method on human trials and have focused more on the former approach to gene editing. Moreover, genetic engineering consists of two types of modifications, one happens in the human's somatic cells and the other takes place in the germline cells.

Somatic cells are all the cells found in the tissues of a body such as the eye, skin, and liver cells, excluding the egg and sperm cells (Hersch, 2020: 3). The cells responsible for reproduction, namely, the egg and sperm cells are referred to as germline cells (Baylis & Robert, 2004: 3). This means that modifications done to the somatic cells only alter the individual's genes and modifications done to an individual's germline cells will not only affect the individual but the changes will also be inherited by their offspring. Somatic modifications are making headway in gene therapy and other enhancement experiments in which people voluntarily partake. For example, in 2016, a Chinese patient with lung cancer became the first person in the world to receive this injection using CRISPR, where the genome was edited to program the patient's immune cells to target the cancer. The clinical trial took place at Sichuan University's West China Hospital in Chengdu, and due to the trial falling under 'therapy' along with the patient's consent, the hospital's review board granted ethical approval for the therapy (Daley et al., 2016: 796). The trial was further conducted on 11 other patients in the early stages of lung cancer using the in vivo approach. The main objectives of the study were to genetically engineer the T cells of the patients, which are the blood cells responsible for communicating "checkpoints" with the immune system. Meaning that these cells determine whether other cells in the body should attack or preserve the immune system. Other objectives included testing whether the treatment was safe, had tolerable side effects, and whether it produced any dangerous response to the immune system.

In April 2020, the results from the trial were published in Nature Medicine, stating that the treatment was safe to be administered and that it had acceptable side effects such as fatigue, rash, and fever (Henderson, 2022: 24). In contrast, the findings also included a few off-target effects on parts of the genome but the on-target effects were more common and the desired modifications were found in 11 of the 12 patients, deeming the treatment a success. Later in 2016, a similar clinical trial on lung cancer patients was conducted in the United States of America at the University of Pennsylvania in conjunction with the Parker Institute. However, the second study involved patients whose advanced cancer could no longer respond to standard therapies such as chemotherapy and radiation. The results from this trial were also made

available in 2020, with similar outcomes such as the treatment being safe and having acceptable side effects with rare off-target effects, except that the unwanted changes at the targeted site were observed frequently. Over time, these changes decreased, thus also deeming the therapy a success (Henderson, 2022: 26). Considering that both trials met their goals, CRISPR has proven to be a very powerful tool with great potential for advancing the quest to combat genetic diseases such as cancer, blindness, and other blood disorders in people. Hence, several other clinical trials using CRISPR to treat genetic mutations, such as bone marrow transplants, have been ongoing, and some of these therapies have now become part of medical treatment.

Besides CRISPR being utilized for therapeutic applications, its availability has also offered laypersons an opportunity to experiment with DNA in their home labs and garages, including their own DNA. This is referred to as biohacking, Do-It-Yourself Biology, or citizen biology (Van Beers, 2019: 4). Sigal Samuel (2019: 3) defines biohacking as "the attempt to manipulate your brain and body to optimize performance, outside the realm of traditional medicine". Biohacking is a very broad term that consists of many different interpretations. According to the Merriam-Webster Dictionary, biohacking is defined as "biological experimentation (as by gene editing or the use of drugs or implants) done to improve the qualities or capabilities of living organisms, especially by individuals and groups working outside a traditional medical or scientific research environment". The type of biohacking that many people find concerning is when it involves genetic engineering reason being that individuals can enhance their own genetics as opposed to using other technologies such as implants and drugs. Most importantly, what makes biohacking involving genetics highly controversial is the fact that in most countries, these experiments are unregulated (Samuel, 2019: 3). Ranging from altering their bodies to altering their brains to become faster, smarter, and better as humans, the possibilities are endless which means that some of these experiments take place without any regard for accepted ethical standards.

As illustrated above, the field of genetic engineering is advancing rapidly, generating considerable excitement, especially regarding somatic applications aimed at treating and preventing diseases. However, researchers are also exploring applications that go beyond therapeutic uses, with the only apparent limitation being human imagination (Kota, 2023: 1). The following sections discuss some of the more controversial prospective enhancements currently being pursued, such as increased life expectancy, physical enhancement, cognitive enhancement, and designer babies.

2.6.1 Increased Life Expectancy

In the Stone Age, life expectancy was estimated to have been around 20-34 years, and a few thousand years later, the average human life expectancy had tripled (Bostrom & Roache, 2007: 124). Human life expectancy has rapidly increased in recent years. Between 2000 and 2016, the world's life expectancy rose by 5.5 years. According to Bostrom & Roache (2007: 124), "improvements in sanitation, medicine, education, and nutrition have all had a positive effect on life expectancy". This means that the increase in life expectancy is primarily due to social and technological developments rather than any changes in the evolution of human biology.

Today, the mean life expectancy of a human being is 79 years, and with the continuous advancement in biotechnologies, there is a great possibility that the current life expectancy can be doubled (World Health Organization, 2022). One can argue that we already have a significantly prolonged life expectancy. However, while an increasing number of people are living longer, many of them are spending their final years in poor health. Consequently, scientists have been dedicated to finding ways to increase the length of time for which humans can expect a good quality of life by targeting the elimination of fatal age-related diseases of our offspring whilst in their embryonic stage (Alexiou et al., 2020: 63). The drive for this stems from the scientific belief that approximately 20-30% of the overall variation in adult lifespan is accounted for by genetic factors (Chereshnev et al., 2020: 1). Meaning that by applying technologies such as CRISPR to immunize one's offspring from any possible age-related genetic diseases such as Type 2 diabetes, Parkinson's disease, dementia, and cancer, this could alter the process of aging (Basaraba, 2020: 5). According to Bostrom & Roache (2007: 125), the leading cause of death for most industrialized countries is aging which makes the human body weak and susceptible to certain pathologies and had it not been for the aging process, life expectancy would be approximately 1000 years. This serves as the basis for research on how genetic enhancement technologies may be used to manipulate genes to stop or alter the process of aging (Zoppi, 2019: 2).

A more recent study, conducted by the Institute of Zoology of the China Academy of Sciences, successfully applied CRISPR to extend the lives of mice by up to 25% and make them physically stronger. In this study, scientists discovered a gene linked to cellular senescence, which is a process that instructs cells to cease growing. Additionally, the study also showed that CRISPR could be applied to partially halt the aging process, and biologists believe that

these results are relatively simple to replicate in humans in a clinical setting (Bacher, 2021). According to Ian Sample (2022), a group of elite Nobel Prize winners has teamed up to lead a new institute in the United Kingdom that aims to rejuvenate human cells, thereby eliminating age-related diseases that inevitably lead to death. A sum of 2.2 billion pounds has been invested in this initiative. Thus far, in a petri dish, these scientists have observed that it is possible to apply the CRISPR technology to reprogram human cells in such a way that they behave 25 years younger. The team has stated that since they are still working to better understand the technology, the dangers are still very great, and thus, they have not produced any products.

2.6.2 Physical Enhancement

Several current techniques are being used to enhance physical abilities. These include cosmetics, organ replacements, strength training, functional enhancements, and drug-induced enhancements. Plastic surgery and orthodontics are classified as cosmetic procedures. Under organ replacements, we have artificial implants such as bionic eyes. Strength training refers to physical exercise and the use of dietary supplements. Functional enhancement includes prosthetics and powered exoskeletons, and drug-induced enhancement includes performance-enhancing drugs and doping, which is a highly controversial topic in professional sport. In fact, it is possibly the area of human enhancement that has been most widely publicized in recent years. According to David Masci (2016: 3), scientists have made significant progress in studying the human genome, and the continuous advancements in human enhancement technologies have allowed researchers to alter human physiology at its most fundamental level. Many different applications of these technologies are either in development, being tested, or in their trial phase. The majority of current physical enhancement applications focus on enhancing and replacing body parts with smarter organs and implants.

The most recent prospective applications include replacing the natural eye lens with a bionic lens. According to Teodora Zareva (2017), the bionic lens is an upgrade from the bionic eye, which would only be suitable for people suffering from blindness or vision loss. Now the bionic lens is genetically implanted to replace the lens of a person with no visual quality problems. It allows the eye to focus at different ranges that are much wider than the natural sight is capable of, as well as allows you to focus on something for longer periods of time without any strain on the eye. Additionally, you can adjust the lens to improve sight well beyond the capabilities of the eye. Therefore, allowing you to see sharp details at very close distances, much like a microscope. Scientists working on this project from the University of

Southern California have recently gained FDA approval and are currently initiating clinical trials (Hellem, 2021).

Human germline technologies could be used to enhance inherited human traits, such as eye colour and height, or to engineer specific characteristics in unborn children, including gender selection, the elimination of common and genetic diseases, and overall fitness. These topics will be discussed in the section on designer babies, as most prospective genetic enhancements are more feasible when applied to germline cells rather than somatic cells.

2.6.3 Cognitive Enhancement

Cognitive capacities can be defined as "capacities that we use for gaining, processing, storing, and retrieving information" (Bostrom & Roache, 2007: 130). This includes how we articulate our reasoning, retain information, and manipulate data. There are several ways to enhance these capacities using current methods, such as education, health, and vitamin supplements, and mastery of psychological techniques. Other methods include drinking coffee, consuming energy drinks, exercising, getting enough sleep, and practicing meditation. These methods have generally gained public acceptance, and given the interest in enhancing cognitive abilities, it is plausible that many would embrace the transformative potential of technologies like CRISPR to achieve previously unattainable improvements.

A few years ago, it seemed as though genetic engineering applications were not only extremely far-fetched but also a dead end in the quest for cognitive enhancement. This narrative has evolved in recent years, and it can be legitimately hypothesized that, due to the simplicity and applicability of CRISPR, scientists have been able to identify certain "genes that can play a very important role in controlling specific cognitive functions" (Lavazza, 2018: 338). Considerable progress has been made in the prospective applications of CRISPR to enhance cognitive abilities. For example, experiments conducted by Lee et al. (2018: 497) and Staahl et al. (2017: 431) demonstrated that genes could be safely edited in the brains of adult mice for the treatment and possible elimination of the genetic causes of neurological diseases using the in vivo approach of CRISPR. The experiments proved successful, as no levels of toxicity were detected in the major cell types of the brains that were edited. This displays in-depth knowledge and understanding of how the brain functions and, thus, scientists are currently researching how to use this information to develop applications that would enable the genetic enhancement of human cognitive abilities (Rebelo et al., 2022: 4).

2.6.4 Designer Babies

Aleksandra Nowak-Gruca (2019: 1) defines the term designer babies as "the use of human germline engineering techniques (such as CRISPR) to create desired genetic traits of a child, such as disease resistance, athletic ability, and intelligence". This notion can be taken further to include other traits such as height, eye colour, longevity, increased eyesight, and hearing abilities (Mitra, 2021: 1). There are several techniques that prospective parents adopt to help them improve the genetic composition of their unborn children. These range from choosing their sexual partners to taking certain herbal and nutritional supplements. On the other hand, there are other morally controversial ways to ensure that a child will be born with a specific genetic makeup. The first is the pre-implantation genetic diagnosis of embryos in IVF treatment. As with many medical interventions involving human reproduction, PGD evokes strong, often contentious opinions of social acceptability, particularly given its potential eugenic implications.

In some countries, such as Germany and the United Kingdom, PGD is only allowed to avoid stillbirths and genetic diseases, and in other countries, it is subject to government regulation. Furthermore, in very few countries, such as Australia, PGD has been used to enable couples who have no history of sex-related disorders to choose the gender of their child (Savulescu et al., 2014: 133). According to Tara Melillo (2017: 760), PGD may one day make it possible to select genes that are not only free from inherited diseases but also those that are most likely to result in enhanced traits, such as high intelligence, above-average height, athletic skills, and other desired characteristics.

The second way in which designer babies may be achieved is through CRISPR genetic engineering. What makes this method different from IVF is its purpose. IVF is currently identified as treatment whereas genetic engineering may be applied to alter human embryos for aesthetic purposes and because these modifications are done to the germline, there are high chances that the resulting genetic changes could be inherited by the next generation (Melillo, 2017: 760; Nowak-Gruca, 2019: 2). The concept of designer babies is not so far-fetched as research and experiments are already underway (Nowak-Gruca, 2019: 1). Since the technology has not yet been mastered, the embryos have to be destroyed after each experimental process as it strictly prohibited to transfer these genetically modified embryos to a woman or to use them for any other purpose which further fuels the ethical debate on designer babies (Vizcarrondo, 2014: 24; Westcott & Pinghui, 2016; Mitra, 2021: 1). He Jiankui's experiment,

by far, remains the most prominent case in human genetic enhancement, as the genetic alterations that were made resulted in the enhancement of the babies' brain functions and prompted a global call for a temporary ban on the use of genetic technologies for reproductive purposes (Alonso & Savulescu, 2021: 563).

2.7 Bioethics

Bioethics is a branch of applied ethics that concerns itself with moral questions relating to healthcare, including those brought on by advances in biology, medicine, and technology (Cascais, 1997: 9). It aims, among other things, to provide ethical justification and moral motivation for protecting, preserving, and respecting human life. Bioethics emerged as a predominant branch of applied ethics in the 1970s. One of the three prominent reasons for the emergence of bioethics as stated by Warren Reich in his introduction to Encyclopaedia of Bioethics was the realization that the introduction of biomedical technologies constituted significant conflicts with basic human values concerning life, death, and health and this had captured the contemporary mind thus intensifying some long-standing concerns from the 1950s which gave rise to perplexing new problems including the "prolongation of life, euthanasia, prenatal diagnosis and abortion, human experimentation, genetic interventions and reproductive technologies…" (Cascais, 1997: 9). This may be one of the reasons why another founder of bioethics, Van Rensselaer Potter's conception of bioethics did not gain any momentum as his notion held that bioethics should not only be about enriching individual lives but also about prolonging "the survival of the human species in an acceptable form of society" (Cascais, 1997: 9). As bioethical research progressed, this notion has reverted since one of the major prospective applications of genetic technologies is to figure out how to increase life expectancy.

According to Fernando Cascais (2014: 9), bioethics is best defined as "the systematic study of human conduct in the area of the life sciences and healthcare, insofar as this conduct is examined in light of moral values and principles". This means that bioethics goes beyond ethical issues in medicine to include considerations related to public health, animal health and welfare, environmental health, population concerns, genetics, reproductive practices, and similar technologies (Cascais, 1997: 11; Rodriguez, 2017: 5).

Early pioneers in bioethics proposed four guiding principles that serve as a framework for moral reasoning: non-maleficence, justice, beneficence, and autonomy (Downie, 2005: 2;

Alexiou et al., 2020: 67). The principle of non-maleficence requires healthcare professionals to ensure that they do not cause harm to patients. Although all treatments involve some level of harm, the benefits of the treatment should always outweigh the harm.

The principle of justice states that in any given situation, the benefits and risks ought to be allocated equally between stakeholders, and the idea that patients with similar positions should receive similar treatment. Beneficence is the principle of balancing risks and costs against the benefits of treatment. Thus, healthcare should always act in a manner that benefits the patient. Lastly, autonomy asserts that an individual's right to make their own decisions should always be respected. Acknowledging and respecting one's decision-making abilities allows individuals to make informed choices (Downie, 2005: 2; Friesen et al., 2017: 15).

These four principles have received the most attention in discussions about biomedical ethics, with arguments for and against them. The one overarching principle that many bioethicists tend to value more than others is autonomy, as they believe that each patient should always have the freedom to choose the course of action that is best consistent with their values and beliefs (Entwistle et al., 2010: 741; Evans, 2021: 3).

One of the primary missions of bioethics is to enable ethical reflection to keep up with scientific and medical advancements. With the introduction of new technology, the general public finds itself in an uncharted ethical territory in which it is not sure how to navigate (Downie, 2005: 2). Hence, as scientific reach continues to exceed ethical grasp, moral quandaries remain constant. The current scope of bioethics includes the ethical questions raised by genetic research, especially of human embryos, and human genetic enhancement technologies, as well as how such research and technologies should be governed. These questions focus on fairness in the balance and distribution of risks and benefits presented by genetic technologies on an individual and group level, including distribution among populations of developed and developing countries (National Academies of Sciences, Engineering, and Medicine, 2017: 6). These are arguably the most pressing issues in the field to date.

In 2015, a group of researchers and ethicists, including the developers of CRISPR, met in California and subsequently released a call for the community to explore the nature of human genome editing and provide guidance on its acceptability. The following five principles were offered in addition to the long-standing principles of biomedicine use. The first is transparency,

a principle that requires openness and the sharing of information in a way that stakeholders can access and understand (National Academies of Sciences, Engineering, and Medicine, 2017: 11). This means that with every development taking place in genetic technologies, including their uses and consequences thereof, there needs to be a commitment to disclose all the relevant information to all the stakeholders.

The second principle is due care, which mostly applies to patients enrolled in research studies or receiving clinical care. The principle requires that all proceedings be done cautiously, under appropriate supervision, and in ways that allow for the accommodation of cultural opinions.

The third principle is responsible science, which underpins absolute adherence to the highest standards of research, from the lab bench to the patient's bedside, in compliance with international and professional norms. Respect for persons was the fourth offered principle, which requires recognition of the personal dignity of all individuals and that all people, regardless of their genetic qualities, have equal moral value. Adherence to this principle requires a commitment to preventing the harmful and abusive forms of eugenics that were once practiced in early 20th-century Britain, America, and Nazi Germany, as well as a commitment to destigmatizing disability.

The last principle is transnational cooperation, which encourages a "commitment to collaborative approaches to research and governance while respecting different cultural contexts" (National Academies of Sciences, Engineering, and Medicine, 2017: 12). Adherence to this principle includes respect for the various national policies, transnational collaboration, data sharing between various scientific communities, and responsible regulatory authorities.

There is no doubt that the global adoption of these principles will contribute a great deal towards fostering ethical clinical applications of genetic technologies across all countries. The fact that these newly proposed principles encourage transnational collaboration and respect for the different cultural contexts, it is paramount for countries to take some time and reflect on all the value systems they deem most important and those that will be most affected by the employment of these genetic technologies (National Academies of Sciences, Engineering, and Medicine, 2017: 12).

Later in 2015, several articles and commentaries in scientific journals and news media highlighted the ethical and scientific challenges posed by CRISPR and similar genetic technologies (De Lecuona et al., 2017: 676). Moreover, the concerned professional bodies, international organizations, and national academies of science and medicine further raised the profile of genome editing by issuing statements on its appropriate uses, paying the utmost attention to the potential for creating heritable genetic modifications. These professional bodies include the European Group on Ethics in Science and New Technologies, the International Society for Stem Cell Research, the United Nations Educational, Scientific, and Cultural Organization (UNESCO), the Center for Genetics and Society, the Nuffield Council on Bioethics, the World Health Organization (WHO), and Universal Declaration on Bioethics and Human Rights (UDBHR) among others (National Academies of Sciences, Engineering, and Medicine, 2017: 19; De Lecuona et al., 2017: 676). One of the main initial tasks of these bodies was to provide a clear distinction between therapy and enhancement, with therapeutic applications taking precedence over enhancement, as well as educating the public on the consequences of somatic versus germline application. They have also highlighted the need to promote robust public engagement concerning the individual and societal benefits and risks of genome editing for enhancement purposes so that the relevant values may be incorporated into the risk or benefit assessments, which will precede any decisions about whether to authorize clinical trials.

Some scholars have argued that human genetic enhancement has raised, and will continue to raise, ethical, regulatory, and sociopolitical questions that go well beyond technical and benefits discussions that modern biologists have identified. Moreover, these scholars hold that the risks and benefits associated with human genetic enhancement should not solely be defined by the scientific community, rather, a comprehensive understanding of the risks and benefits will require broad public debates that are highly inclusive of all stakeholders, taking special care those with different cultural backgrounds, ideologies, and religious views (Evans, 2021: 4). Additionally, these scholars argue that the risks and benefits of human genetic enhancement should not be determined solely by the scientific community. A comprehensive understanding of these risks and benefits requires inclusive public debates that involve all stakeholders, paying special attention to those with diverse cultural backgrounds, ideologies, and religious beliefs.

2.8 The Call for a Global Moratorium on the Clinical Use of Germline Enhancement

The controversial announcement by He Jiankui in 2018, claiming to have created the first gene-edited babies, prompted widespread international concern and condemnation (Greely, 2019: 341). In the aftermath, prominent organizations such as the World Economic Forum Global Future Council on Human Enhancement (GFC-HE) and the National Opinion Research Centre of the United States (NORC) began to explore the potential applications of CRISPR in human enhancement (Lander et al., 2019: 166). Recognizing the urgency of the situation, eighteen leading scientists from diverse fields issued a call in December 2018 for a temporary global moratorium on clinical use of germline genome editing (Lander et al., 2019: 166). The moratorium was envisioned as a precautionary measure, intended to provide time for the establishment of an international governance framework rooted in the highest scientific, ethical, and societal standards. Li et al. (2019: 35) describe the moratorium as a five-to-six-year prohibition on germline genome editing where the intention is to achieve pregnancy, thereby preventing premature and ethically questionable clinical applications. This proposal was not aimed at halting basic scientific research, but rather at ensuring that any movement toward clinical application would proceed under robust global oversight mechanisms (Li et al., 2019; Lander et al., 2019).

Furthermore, this moratorium emerges from a growing awareness that the current ethical guidelines for germline editing are often fragmented, vague, or insufficient to prevent violations (Ishii, 2017: 671). A comparative policy study by Giulia Cavaliere et al. (2019: 371) analysed the regulations for 96 countries and found that while 70 countries explicitly ban human germline editing, 5 allow it with exceptions, 3 are legally indeterminate, and 18, many in Africa, including South Africa, lack clear policies addressing germline editing, especially in relation to enhancement. This regulatory inconsistency highlights the absence of global alignment and demonstrates why proposals for a moratorium continue to generate debate (Cavaliere et al., 2019: 371; Lander et al., 2019: 166).

While some scientists, together with CRISPR co-inventor Dr. Charpentier, argue that a moratorium is the only ethical way to move forward, as this allows time for open discussions towards forming a broad societal consensus on establishing regulation and governance of the technology. Others, including her co-inventor, CRISPR, Dr. Doudna, contend that what is needed is not a halt but stricter regulation (Kuchler et al., 2020: 2). Critics of the moratorium also caution that it may not prevent determined individuals from pursuing germline

enhancement, that it could be difficult to lift the moratorium once it is imposed, and that it would likely not achieve universally accepted (Kuchler et al., 2020: 2). Therefore, in 2019, the World Health Organization (WHO) recommended the creation of a global registry to track human genetic engineering research through the International Clinical Trials Registry Platform (ICTRP). The ICTRP, a WHO Network, was designed to facilitate the registration of clinical trials by working together and exchanging information with prospective registries to establish best practices in clinical trials and ensure public accessibility of information on these trials. Its core aims include identifying research gaps, improving transparency, ensuring ethical obligations are met, and preventing unnecessary duplication of trials (World Health Organization, 2019).

Despite such initiatives, no global consensus on the moratorium has emerged (Kaan et al., 2021: 1). This lack of agreement reflects deep differences in ethical, social, and scientific perspectives, with some countries exerting greater influence than others. Hanzhi Yu et al. (2021: 3) show that among the five major world regions, namely Africa, Asia, Europe, North and South America, and Oceania - North America, Asia, and Europe, respectively, are well ahead of the rest of the world in terms of research and publications on the editing of the human genome, thus, placing their laws and regulations at a far more progressed level concerning which clinical applications of CRISPR are permitted and which are not. As a result, some argue that a moratorium would hinder scientific progress, pushing researchers toward more permissive or flexible regulations. Moreover, the feasibility of an international moratorium is questionable, as it would require detailed clarification of its scope, the practice to be prohibited or permitted, its ethical and legal bases, and the justification for its duration (Kaan et al., 2021: 3). Until such issues are resolved, Kuchler, et al. (2020) and Yu et al. (2021) in agreement with Kaan et al. (2021) argue that a decision to halt participation on germline editing on humans is not prudent, as it would delay innovations that might be very valuable to future generations.

Adding further weight to these debates, according to David Barrett et al. (2025: 886), three prominent gene and cell therapy organizations, namely, the International Society for Cell and Gene Therapy (ISCT), the Alliance for Regenerative Medicine (ARM), and the American Society of Gene and Cell Therapy (ASGCT), have issued a joint statement calling for a further 10-year global moratorium on heritable human genome editing. This is not an extension of the earlier five-to-six-year moratorium, but rather a new and more conservative initiative reflecting continuing ethical disagreements, persistent safety uncertainties, and growing fears of

unregulated enhancement practices. The statement emphasizes that there is currently no compelling medical necessity for germline enhancement when somatic approaches already exist, and it urges decision-making that is grounded in transparency, public engagement, and regulatory oversight (Barrett et al., 2025: 886). These developments represent a significant shift of moving from an initial precautionary stance to a more cautious suspension. This change reflects growing scientific, ethical, and societal concerns regarding the future of germline enhancement, while revealing sharp disagreements about whether a moratorium aids or hinders responsible innovation.

The following sections discuss some of the most prevalent ethical concerns posed by genetic technologies.

2.9 The Ethical Concerns of Germline Enhancement

While germline enhancement technologies such as CRISPR are fairly new, the debate about the ethics of gene editing is not. For decades, scholars have debated the ethics of creating heritable alterations to the human genome. Since the discovery of CRISPR, the debate surrounding its use for genetic enhancement has gained increased attention (Mulvihill et al., 2017: 19). It has been suggested that the technology be highly regulated due to ethical issues such as the inability to anticipate all of the repercussions of altered genes in the future and the possibility of the technology only being available to those who can afford it, ultimately increasing the already existing inequality gap between the rich and the poor (Greely, 2019: 119). Germline enhancement technologies enable new ways of preventing and treating human diseases, new insights into fertility studies, and a better understanding of the biology of human embryos and germline cells. However, the possibility of germline enhancement has also sparked public debate and prompted broad ethical concerns. These range from the safety and efficacy of genetic enhancement technologies, consent from prospective persons, as well as sociocultural and religious issues concerning embryo research.

2.9.1 The Safety and Efficacy of Germline Enhancement

Significant progress has been made in the efficacy of human germline enhancement, with several successful cases reported in the literature. This has led to an increase in germline enhancement experiments globally, led predominantly by researchers in the West and East regions (Shinwari et al., 2018: 104). Despite these advancements, considerable uncertainty remains regarding the safety of such procedures. Pang and Ho (2016: 59) caution that although germline interventions are not yet ready for clinical application, continued research is necessary

to assess their long-term safety. Off-target effects are the most pressing concern, as their occurrence and potential impact on the genome are difficult to predict, which raises the risk of harmful consequences for future generations (Khan, 2019: 326). Therefore, precision in genetic modifications and ensuring patient safety are crucial for broader acceptance. Any future clinical applications must proceed with utmost caution to avoid unintended and potentially irreversible effects.

According to Zabta Shinwari et al. (2018: 106), repeated experimentation can progressively reduce error rates to safer levels, which may help alleviate some concerns regarding heritable germline enhancements. However, despite the rapid advancements in science, many researchers argue that clinical applications of germline editing are still a distant reality (Shinwari et al., 2018: 105). This caution stems from the irreversible nature of germline modifications, which require the establishment of entirely new clinical guidelines or substantial revisions to existing principles governing somatic therapies to safeguard patients from adverse side effects (Baumann, 2016: 145). In contrast, if the efficiency of the editing process is too low at critical stages and corrective measures cannot be implemented, the outcome may lead to unintended and potentially harmful consequences.

Brokowski and Adli (2019: 89) highlight that concerns about the reliability and interpretation of heritable germline enhancement experiments are inherently difficult to control and predict, and meaningful analysis of their outcomes may take decades or even generations. The social acceptability of germline enhancement depends not only on its perceived safety but also on respect for autonomy. If prospective parents lack sufficient understanding of the risks associated with genetic technologies, including the intended and unintended modifications, harmful outcomes could arise. These outcomes could harm individuals, strain parent-child relationships, and foster prejudice against those with unintended traits, thereby endangering the welfare of future generations (Andoh, 2011: 73; Ishii & Beriain, 2019: 371).

2.9.2 The Consent from Prospective Persons

According to Munirah Isa and Muhammad Safian-Shuri (2018: 110), many parents are particularly attracted to the advantages of human genetic enhancement. This further complicates the debate over whether its applications should be permitted or banned. In today's society, the temptation of having the "perfect child", with enhanced cognitive abilities or other

exceptional traits that could contribute significantly to the development of the world, can be hard to resist (Isa & Safian-Shuri, 2018: 112). However, as Shinwari et al. (2018: 106) note, altering the human genome raises profound ethical questions encapsulated in the "three W's": *who* decides *what* kind of modification, and for *whom*? These concerns intersect with broader issues of parental authority and informed consent. Should parents have sole autonomy in making genetic decisions on behalf of their children, or would this impose choices on future generations who cannot yet consent? Consequently, scholars such as Bonginkosi Shozi (2020: 63) emphasize the need for government-imposed restrictions on parental freedom in this domain. Furthermore, some argue that the very act of parents selecting their children's traits is ethically troubling. Jürgen Habermas (2003: 53) contends that heritable enhancement objectifies prospective children by instrumentalizing their existence and eliminating the natural element of unpredictability in human reproduction.

On the other hand, genetic enhancement may gain support because the idea of parents influencing their children's traits is not entirely new. Long before the emergence of genetic technologies, humans practiced a form of "selectionist genetics" by choosing partners who exhibited desirable traits (Alonso & Savulescu, 2021: 569). However, this natural form of selection was often slow, unreliable, and inefficient. In contrast, modern genetic technologies allow prospective parents to select traits with far greater precision and even introduce characteristics that are absent from either parent's genomes. It is precisely this heightened level of control that makes germline enhancement more ethically troubling than traditional sexual selection (Shozi, 2020: 63). Shozi further argues that germline enhancement creates "a 'collision' between a prospective parent's interest in determining the nature of the prospective person, and the prospective person's self-identity". This tension gives rise to what Alonso and Savulescu (2021: 569) describe as the 'non-identity' problem, where the child may struggle to identify with traits imposed by parental choice and can never undo these predetermined aspects of their identity. Pang and Ho (2016: 61) also caution that such practices could be viewed as dehumanizing, which may contribute to the rejection of germline enhancement by some couples.

2.9.3 Socio-Cultural and Religious Concerns in the Embryonic Research Phase of Germline Enhancement

For germline enhancements to be achieved, experiments must be conducted on human embryos. However, due to the prohibition of embryonic research in many regions of the world,

the progress of genetic technologies is significantly constrained (Shinwari et al., 2018: 104). This has fuelled speculation that some scientists may be conducting secret experiments on non-viable embryos. Such concerns are heightened by high-profile cases, such as the 2016 Guangzhou study and Jiankui's experiment, which revealed how close the scientific community may be to crossing ethical boundaries.

Several key stakeholders have expressed concerns that genetic technologies could be used for unethical human experimentation, emphasizing the need for scientists to strictly adhere to the 14-day cut-off for embryonic research, widely recognized by the scientific community (Brokowski & Adli, 2019: 92). Some scholars have argued that limit may be too restrictive, especially given current interest in exploring the potential for "designer babies" (Shinwari et al., 2018: 106). However, this is one issue that most communities are not willing to negotiate and would rather recommend that genetic enhancement be prohibited (Andoh, 2011: 73; Shinwari et al., 2018: 106). Carolyn Brokowski and Mazhar Adli (2019: 92) argue that the controversy surrounding embryonic research is not merely about genetic technologies but stems from the unresolved question of the moral status of the human embryo.

While scientists may agree on the technical boundary of 14 days, there is no consensus among governments, courts, laboratories, funding agencies, religious organizations, or any other group on when an embryo acquires personhood (Brokowski & Adli, 2019: 92). This raises a series of ethical questions: Does destroying human embryos during research amount to the killing of human beings? Do embryos possess moral rights, and if so, what duties do we owe them? And is there any ethically justifiable reason for genetically modified embryos to be implanted for reproduction? According to Brokowski and Adli (2019: 92), these questions reveal the moral ambiguity at the heart of germline research. On the one hand, failing to address them risks enabling practices that many regard as unethical. On the other hand, banning or severely restricting embryonic research could stifle scientific progress and prevent exploration of therapeutic applications involving totipotent cells, which are only found in viable human tissue (Brokowski & Adli, 2020: 92). Thus, the embryonic research phase represents one of the most contested ethical concerns in the debate on human germline enhancement, balancing the potential for transformative medical breakthroughs against deeply held moral, cultural, and religious convictions about the value of early human life.

Since the emergence of genetic technologies, opinions about their acceptability have varied widely. To understand society's acceptance or rejection of these technologies, it's essential to consider the perspectives of the world's major religions, including Christianity, Judaism, Hinduism, Buddhism, and Islam. According to David Warmflash (2019: 1), there is rarely any universal consensus within religions on ethical issues, and genetic technologies are no exception. Each religion tends to formulate its own response to new scientific developments. From a religious standpoint, the most dominant objection to genetic technologies generally stems from Christianity, often framed as the concern of "playing God". This objection is frequently expressed by scholars who argue that producing a genetically enhanced human may be considered immoral, since it involves altering God's creation and transgressing divine law (Isa & Safian-Shuri, 2018: 117).

The idea of "playing God" is rooted in the belief that only God has the power to create human life, and any human attempt to imitate or modify creation is seen as potentially harmful. Moreover, as God's creations are believed to be flawless and endowed with divine wisdom, making arbitrary alterations is prohibited (Isa & Safian-Shuri, 2018: 117). As Isa and Safian-Shuri further explain, "when a human wants to play the role of God, to create and destroy, to control and rule, without comprehending that he is not God, harm to the earth results (2018: 117). Consequently, Christian perspectives on research involving human embryos and germline enhancement tend to be more restrictive than those of other religions. Given Christianity's status as the world's most widespread religion, such views carry significant weight in the global bioethical discourse.

Some scholars, such as Cletus Andoh, Zabta Shinwari, and Richard McMahon, caution that once proven safe, technologically advanced nations may misuse genetic technologies to pursue the creation of a "master race", referring to humans engineered to be genetically superior, more intelligent, physically attractive, and exceptionally athletic (Andoh, 2017: 42; McMahon, 2020: 4). Such individuals might never fall ill, enjoy extended lifespans, and remain productive indefinitely. In this way, future generations could become physically more robust and potentially superior to any that came before them (Andoh, 2017: 42).

However, this scenario raises concerns that germline enhancement would intensify existing social inequalities and discrimination among nations, paving the way for an era of high-tech consumer eugenics (Shinwari et al., 2018: 106). Given their limited resources and capacity to

mitigate these risks, underdeveloped countries may struggle to cope with widening health disparities. As Andoh (2017: 42) warns, unequal access to such technologies could foster a new form of genetic classism, where eugenics is revived through the manipulation of human genetics for selective improvement. This raises a critical question: will the editing of the genome for enhancement purposes reduce inequality, or will it deepen global divides?

Moreover, Shinwari and others argue that in the future, germline enhancement may not remain confined to therapeutic goals. Instead, scientists might be driven to extend its use further, potentially leading to the creation of new or unknown human-like species (Shinwari et al., 2018: 106). Hence, McMahon (2020: 4) urges careful oversight to prevent the potential misuse of genetic technologies in ways that could revive divisive ideologies under the guise of scientific progress.

One of the most pressing ethical concerns surrounding germline enhancement technologies is their potential to alter the very essence of humanity (Player & Matsuura, 2020: 3). Designing humans with specific traits may be seen as infringing on the fundamental freedoms and rights, including liberty, equality, and uniqueness, that define our humanity. Each person possesses a distinct identity, shaped in part by their genetic inheritance, which not only differentiates individuals biologically but also contributes to their moral and social identity (Andoh, 2017; Player & Matsuura, 2020: 3). Furthermore, Shozi (2020: 65) emphasizes that "just as DNA is foundational to human biology, it is also foundational to moral worth. Hence, the manipulation of human genetic material is morally equivalent to the manipulation of human persons". From this perspective, the human genome carries intrinsic moral value, and any modification may pose a threat to human dignity.

These ethical concerns extend into societal perceptions and legal debates. Isa and Safian-Shuri (2018: 118) note that public fears often center on the idea that germline enhancement could transform procreation into manufacturing, thus treating humans as products rather than beings with inherent worth. Legal considerations further complicate the issue: in countries such as Hungary, Senegal, and South Africa, positive liberties, including access to healthcare, are morally supported and often enshrined as constitutional rights (Heymann et al., 2013: 645). If germline enhancement falls under medical ethics, it raises the question of whether individuals might claim it as a constitutional right, similar to elective procedures such as plastic surgery, making prohibition difficult. Recognizing these challenges, many scientists, including

developers of CRISPR, advocate for a temporary moratorium to allow countries to establish clear governance frameworks, ensuring that these powerful technologies are regulated responsibly for both individuals and society (Cavaliere et al., 2019: 80).

2.10 African Perspectives on Human Germline Enhancements

For a long time, African perspectives on alterations and modifications to the human genome and embryo research have been underrepresented (Andoh, 2018: 39). Recent global discussions on the governance of human genome editing are often framed as inclusive and international, bringing together researchers, scientists, and the general public. However, African voices remain largely absent, resulting in limited consideration of Africa within the broader debate on human germline enhancement (Igwe, 2021: 87).

This absence is particularly concerning given that African populations are recognized for possessing the highest levels of genetic diversity in the world, yet less than 2% of all sequenced genomes are African (Wonkam, 2021: 1). Such diversity stems from long-standing genetic adaptations to diverse environmental conditions, dietary patterns, and exposure to infectious diseases. Despite these adaptations, Africa remains among the most disease-prone regions globally, with persistently low life expectancy and high mortality rates (Shozi, 2020: 62). According to Gerald Mboowa and Ivan Sserwadda (2019: 1), this combination of rich genetic diversity and a high disease burden has catalysed growing interest in genetic technologies across the continent. For Africa, the ethical engagement with human germline enhancement must therefore account not only for the potential medical benefits but also for issues of representation, equity, and the continent's unique genetic heritage.

Currently, Africa continues to remain largely passive in the technological field. This passivity has made the continent dependent on other regions for advanced technologies, relying heavily on technology transfers from Western and Eastern nations (Igwe, 2021: 121). Furthermore, Africa's socio-political and economic ties with these global powers have resulted in minimal influence over the techno-politics, bio-politics, and other drivers of the human enhancement agenda. Consequently, most African countries remain positioned at the lower levels of the Human Development Index. Of particular concern is that, for decades, African nations have been the recipients of second-hand or slightly used technologies from developed countries, some of which pose significant risks to human health and the environment. This dynamic defines Africa's current standing in the global techno-political hierarchy and raises pressing

ethical questions about the continent's capacity to engage meaningfully in technology-intensive and sensitive programs such as human germline enhancement (Igwe, 2021: 122). Cletus Andoh (2011: 67) and Leo Igwe (2021: 122) further assert that African nations have lagged behind other regions in technological advancement, with the continent often described as technologically backward, underdeveloped, or developing. While germline enhancement technologies hold the promise of eradicating diseases and increasing life expectancy, Africa's technological call for caution in adopting an overly optimistic view of human germline enhancement, as this gap is likely to persist over time. Given the ethical, social, and biopolitical implications of these technologies, it is crucial to explore African perspectives on the prospects and possibilities of applying them in local contexts.

Current discussions on human germline enhancement overwhelmingly reflect Western and other non-African realities, even though transhumanist approaches to improving the human condition could offer substantial benefits in African contexts (Igwe, 2021: 123). Evidence from other technological domains demonstrates how innovation can meaningfully transform livelihoods across the continent. For instance, technologies such as mobile phones and cryptocurrencies have expanded financial inclusion, improved access to market information, and strengthened economic participation, particularly among unbanked and rural populations (World Bank, 2022: 45). These developments illustrate the capacity of emerging technologies to address structural inequalities and enhance everyday life. Similarly, germline enhancement technologies, if adopted appropriately and guided by ethical frameworks, could contribute to addressing persistent health and developmental challenges in Africa. However, their integration must be approached with caution, as it may give rise to tensions with deeply embedded ethical and cultural values. Many African traditional worldviews regard humanity as a product of divine creation, whereas modern science perceives humans as part of the continuum of animal species (Shozi, 2020: 64). This tension between tradition and science highlights the importance of framing human germline enhancement within culturally informed ethical deliberations. Doing so will help ensure that technological progress does not inadvertently undermine African moral values and social cohesion.

African scholars such as Cletus Andoh, Bonginkosi Shozi, and Donrich Thaldar have sought to contribute to discussions on human germline enhancement by critically examining the compatibility, or lack thereof, of these technologies with African cultural ideologies. According to Ademola Fayemi (2018: 54) and Igwe (2021: 122), there is a prevalent tendency

within African scholarship to adopt a cautious and, at times, conservative stance toward the human germline enhancement project and its envisioned benefits for humanity. This cautious approach often manifests in scepticism, with some scholars interpreting transhumanist ideas as potential vehicles of neocolonial influence. Such concerns are further reinforced by critiques that identify problematic ideological undercurrents within certain strands of transhumanism. For instance, Timnit Gebru and Émile Torres (2024) argue that contemporary techno-futurist movements may reproduce assumptions aligned with eugenic thinking that risk justifying inequality and exclusion. In this light, African scepticism toward human germline enhancement can be understood not merely as resistance to external influence, but as a critical ethical response to the potential social and moral implications embedded within some transhumanist ideologies (Gebru & Torres, 2024).

Scholars such as Manitza Kotzé (2016) and Ambriose Wonkam (2021) hold the notion that emerging technologies would most likely exacerbate global inequalities, disproportionately marginalizing impoverished parts of the world, particularly in Africa. While some parts of Sub-Saharan Africa were already disadvantaged before the introduction of basic technologies, many areas still have not been eradicated due to the uneven deployment of technological innovations. This raises pressing questions: How might the application of human enhancement technologies pragmatically improve these regions? Will Africa risk becoming a continent of "outdated transhumans" once again? (Igwe, 2021: 123). Despite these concerns, Igwe posits that many transhumanists contend that such apprehensions can be addressed. He argues that any enhancements, even incremental, could lead to improvements over existing conditions, including in more developed regions. Furthermore, according to Igwe, transhumanists suggest that these enhancements could empower individuals to innovate more rapidly and effectively from their current situations, helping them bridge development gaps and potentially catch up with those who are technologically advanced or living in more privileged contexts (Igwe, 2021: 123).

African nations have historically been peripheral to global discussions on genetic technology (Igwe, 2021: 121). However, significant efforts to build local capacity in genetics research began in 2003 with the establishment of the African Society of Human Genetics (AfSHG). The society's primary objective is "to foster genetics research in Africa to generate knowledge for the prevention of disease and the promotion of health" (African Society of Human Genetics, 2003: 1). AfSHG aims to equip African scientists and policymakers with the necessary

knowledge and infrastructure to participate meaningfully to genomic research, while also providing a platform for networking and collaboration across the continent (Ndiaye et al., 2017: 2).

Building on earlier efforts, fairly recent initiatives like the Human Heredity and Health in Africa (H3Africa) consortium, established in 2012, have significantly advanced Africa's involvement in genomic research. H3Africa focuses on enhancing the ability of African scientists to apply genomic approaches to understand the factors contributing to chronic and infectious diseases in Africa (Peterson, 2014: 3). Through the establishment of biobanks, training programs, and research infrastructure, H3Africa enables African scientists to define and direct their own research agendas, which is particularly important for ethical and culturally informed applications, including human germline enhancement. Conducting genomic research in Africa, however, remains ethically and culturally complex, considering the deeply rooted beliefs regarding the donation of any body parts, particularly the body. According to Constantine Asahngwa et al. (2025: 6), blood is perceived as sacred in certain African communities and is believed to house the human soul. This spiritual symbolism reinforces the perception of blood not merely as a biological substance but as life itself. Such cultural understandings highlight some of the challenges to the acceptance of human germline enhancement technologies, particularly in rural and traditional communities where religious and cultural worldviews remain deeply entrenched.

Furthermore, in Africa, there exists a profound interconnectedness between religion, spirituality, and morality, which inevitably influences bioethical discourse. As Johnjoe McFadden (2016: 1) observes, questions arise as to whether the alteration of the human genome conflicts with the theological notion that humans are made in God's image, or whether the application of germline technologies effectively constitutes "playing God? These questions also raise concerns about decision-making authority: Who determines which traits may be edited and which should not? And who bears responsibility for ensuring the safety of such sensitive technologies?

In response to such uncertainties, efforts have been made to gauge public views on germline enhancement. A notable example is the SIENNA (Stakeholder-informed ethics for new technology with high socio-economic and human rights impact) Project, which conducted a survey in 2019 across 11 countries, including South Africa, with 1000 participants in each

country (Prudhomme et al., 2019: 2). The survey assesses awareness, perceptions, and acceptance of germline enhancement technologies concerning various potential applications. Overall perceptions of the technologies were more positive (47%) than negative (33%). South Africa, Greece, and Brazil reported the most favourable attitudes, while Germany, the USA, and France expressed less positivity. Additionally, younger participants (ages 18-34) and those with university degrees were significantly more supportive of these technologies (Prudhomme et al., 2019: 6).

A striking finding from the study was that a significant majority (81%) of respondents expected their societies to be "completely" or "somewhat different" within the next 20 years due to the widespread application of the technologies. In contrast, only 18% believed the changes would be "not very different" or "not different at all" (Prudhomme et al., 2019: 40). However, attitudes varied significantly concerning more controversial applications, such as "designer babies". While countries like Sweden (83%) and Germany (82%) strongly opposed parental use of germline enhancement to enhance traits such as intelligence and strength, South Africa ranked among the countries that strongly agree (72%) that parents should be allowed to enhance their children in this way (Prudhomme et al., 2019: 41). These findings highlight not only Africa's cultural and moral complexity in responding to germline enhancement, but also the continent's emerging voice in shaping global bioethical debates.

Within the African context, the application of genetic technologies, whether for healthcare or enhancement, remains worryingly ambiguous (Andoh, 2017: 34). This ambiguity stems largely from the limited engagement with the ethical, cultural, and religious implications of human germline enhancement within African scholarship. Thaldar et al. (2022) made an important attempt to address this gap by conducting the first public engagement study on human heritable genome editing (HHGE) in Africa. Their study is described as "novel as it is the first public engagement study on HHGE in Africa" (Thaldar et al., 2022: 1). The study involved 30 participants representing diverse demographic profiles, including race, gender, educational background, age, and religious beliefs. The rationale for public participation is based on the belief that decisions regarding the direction of science and technology should not be determined only by a small group of experts, but should also reflect broader societal values (Thaldar et al., 2022: 2).

The findings indicated strong public support for using gene editing to prevent genetic disorders and to provide protection against diseases like Tuberculosis (TB) and HIV/AIDS, as long as the technology proves to be safe and effective. In contrast, a substantial majority opposed the use of gene editing for enhancement purposes, particularly for cosmetic traits. The only exception was cognitive enhancement, which participants considered a special case; they viewed gene editing for intelligence as beneficial not only for individuals but also potentially advantageous for society as a whole (Thaldar et al., 2022: 13). However, this support was tempered by concerns that cognitive enhancement could create a new category of humans with altered capabilities, distancing them from "unedited" individuals and potentially destabilizing social cohesion and identity. This tension highlights the delicate balance between the perceived collective benefits and the risks of exacerbating social divisions that germline enhancement poses within the African context (Thaldar et al., 2022: 13).

2.11 South Africa's Current Ethical Guidelines and Regulations on Human Germline Enhancement

The current South African ethical standards seem to be underdeveloped and simply replicate the stance of the majority of worldwide ethical declarations without giving appropriate consideration to South Africa's specific healthcare demands, values, and existing legal regulatory environment. For instance, as mentioned above, South Africa is dealing with epidemics like TB and HIV, on a scale incomparable to other countries from which some of the ethical statements are drawn. Thaldar et al. (2020: 1) have attempted to comprehensively analyse the ethical and legal positions regarding human germline editing in South Africa. They attest that "South Africa's ethical regulations are problematic as they prohibit all research on, and the clinical application of, human germline editing. By contrast, the South African legal regulatory environment allows a regulatory path that would, in principle, permit research on human germline editing" (Thaldar et al., 2020: 1). However, it is unclear how human germline editing will be regulated legally in clinical settings. Therefore, it is necessary to alter South Africa's current ethical and legal framework. Hence, South Africa is deemed ambiguous when it comes to the permissibility of human genetic enhancement.

It is of grave importance that the people of South Africa know what the current stance of the country is on the moral and legal limitations of enhancing human germline and what ought to be the country's stance given the principles outlined in the South African Constitution. In their article 'Human germline editing: Legal-ethical guidelines for South Africa', Thalder et al.

(2020: 2) analyze the country's current position based on the three most prominent ethics guidelines, namely the ethics guidelines of the South African Department of Health, the Health Professions Council of South Africa (HPCSA), and the South African Medical Research Council (MRC). The Department of Health's ethics guidelines have sections on genetics and genomics research, highlighting general ethical concerns about these types of research. However, when it comes to the more specific topic of genome editing, the Department of Health is rather silent on its ethics guidelines (Thaldar et al., 2020: 2).

South Africa uses the HPCSA's Booklet 14, published in 2008, titled 'General ethical guidelines for biotechnology research in South Africa' as its code of ethical practice for medical biotechnology. Under the heading '13.3 Gene Therapy Research', the HPCSA states that "all research in relation to gene therapy must be directed to alleviating diseases in the individual patients and no attempts should be made through the use of gene modification, to change human traits not associated with disease". Under '13.3.2 Germline gene therapy research', the HPCSA states that "germ line gene therapy involves the insertion of genes into eggs already fertilized or very early embryos. The inserted genes would be transferred to subsequent generations, as it has the effect of modifying the human germ line. Research relating to germline gene therapy is therefore not acceptable" (Health Professions Council of South Africa, 2008: 42). As much as the HPCSA provides specific guidance on germline research, it does not define what it means by 'therapy'. For example, it does not mention whether this includes health-related enhancement to the genome. The justification based on heredity suggests that the goal is to ban all types of human germline modification research as well as their clinical applications. Thaldar et al. (2020: 2) view this as problematic, given that heritability in and of itself is undoubtedly a consideration to take into account, but it is not always a bad one or a good enough reason for a ban.

Lastly, the ethics guidelines of the MRC appear to have contradictory positions. In Book 2, under section 3.2.3 'Innovative practice or research', the MRC states that "The insertion of genes into fertilized eggs or very early embryos is fundamentally different because these genes would be passed on to the offspring in subsequent generations. Germ- line therapy should not be contemplated" (South African Medical Research Council, 2004: 17). Given that these ethics guidelines would go on to be one of the most fundamental guidelines for dealing with germline enhancement the choice of words 'should not be contemplated' is a poor one because as one is trying to understand South Africa's position on human genetic enhancement, one needs to

contemplate on germline modification (Thaldar et al., 2020: 2). Further, under section 3.2.3.1 'Public policy and the practice of germ-line gene therapy', the MRC provides a brief explanation as to why there are no simple solutions to the dilemmas presented by germline gene therapy therefore, "…modification of the human germ line should not yet be attempted until such time that it is clearly sanctioned by South African law" (South African Medical Research Council, 2004: 20). This statement is indeed ambiguous because one might ask oneself, who must sanction human germline editing before it can be attempted, and when will this sanction be sufficiently clear?

Then, when one goes back to section 2.17 'Pre-embryo manipulation and research' seems to take a different position, stating that "Pre-embryo manipulation and research may yield valuable medical information. However, it can be regarded as ethical only if the embryos are not specifically produced for the purpose of research" (South African Medical Research Council, 2004: 12). This statement suggests a more permissive approach to genetic manipulation of embryos which would include germline editing of embryos – when it states that "The embryos should not be transferred to the uterus unless there is reasonable certainty that the manipulation carries no potential risks for the foetus". However, the MRC is silent on the risks to the prospective person (after birth) whose genome is to be edited. Therefore, Thaldar et al. (2020: 2) assert that the hostility towards human germline editing by the HPCSA and the MRC is problematic because there is no apparent basis for placing an absolute ban on human germline editing. At most, safety and efficacy concerns are justifiable reasons for a temporary prohibition on clinical application, but not on research. Additionally, safety and efficacy concerns may be momentary in nature, with emphasis on why any ban on clinical applications needs to be temporary, allowing the opportunity for further research and clinical trials on human germline enhancement.

According to Section 73 of South Africa's National Health Act (NHA), "every institution, health agency and health establishment at which health research is conducted, must establish or have access to a health research ethics committee, which is registered with the National Health Research Ethics Council (NHREC)" (National Health Act, 2003: 39). This committee is responsible for reviewing research proposals and protocols as well as granting approval where research proposals and protocols meet its ethical standards. Even though not every human germline editing study would necessarily be about health, the NHA's expansive definition of 'health research' is expected to encompass all human germline editing studies

under its ambit, hence making NHREC clearance a requirement under the law. Research on human germline editing will necessitate the adoption of the 'Regulations Relating to Research with Human Participants' because research on human germline cells would require participants to donate germline cells. These Regulations state that research involving human participants must:

> (a) comply with the Department of Health national ethical guidelines for research with human participants at a minimum; (b) be responsive to health needs or priorities of the population, participating community or proposed participants; (c) have a valid scientific methodology and be likely to provide answers for the specific research questions that are posed; (d) include a favourable risk-benefit analysis; (e) ensure that the recruitment and selection process is just and fair; (f) be undertaken with appropriate consent processes; (g) undergo independent review by a registered health research ethics committee; (h) respect participants' rights, including but not limited to rights to dignity, privacy, bodily integrity and equality; (i) make provision for compensation for research-related injury, for more than minimal risk research; and (j) be managed by a lead researcher, or person with similar standing or title, with suitable experience and qualifications (National Health Act, 2014: 6).

These principles are accompanied by obligations that researchers who conduct research involving human participants need to uphold. The regulations state that researchers must:

> (a) submit the research proposal for ethics review and approval to a registered health research ethics committee and, where applicable, to the Medicines Control Council or any other body required by law, before commencing with the research; (b) consult with representatives from the participating community or other relevant research stakeholders, where appropriate; (c) consult with and notify the affected institutional or governmental authorities where necessary; (d) assess the ongoing welfare of participants and take appropriate steps in the event that participants experience harms; (e) disseminate research results, whether negative or positive, to research stakeholders, in a timely and competent manner including to participants and participating communities as far as possible; and (f) register the research in the South African National Clinical Trials Register, if classified as a clinical trial (National Health Act, 2014: 7).

Both the principles and obligations ensure that there is no harm or threat to the research participants, highlighting the importance of their consent for the given research. In addition, embryos would also be regulated by another provision of the NHA, namely section 57(4) which states that "the Minister may permit research on stem cells and zygotes which are not more than 14 days old on a written application and if- (a) the applicant undertakes to document the research for record purposes: and (b) prior consent is obtained from the donor of such stem cells or zygotes" (National Health Act, 2003: 62). According to this clause, embryonic development is permissible, subject to ministerial and donor consent, and an agreement by the researcher to maintain records of the research. In the event that the research advances to human clinical trials where an embryo with an edited genome can safely be transferred in utero for reproductive purposes, section 71 'Research on or experimentation with human subjects' of the NHA will take effect. Though a germ cell is edited or enhanced before the prospective child is born, the research continues throughout the pregnancy and into the child's life. The research may only be carried out if the specific genome alteration holds out the potential of a direct benefit to the child and, similar to a minor, the prospective child cannot consent; therefore, a prospective child would be best suited under the category of a minor (Nordgren, 2019: 560; Thaldar et al., 2020: 3).

Section 71 (3)(a) specifically speaks to human genetic enhancement as it is considered non-therapeutic, stating that "where research or experimentation is to be conducted on a minor for a non-therapeutic purpose, the research or experimentation may only be conducted- (i) in such manner and on such conditions as may be prescribed; (ii) with the consent of the Minister; (iii) with the consent of the parent or guardian of the minor; and (iv) if the minor is capable of understanding, the consent of the minor" (National Health Act, 2003: 73-74). When considering the clinical application of human germline modification, a plausible concept that emulates germline modification used in the NHA is 'reproductive cloning of a human being' (Thaldar et al., 2020: 3). This concept is defined in 57(6)(a) as: the manipulation of genetic material in order to achieve the reproduction of a human being and includes nuclear transfer or embryo splitting for such purpose (National Health Act, 2003: 62).

In addition, the NHA prohibits reproductive cloning of human beings by stating that "a person may not (a) manipulate any genetic material, including genetic material of human gametes, zygotes or embryos; or (b) engage in any activity, including nuclear transfer or embryo splitting, for the purpose of the reproductive cloning of a human being" (National Health Act,

2003: 62). One can argue that although the clinical application of human germline editing is not cloning as the term is widely understood, however, because germline editing is a type of 'modification of genetic material', it falls within the NHA's definition of 'reproductive cloning of a human being'. According to this viewpoint, the clinical application of germline editing would be illegal and punishable by law in South Africa, unless specific reference to germline editing is provided (Thaldar et al., 2020: 3).

Thaldar et al. (2020: 4) propose the following five principles that can be used to reform the current ethics guidelines on human germline editing in South Africa: (1) Human germline editing should be regulated, not banned, (2) Use the well-established standard of safety and efficacy, (3) Non-therapeutic uses of germline gene editing may be permissible, (4) Respect parents' reproductive autonomy, (5) Promote the achievement of equality of access. The first principle states that, given its potential to improve the lives of South Africans, human germline editing should be regulated and not banned. Also, since the nature of germline editing involves modifications to the genome, which could be heritable and passed on to future generations, the potential long-term implications of the proposed research need to be considered. This would apply to the risk-benefit analysis, including informed consent and, where relevant, community engagement.

The second principle states that new human germline editing clinical applications will have to be subjected to clinical trials on humans, the same way as with new medicines or medical devices. The clinical protocols should be designed mindful of the fact that germline editing is designed to be heritable. This means that the first human trials may have to monitor the trial participants over multiple years, perhaps even over generations. However, as with new medicines or medical devices, human germline editing clinical applications should only be made accessible to the public if they are proven to be safe and effective.

The third principle declares that non-therapeutic uses of germline editing, specifically enhancement, are viewed by some as ethically problematic, as they are viewed as nothing more than an endeavour to enhance people without a valid moral justification, and because they could easily lead to eugenics programs. Individual uses of germline editing technologies, by contrast, promote procreative freedom by leaving their application up to individual choice (Thaldar et al., 2020: 4). Furthermore, the assumption that there are no morally justifiable reasons for enhancement applications of germline editing is another issue worth questioning, given that

several noteworthy bioethicists and reputable ethics bodies such as the Nuffield Council on Bioethics (2018) have opined that there may be circumstances where genetic enhancement would be ethically justifiable. One such instance is the potential use of germline editing to select desirable genetic traits in future offspring, much like the selection of embryos through pre-implantation genetic testing. There is, further, no apparent reason why this would be deemed unacceptable in South Africa, given that the genetic selection of embryos for non-medical reasons is permissible in our law except for sex selection, which may only take place to prevent a serious medical condition (Thaldar et al., 2020: 4). Since germline editing does not require destroying multiple embryos lacking the desired genetic traits, it presents an ethically compelling option in societies such as South Africa, where some regard the embryo as having a special moral status that should not be violated. As such, Thaldar et al. (2020: 4) suggest that both therapeutic and non-therapeutic applications of germline editing may be permitted.

The fourth principle affirms that while human germline editing is a broad societal interest, the choice to use it, once safe and effective, rests with the individual prospective parents. This is because, as recognized by the Nuffield Council on Bioethics, the use of germline editing technology overlaps with the high premium modern liberal democracies give to the need to respect the reproductive goals of persons seeking to become parents. While some consider human germline editing an unprecedented intrusion into the destiny of future generations. Others have argued that it is in no way meaningfully different from other ways in which parents can influence their children. Underlying these arguments is the claim that human germline editing falls within the field of socially accepted and legally protected interests of parents in making decisions relating to reproduction. Therefore, if clinical applications of germline editing become available to the public, prospective parents should be permitted to choose whether they wish to use such applications for their prospective children. The choices of prospective parents in this regard should not otherwise be restrained, unless it is a limitation that is reasonable and justifiable in an open and democratic society such as South Africa.

Lastly, the fifth principle encourages equal access to germline editing technologies. A concern that is often raised in debates about human germline editing is that this new technology may only be accessible to the rich, with the consequence of exacerbating existing inequalities in society, particularly in societies like South Africa, given the wide gap between the rich and poor, and the lack of access to health care for the underprivileged (Thaldar et al., 2020: 5). One

possible response is that although new technologies are often expensive initially, in time they typically become far less expensive. Ongoing research and development of the technology further make it more accessible. In other words, the solution to the concern about human germline editing exacerbating inequality cannot be to suppress the technology.

South Africa is among the few countries that explicitly protect the right to freedom of scientific research, a protection that extends to research on human germline editing. In this context, the right operates in a mutually reinforcing relationship with the rights to health care, dignity, and equality. South Africa's ethical guidelines acknowledge the potential risks and benefits of genetic technologies; however, the clinical application of human germline editing introduces unique uncertainties, leaving the country's stance on the technology vague (Thaldar et al., 2020: 5). With sufficient public engagement, South Africa could adopt a clearer and more inclusive position that reflects the nation's diverse cultural perspectives, particularly in relation to the clinical use of human germline editing.

2. 12 The Ontological and Ethical Beliefs of the Zulu People in South Africa

The Zulu people are a Nguni ethnic group prevalent in South Africa, with the majority residing in the province of KwaZulu-Natal. According to the latest national census, IsiZulu is the most commonly spoken home language in South Africa, with 24.4% of the population identifying it as their first language (Statistics South Africa, 2023). In the Nguni languages (Zulu, Xhosa, Ndebele, and Swati), the word *iZulu* translates to "heaven" (a spiritual or divine place), "sky" (the physical space above the earth), or "weather" (the condition of the sky). This highlights that the word *iZulu* holds both linguistic and spiritual significance (Callaway, 1970: 13). Linguistically, it has multiple literal interpretations, while spiritually, it holds deeper cultural and cosmological implications, linking the sky to Zulu beliefs about the universe, God, and ancestors.

The Zulu community is widely known for its strong spiritual and religious orientation. Chara Scroope (2019: 1) notes that approximately 81% of Zulu people living in South Africa identify as Christians. They believe in a supreme deity called *uNkulunkulu*, which means "the Great and Wise One" in a Christian context. However, religious identity among Zulu people is often fluid. Some individuals identify strictly as Christians, while others adhere to traditional ancestral belief systems, and some combine both Christian faith with ancestral veneration (Scroope, 2019: 1).

In this blended belief system, *uMvelinqangi*, meaning the "Most High" or "the One Who Came First," is recognized as the supreme being who coexists with various spiritual entities, including ancestral spirits and natural forces (Hexham, 1981: 273). By "natural forces", Irving Hexham refers to elements of the natural world believed to possess power, agency, or spiritual significance in Zulu traditional beliefs. These include weather phenomena like rain, drought, and lightning, as well as earthly elements such as mountains, rivers, and waterfalls. The Zulu people hold a strong believe that these various beings communicate with them and can intervene in their lives for good or ill (Callaway, 1970: 13; Nwoye, 2017: 47). For instance, if lightning strikes a homestead, it may not be perceived as a mere weather event, but rather as an intentional act related to ancestral displeasure, witchcraft, or the intervention of uMvelinqangi. Therefore, the Zulu worldview reflects a complex ontology where divine beings, ancestral spirits, nature, and the human community exist in a reciprocal and ethically significant relationship.

This belief system emphasizes that ancestors function as active intermediaries between the living and the divine, influencing many aspects of Zulu ethical life (Nwoye, 2017:51). For example, the birth of a child is often seen as a gift facilitated by ancestral approval, and couples seeking a specific gender may perform rituals to request ancestral intercession. This reflects deep faith in spiritual agency rather than reliance on biomedical intervention. Additionally, Zulu beliefs and ethical systems have evolved within the context of modern South Africa, adapting to urbanization, constitutional democracy, and scientific advancements (Nwoye, 2017: 52). While many Zulu people today reside in urban areas and actively participate in global economic and social systems, the foundational principles of relationality, spiritual interconnectedness, and ancestral veneration remain deeply embedded in their social and cultural life (Scroope, 2019: 2).

Moreover, as Zulu people navigate realities of modern urban life, ancestral belief systems and the ethical importance of community continue to shape their life choices, including decisions related to health, reproduction, and social responsibility (Nwoye, 2017: 47). This dynamic interaction between traditional beliefs and contemporary experiences demonstrates that Zulu beliefs are not static, rather, they are adaptive and provide a living ethical framework for addressing contemporary challenges. Accordingly, the question of whether genetic technologies such as human germline enhancement might disrupt this relational and spiritual

worldview is particularly significant. The Zulu community, much like many other African communities, possesses deeply rooted ethical and cultural ways of interpreting issues such as diseases, fertility, and gender selection, often in ways that contrast with technoscientific solutions (Nwoye, 2017: 47). It is against this background that the study seeks to enquire whether germline enhancement would have any ethical implications or reshape any African cultural values and belief systems.

2. 13 The Research Gap

The literature reviewed above shows that many scholars have identified the ethical concerns raised by the emergence of human germline enhancement technologies. While these technologies are intended for global use, their development largely reflects Western ethical and cultural assumptions. Given their increasing relevance within African contexts, an African-centered ethical perspective is essential to ensure contextually appropriate evaluation and governance. This study seeks to address this gap by arguing for the importance of examining the ethics of human germline enhancement from an African perspective, using the Zulu people as a case study. To achieve this, the study explores the Zulu ontological understanding of the sanctity of life and considers how this worldview informs ethical and cultural responses to germline enhancement.

It also situates this inquiry within the broader South African context, where existing ethical guidelines and regulations remain limited, ambiguous, and insufficient for addressing future developments. The lack of clear guidance makes it difficult for the country to establish an informed position should such technologies become available. This is why public engagement emerges as a critical starting point, though it presents challenges in a culturally and religiously diverse society such as South Africa. In light of this, the study focuses on understanding the potential challenges that human germline enhancement may pose for Zulu culture, and whether these challenges would influence its adaptability from both an ontological and ethical perspective.

2. 14 Conclusion

This chapter has reviewed relevant literature that informs this study, organized around key thematic areas. It began with a brief historical overview of human enhancement and the methods associated with genetic enhancement, followed by clarifications of the various definitions, with a particular focus on human germline enhancement. The discussion then

explored the present and potential applications of germline enhancement, alongside the ethical concerns that accompany these technologies. The discussion then shifted to African perspectives on human germline enhancement. Next, the study examined South Africa's current ethical guidelines and regulations concerning genetic technologies, along with an exploration of the ontological and ethical beliefs of the Zulu people.

Ultimately, the study highlighted the gap it intends to fill, which is to conduct an inquiry into the ethical and cultural perceptions of human germline enhancement among the Zulu people in South Africa. The aim is to investigate how their ontological beliefs, especially their understanding of the sanctity of life, would influence their response to human germline enhancement. The next chapter, chapter three, discusses the study's theoretical framework.

CHAPTER THREE
THEORETICAL FRAMEWORK

3.0 Introduction

The previous chapter reviewed key literature relevant to this study, highlighting the ethical concerns surrounding human germline enhancement technologies, including increased life expectancy, physical and cognitive enhancements, and the concept of designer babies. It further examined these technologies from an African perspective, discussed South Africa's current stance, and explored the ontological and ethical beliefs of the Zulu people. This chapter outlines the theoretical frameworks guiding the study.

Tommaso De Benetti (2009: 37) defines a theory in research as a plausible principle or body of principles offered to explain a phenomenon. In a more philosophical context, a theory is expected to provide a model capable of predicting future occurrences or observations, which are tested through experimentation or otherwise confirmed by empirical observation. This model, also known as a theoretical framework, is used by researchers to help them organize their observations and lines of thought (Delport, Fouché & Schurink, 2011: 297). The theoretical frameworks that will guide this research are principlism and African communitarian ethics. In line with the main objective of this research, that is, to critically examine how the Zulu ontological understanding of the sanctity of life shapes ethical and cultural responses to human germline enhancement, the study uses principlism as an evaluative tool and African communitarian ethics as both descriptive and prescriptive tools.

3.1 Principlism

Principlism, also known as the four-principles approach, is a widely used framework in healthcare and biomedical ethics that emphasizes four key principles: respect for autonomy, beneficence, non-maleficence, and justice. Principlism was popularized by Tom Beauchamp and James Childress in 1979 in their classic textbook '*Principles of Biomedical Ethics'*. This followed the Belmont report, which was also published in 1979 by the United States National Commission for the Protection of Human Subjects of Biomedical and Behavioural Research. This was the first national public body to shape the bioethics policy in the United States (Beauchamp & DeGrazia, 2004: 56). The commission was tasked to determine the fundamental ethical principles that ought to guide research involving human subjects. In response, the commission identified the following three basic principles as being predominantly relevant to

the ethics of research involving human subjects: Respect for persons, Beneficence, and Justice (Iserson, 1999: 42).

Respect for persons involves two ethical convictions; "first, that individuals should be treated as autonomous agents, and second, that persons with diminished autonomy are entitled to protection" (Iserson, 1999: 43). Thus, the principle requires one to first acknowledge a person's autonomy which is to give weight to their choices and opinions while refraining from impeding their actions unless they are visibly harmful to others. Further, the principle requires one to protect those with diminished autonomy. According to the Belmont Report, people with diminished autonomy are those who are not capable of self-determination. David Ryan and Edward Deci (2000: 68) define self-determination as the empirical process that enables the best possible functioning of the innate tendencies for growth and integration, as well as for healthy social development and personal well-being.

The ability to make decisions for oneself develops throughout a person's life, although some people lose this ability entirely or in part due to illness, mental impairment, or other circumstances that severely restrict liberty (Iserson, 1999: 43). Hence, the principle requires that the respect for the immature and the incapacitated be protected insofar as they are in that state. Some people require little protection as long as they are assured that they can engage freely in activities with an understanding of potential adverse consequences. The level of protection is determined by the risk of harm as well as the likelihood of benefit. Therefore, the people in need of extensive protection may even be excluded from activities that may be harmful to them (Iserson, 1999: 43). Beauchamp and Childress take the principle of respect for persons further by placing more emphasis on respecting one's autonomy. This approach set them apart from other texts in the emerging field and is largely responsible for their influence as they were perceived as formalizing the conversation on autonomy and elevating it to a more rigorous philosophical level (Lysaught, 2004: 674).

3.1.1 Respect for Autonomy

Respect for autonomy is a principle concerned with respecting an individual's ability to make their own choices. Any conception of moral decision-making presupposes that logical agents are engaged in making informed, voluntary decisions and that individuals can act with intent. In a healthcare setting, the autonomy of the patient must always be respected. Such regard is more than simply a matter of attitude; it is also a way of valuing and promoting the patient's

autonomy. Even if the patient's values differ from the typical objectives of biomedicine, the communication process must be empathetic and mindful of the patient's unique values (McCormick, 2013). The principle of respect for autonomy can be expressed as a negative and positive obligation. As a negative obligation, the choices of the individual should not be interfered with and as a positive obligation, autonomous informed decisions are promoted by disclosing appropriate information (Beauchamp & Childress, 2001: 65). Therefore, a person is considered competent if he or she understands their particular situation, the consequences of their decision, and the decision is founded on coherent reasoning (Iserson, 1999: 43).

According to Beauchamp and Childress (1979: 58), "it is one thing to be autonomous…but quite another to be respected as an autonomous agent and to respect the autonomy of others". Here, Beauchamp and Childress acknowledge the importance of the term "respect" in the field of bioethics and how it entails deferring to the other, taking into account their interests and feelings, attending to their needs, and looking out for the well-being of others. While Beauchamp and Childress's concept of autonomy seemed to cover the same area as the principle of respect for persons, they introduced three significant changes. Firstly, their principle highlights that what is to be respected is not persons as such but the autonomy of persons. Secondly, though somewhat of a repetition, Beauchamp and Childress insist that the world of persons is confined to autonomous individuals. Thirdly, respect in this context refers to noninterference and an obligation not to restrain autonomous actions. Thus, Beauchamp and Childress's account of respecting and valuing autonomy has had a significant influence on clinical bioethics (Lysaught, 2004: 676).

Although human germline enhancement is not typically pursued for therapeutic reasons, it is, however, described as a biomedical intervention that, like plastic surgery, would be performed by a professional healthcare practitioner (Friedmann, 2019: 352; Almeida & Diogo, 2019: 182). Granting that using human germline enhancement technologies is indeed an individual's choice, it would nevertheless have an impact on society as a whole because this touches on the very essence of humankind, which raises several ethical concerns. As stated by Jonathan Pugh (2020: 6), autonomy is about a person's ability to make informed decisions regarding how to lead his or her life, without being coerced by another person. It follows that an individual may choose whether or not to enhance his or her capabilities. However, what happens in the case of parents wanting to enhance the capabilities of their unborn child? Should their autonomy be restricted? Are there justified reasons for doing so? In cases where parents could choose certain

traits for their babies, such as height, eye colour, and intelligence, this could severely impact human diversity. Furthermore, certain trends might favour particular traits, while others might disappear, which would reduce genetic variability. Thus, each individual enhancement has consequences for society (Cavaliere, 2019: 22).

David Archard (2008: 1) asserts an argument on how germline enhancement could or could not be admissible because it might be seen as a violation of human autonomy. This is done by evaluating the autonomy of a person who is to grow up from the embryo subjected to germline modification. First, a distinction is made between personal and moral autonomy. Archard defines personal autonomy as one's ability to freely choose their desires (preferences and goals). Personal autonomy is divided into two varieties: material and formal. By contrast, the material variety requires one to choose a specific type of desires that are moral, prudent, and those that realize some ideal of human excellence. The formal variety does not prevent one from choosing their desires, "whether they be moral or amoral, whether they are to satisfy some ideal of human excellence or not, whether they are to be loyalty, commitment, obedience to a group or rather some kind of substantive independence, whether they can be self-destructive or not" (Archard, 2008: 2).

Furthermore, moral autonomy is defined as one's ability to reflectively uphold certain principles that will govern their actions and/or affirm principles they already accept, which they may have initially accepted on unreflective grounds, such as the capacity for normative self-government. Moral autonomy has three varieties: material, formal, and Kantian moral autonomy. The material autonomy outlines the moral principles that one must reflectively choose and affirm in order to be deemed 'morally autonomous', while a formal variety requires one to reflectively choose the moral principles that will guide their actions. This is also referred to as the capacity to understand moral principles as a particular category of justifications for actions. Moreover, this variety constitutes a cognitive element of the moral sense whereby one is required to comply with moral principles. The third variety, which Archard considers to be the strongest variety, is the Kantian moral autonomy, which he defines as one's ability to reflectively choose and affirm the moral principles that guide their actions as well as solely be driven by these principles, free from interference from any empirical factors (Archard, 2008: 4).

When applying these definitions to germline enhancement, it is important to be clear about the type of enhancement that is to be conducted on the embryo as well as the implications of that enhancement (Archard, 2008: 5). For example, is the enhancement 'directed' meaning it consists of the prospective parents choosing to modify the embryo in such a way that its development is strongly determined to proceed in a certain definite direction, or is the enhancement 'all-purpose' which consists of the prospective parents choosing to modify the embryo in a way that increases the embryo's overall capacities to effectively pursue various life careers.

According to Archard, directed enhancement diminishes personal autonomy because by determining a person through genetic modification to choose a concrete life career or even choose from a smaller set of life careers than they would have been without the intervention, one undermines the person's ability to choose their particular desires (2008: 5). However, moral autonomy would not be affected as the person would still be able to determine their own set of principles that guide their actions.

All-purpose genetic enhancement, on the other hand, does not diminish personal autonomy and does not affect moral autonomy in any way. Instead, this type of enhancement increases one's autonomy, as it widens the range of goals from which they can choose those goals they wish to be theirs. Once the type of enhancement is thoroughly established, the task of determining whether the enhancement is a violation of human autonomy becomes an easy one.

3.1.2 Beneficence

The concept of beneficence is broadly understood as the acts of kindness or charity that demand us to take more positive steps towards helping others (Iserson, 1999: 43). In the Belmont report, beneficence is understood as a strong obligation to the following general rules: "(1) do no harm and (2) maximize possible benefits and minimize possible harms" (The National Commission for the Protection of Human Subjects of Biomedical and Behavioral, 1979: 5). This obligation stems from the earliest Western expression of biomedical ethics known as the Hippocratic Oath. According to Daniel Sokol (2013: 1), this is an oath historically taken by new physicians swearing to uphold specific ethical standards such as prioritizing to benefit the patient, avoiding or minimizing harm, and respecting the values and preferences of the patient. Principlism, as described by Beauchamp and Childress, divides Belmont's principle of beneficence into two separate principles: the principle of beneficence and the principle of non-maleficence.

Beauchamp and Childress (1994: 259) state that morality not only requires us to treat people autonomously and refrain from harming them, but we also need to contribute to their welfare as well as promote their interests, and such actions fall under the principle of beneficence.

Beauchamp and Childress (1994: 260) make a distinction between specific beneficence and general beneficence. Specific beneficence refers to the duties we have to act positively towards the benefit of others, aiding them to further their important and legitimate interests by preventing or reducing potential harm. This type of beneficence mostly applies to those with whom we have personal or special relationships. General beneficence goes beyond those unique ties to all persons. In most cases, general beneficence seems ideal because even though moral ideals encourage us to take positive action to help others with whom we do not have a particular relationship, the moral rules do not obligate us to do so. However, in biomedical ethics, beneficence requires physicians to "benefit their patients according to their best judgment" (Iserson, 1999: 43). Often, upon learning the benefits for the patient, the physician may need to weigh the risks the patient may be exposed to. The challenge provided by these imperatives is determining when it is acceptable to pursue particular benefits despite the associated risks, and when the danger justifies foregoing the benefits.

Basil Varkey (2021: 21) asserts that although beneficence has historically played a significant role in the conventional practice of medicine, the principle often raises issues of paternalism and conflicts with respect for autonomy. Medical paternalism takes place when a physician makes a medical decision on behalf of a fully capable patient without considering their opinion, which is considered unilateral or nonautonomous conduct. However, when a patient's ability to make decisions for themselves is either temporarily or permanently limited, then paternalism may be ethically justified. Hence, the Belmont Report defines the principle of beneficence as an obligation to make efforts to secure a person's well-being rather than a function of autonomy.

If the principle of beneficence were applied to human germline enhancement, one could consider germline enhancement to ensure a prospective person's well-being. In 2001, when preimplantation genetic diagnosis (PGD) and in vitro fertilization (IVF) made it possible for parents to choose from a variety of embryos, Julian Savulescu, an Australian philosopher, introduced the principle of procreative beneficence (PPB). According to this principle, "parents have the obligation to choose the child that is expected to have the best life" (Savulescu, 2001:

1). He argues that once the genetic technologies are proven safe and effective, it is morally on par for parents to voluntarily embrace the parental obligation to genetically enhance their prospective children. Whether the life of the individual receiving the enhancement genuinely improves as a result of the improvement of some capacity is a matter of debate. Thus, making it difficult to ascertain the moral stance on any specific type of germline enhancement.

Ultimately, Savulescu notes that it is not the removal of a disease that is important, but rather how it affects a person's life. He clarifies that he is neither a proponent nor an opponent of human germline enhancement, but instead, he focuses on 'all-purpose goods' that could come from enhancement which include increasing the "chances of leading a good life in the relevant set of circumstances" (Savulescu, 2001: 1). According to Beauchamp and Childress (2019: 10), the principle of beneficence aims to promote well-being for both individual patients and society as a whole. Therefore, it is possible that the concept of human germline enhancement could be ethically justified through the application of beneficence.

3.1.3 Non-Maleficence

In biomedical ethics, the principle of non-maleficence refers to a physician's duty to 'do no harm' or allow harm to be caused to a patient. In simple terms, the principle underpins several moral precepts, including prohibitions against killing, inflicting pain or suffering, incapacitating, as well as depriving others of the benefits of life (Beauchamp & Childress, 1994: 260). As stated by Annelien Bredenoord (2016: 140), the principles of non-maleficence and beneficence are closely related and are often considered inseparable pillars of ethics. However, Beauchamp and Childress (1994: 260) distinguished non-maleficence from beneficence as an additional principle, stating that the former differs from the latter in two major ways; Firstly, non-maleficence acts as a threshold for therapy because it rules out any treatment that causes more harm than good. Whereas, beneficence takes into account all available treatment options and ranks them in order of preference.

Secondly, we often employ beneficence in response to certain situations, such as selecting the best course of action for a patient. In contrast, in clinical practice, non-maleficence is always a constant, and as attested by Bredenoord, "as far as we are aware, no authors have criticized this obligation not to harm patients" (2016: 140). Therefore, the application of beneficence in any situation most likely involves an examination of non-maleficence, which is why some scholars,

such as Lynn Jansen, Ben Saunders, and Basil Varkey, prioritize non-maleficence over beneficence in medical ethics.

Although mistakes may occur in the medical field, non-maleficence, however, articulates a fundamental commitment on the part of healthcare practitioners to protect their patients from any harm. Beauchamp and Childress (1994: 260) allude to some instances where a single action may result in two outcomes (double effect), one of which is thought to be positive and the other, negative. Additionally, under the principle of non-maleficence, four conditions would have to be analyzed and applied in such situations: (1) The nature of the act: the act itself must be good or at least morally neutral and free from intrinsic wrongdoin; (2) The agent's intention: it should always be good, even if the negative effect is foreseen; (3) The distinction between means and effects: the negative effect must not serve as a means to achieve beneficial outcome; and (4) Proportionality between the good and bad effects: the beneficial outcome should always outweigh the undesirable effect (Beauchamp and Childress, 1994: 260). These conditions describe how a morally questionable act can still be ethically acceptable if the intent and outcome align with minimizing harm.

The four conditions may be applied to human germline enhancement since these technologies are envisioned to yield a double effect where the modifications are done to an individual or embryo with no defects, and as such, may be seen as an unnecessary intervention, as this exposes the person to potential harm that could have been avoided. However, because the enhancement is envisioned to increase the chances of leading a good life, for example, the person may possess increased cognitive abilities that, when applied accordingly, may result in beneficial changes in their lives, such as wealth. This may justify the use of such technologies since the principle of non-maleficence clearly states that it is the practitioner's duty not to deprive the patient of the benefits of life.

While the application of beneficence would involve weighing the benefits of human enhancement against the associated risks and costs, the application of non-maleficence would focus on the notion of avoiding any harm that could result from the use of human enhancement technologies. Similar to Julian Savulescu's concept of procreative beneficence, South African-based philosophers, Donrich Thaldar and Bonginkosi Shozi, argued for the employment of the principle of procreative non-maleficence as one of the principles that may be useful to guide

the reproductive clinical applications of human germline enhancement technologies (Thaldar & Shozi, 2020: 32).

According to Thaldar and Shozi (2020: 32), the principle can provide a framework for balancing out the reproductive rights of prospective parents with the state's duty to protect child welfare, which are the two often competing interests that are recognized by the law in most liberal democracies. The principle's relevance was brought about by the country's realization that the range of possible reproductive decisions that parents may make when using new reproductive technologies does not include choices that will cause harm to the prospective child. Thus, Thaldar and Shozi proposed the procreative non-maleficence principle as a general legal principle that can offer useful guidance in the near future when germline modifications may develop into an efficient and secure reproductive option that prospective parents can choose.

3.1.4 Justice

In the Belmont Report, the principle of justice is defined as the notion that "equals ought to be treated equally" (United States Department of Health, 1977: 626). However, this definition requires clarification regarding who is regarded as equal, who is unequal, and why. The Belmont report stipulates that the distinction between the equal and unequal is made based on experience and other factors, such as age, deprivation, competence, merit, and status, which may be used to justify differential treatment in healthcare.

Beauchamp and Childress do not provide their own definition for the principle of justice, however, they point out the various philosophical concepts of justice with distributive justice being the most pertinent to clinical ethics (Beauchamp & Childress, 1994: 330; Iserson, 1999: 58). They argued that justice was the distribution of resources according to the concept of justice that a given society adheres to. Thus, implying that different communities subscribe to different theories of justice. For example, a consequentialist approach to justice would be to distribute resources according to what produces the best results or the most overall happiness. In contrast, they propose that a liberal philosopher such as John Rawls would favor allocating access to health resources following standards that everyone could deem acceptable (Beauchamp & Childress, 1994: 330).

Beauchamp and Childress's interpretation of the principle of justice has faced criticism from various scholars, including W. D Ross, Danner Clouser, and Bernard Gert. They argued that this version of justice lacks sufficient precision for guiding individuals in decision-making. Rather than providing clear assistance, it offers multiple forms of justice for individuals to choose from, which can complicate the decision-making process (Bredenoord, 2016: 142).

Furthermore, there are widely accepted formulations in which costs and benefits may be distributed in a just manner. These include the following: "to each person an equal share, to each person according to need, to each person according to effort, to each person according to contribution, to each person according to merit, to each person according to free-market exchanges" (Iserson, 1999: 61; Varkey, 2021: 21) Therefore, as aforementioned, one's application of justice is based on their subscribed theory. However, when a benefit to which a person is entitled is withheld without justification or when an excessive burden is placed upon them, this is considered an injustice (United States Department of Health, 1977: 626; Beauchamp & Childress, 1994: 330). In research on human subjects, justice as described by both Beauchamp and Childress and the Belmont report, is incorporated to ensure that reasonable, non-exploitative, and well-considered procedures are administered fairly and that there is fair and equal distribution of the costs and benefits of the research.

As maintained by Manitza Kotzé (2014: 8), when applying the principle of justice to human germline enhancement, one is confronted with the much bigger issues of socio-economic justice such as "basic health care, clean water, satisfactory nourishment, maternal and child care and the treatment and prevention of HIV/AIDS" which are far more pressing crises than the accessibility of genetic treatments, let alone the enhancement aspect of germline modification. Additionally, the direct link between justice and human germline enhancement technologies would be the inequality that would exist in access and affordability of such technologies, which would perpetuate injustice. However, these concerns can be easily argued away given the significant disparities that currently exist in the health care sector.

As a result, failing to address the greater socioeconomic context might lead one to claim that these biotechnologies do not advance the discipline of bioethics since the disparities they may exacerbate already exist. (Kotzé, 2014: 8). Nonetheless, this raises questions about the social justice aspect concerning the use of human germline enhancement technologies. For instance, Francis Fukuyama (2002: 16) states: "If wealthy parents suddenly have open to them the

opportunity to increase the intelligence of their children as well as that of all their subsequent descendants, then we have the markings not just of a moral dilemma but of a full-scale class war". This possibility, according to Kotzé (2014: 8), raises significant questions about human dignity and whether there is a general belief that all people are born equally with inherent dignity; what impact might this potential genetic division have for humankind? On the other hand, human germline enhancement might also be viewed in terms of power, particularly because a relatively small portion of the population would be able to afford and have access to these technologies.

3.2 Critique of Principlism

The principlism approach is a framework that has faced significant criticism over the years, despite its promising beginnings (Clouser and Gert, 1990: 219). According to the authors, some of the notable arguments against principlism include the following: (1) The approach does not take the dialectical relationships between ethical theory and moral practice into account. (2) The approach primarily operates as a mere checklist that reminds you of issues to keep in mind when considering a biomedical moral issue. (3) It only favours Western moral intuition. (4) The approach lacks any systematic relationship between each principle, which could sometimes lead to unresolvable conflicts with each other. This is usually because the four principles have no unified moral theory from which they are all derived.

Clouser and Gert (1990: 219) explain that the practice of employing "principles" instead of traditional moral theory and specific moral rules and ideals in dealing with moral issues that occur in medical practice is misleading from both a theoretical and practical standpoint. This is because these principles do not function as intended and are instead a mere collection of sometimes superficially related matters for consideration when trying to resolve a moral dilemma. In addition, Daniel Callahan (2003: 288) argues that the absence of moral traditions and theories, is in fact, the blocking function of principlism because instead of encouraging us to think "richly and imaginatively about ethics", its ethical reductionism enables us to disregard the complexity of life as well as the ambiguities and uncertainties that characterize the most significant ethical dilemmas. Although at times this can be helpful, often it is not because focusing solely on the external conditions of moral decision-making unintentionally leads us to end our moral analysis, including its socio-legal aspect, which takes into consideration our right to make our own decisions and to be treated fairly and gently (Callahan, 2003: 189). This is echoed by Fayemi (2021: 52), who maintains that the absence of a unified moral theory in

principlism consequently defaults to eclectic theories that eventually obscure moral foundations and ultimately block substantive ethical inquiry.

In light of what has been discussed above, human germline enhancement is considered a significant ethical dilemma because it raises questions about the essence of humanity and the moral status of human embryos, for instance. Thus, reflecting the true nature of the complexity of life. On the one hand, the technology promises to enable the enhancement of cognitive abilities, which might arguably bring about desired outcomes, and on the other hand, the genetic changes made to the germline might be irreversible, meaning that future generations would be modified in ways they had no choice about. Therefore, Callahan (2003: 288) argues that a framework that enables us to sidestep deep moral reasoning and deliberations on such a complex moral dilemma, despite it being an issue directly located in biomedicine, is highly problematic.

Tom Walker (2009: 229) states that, as an approach, principlism is insufficient as it merely lists the principles that an agent needs to consider in ethical decision-making instead of providing further guidance on how we arrive at moral conclusions. Thus, he argues that more principles are needed to make this claim true. According to Walker, we need more than four principles to effectively capture the common morality found in biomedicine. Therefore, to better capture universalism, proponents of principlism could simply increase the number of principles or argue that "not all moral norms are universalisable" (Walker, 2009: 230). However, in the latter instance, relying on a framework with only four guiding principles makes it difficult to pinpoint and resolve moral issues. He writes:

> As a descriptive claim, principlism would be true if it expresses the moral norms that are in fact shared by all morally serious people. That is, when thinking seriously about what we ought to do, we all, no matter what our cultural background, recognise moral norms that are captured by the principles of respect for autonomy, non-maleficence, beneficence, and justice (though we may disagree about the scope of these) (Walker, 2009: 231).

This leads us to the third criticism, where Walker and other scholars, including Jacqueline Lindridge, Soren Holm, Daniel Callahan, and Mathew Shea, argue that although principlism is applauded for its two key virtues, its liberal, individualistic culture from which it emerged, and its simplicity in conceptualization and application. Unfortunately, this makes the approach 'philosophically incoherent' and only compatible with Western moral intuition (Callahan,

2003: 288; Lindridge, 2017: 160). In addition, Callahan asserts that principlism is "too narrow to do all the necessary work of ethics, too individualistic to help us answer questions about the appropriate needs of communities, and too mechanical to encourage some necessary analytical and personal skills" (2003: 291). Similarly, Holm argues that such an approach provides inadequate moral guidance for non-American users due to limited guidance on specific considerations within one or four broad principles (Holm, 1995: 337).

Francis Akpa-Inyang and Sylvester Chima (2021: 4) also argue that principlism's emphasis on individual autonomy is often incompatible with African values such as communal responsibility, interdependency, and relational personhood, as it is ignorant of the moral authority of culture in shaping ethical decisions. Moreover, Walker observed that while the approach may assist in distinguishing which commitments align with each guiding principle, it also poses a challenge in identifying one's moral responsibilities as a member of a specific culture. To avoid this, Principlists must adopt culturally specific variations of principlism, which would go beyond the current four principles (Walker, 2009: 130). Thus, as an analytical tool, he believes that the framework should allow for adjustments based on the cultural context in which it is used.

Apart from being too individualistic, another basis for denying principlism, as expressed by critics of the approach, is the common occurrence in which the principles come into conflict with one another. Lindridge states that at times, in application, one or more of the four principles come into conflict with each other due to the complexity of ethical dilemmas (Lindridge, 2017: 173). Thus, an agent needs further guidance on what to do to resolve this conflict, which the approach lacks in providing. This is the approach's greatest flaw; despite the robust academic defence it receives. Callahan observed that, as much as Beauchamp and Childress claim that the four principles should be considered as prima facie obligations that must be fulfilled, unless they conflict with another principle, often, autonomy is seen as the most important principle (Callahan, 2003: 288). This is because when principlism is employed, the main conflicts that arise are between autonomy and other principles. The aim is to resolve these conflicts in a way that minimizes harm to an individual's autonomy.

Callahan argues that, for instance, non-maleficence "comes down to a right not to have our mind or body harmed by another, to be left intact," which is a traditional form of autonomy, renowned for its individualism (Callahan, 2003: 288). Joseph DeMarco states that when this

happens, the value of the framework as moral pluralism is lost (DeMarco, 2005: 101). Hence, a need for more principles to balance the priority of the conflicting principles. Shea believes that this might be best done with the inclusion of a theory of good which would better "flesh out the principles of beneficence and non-maleficence in a detailed and content-full way" (Shea, 2020: 391). This value theory would assist us with the conceptualization of human well-being to establish what constitutes a benefit and a harm. Fayemi asserts that relying solely on principles instead of moral theories and ideals to tackle ethical issues in medical practice can be problematic. This is because there is no systematic link between principles and moral theories, which poses both practical and theoretical challenges. Without a moral theory to connect these principles, it becomes difficult to generate clear, coherent, comprehensive, and specific rules for action, as well as to justify those rules (Fayemi, 2021: 52).

3.3 African Communitarian Ethics

The second theory that will be used to guide this study is African communitarian ethics. This is a moral and philosophical framework rooted in the traditional values and communal principles of various African societies (Eze, 2008: 386). Michael Eze further defines African communitarian ethics as a theory that emphasizes the value of belonging to a community, interconnectedness, and promoting the well-being of individuals within the context of their social groups. According to Eze, "The relationship between the individual and community is dialogical, for the identity of the individual and the community is dependent on this constitutive formation. The individual is not before the community, and neither is the community before the individual" (Eze, 2008: 386). This means that the connection between an individual and their community is interactive and mutually influential. In other words, one's sense of self and the community's identity are continuously shaped and defined through their dynamic relationship, with neither being considered as existing independently. Key features of African communitarian ethics include maintaining harmonious relationships, solidarity, and a sense of belonging (Metz, 2013: 80; Akpa-Inyang & Chima, 2021: 2).

Some of the early thinkers on African communitarian ethics include John Mbiti, Ifeanyi Menkiti, Kwame Gyekye, and Kwasi Wiredu. They collectively observed that despite the vast diversity within Africa, certain shared moral concepts, value systems, beliefs, and practices prevail across various ethnic groups. These concepts include the emphasis on an individual's character, shaped by the accumulation of their actions and habits, as well as a strong emphasis on communal and social relations (Gyekye, 2004: 90). For instance, Aden Husien and Olira

Kebede (2017: 60) note that “the action or behaviour is judged as moral or amoral based on social interaction. A person is not simply good or bad; instead, he or she may act in a good or bad way depending on the consequences of his or her action viewed in the community”. This implies that in the African context, the ethics of a society are deeply rooted in the ideas and beliefs about what is right or wrong and what constitutes good or bad character (Husien & Kebede, 2017).

3.3.1 Personhood

According to Francis Akpa-Inyang and Sylvester Chima (2021: 3), many African cultures center their ethics around the concept of ‘personhood’, which refers to an adult human who embodies moral virtues that contribute to social functioning and overall flourishing of humanity. They further explain that personhood is defined through the lens of relationality and solidarity. Relationality emphasizes that individuals exist in relation to others, particularly family, community, ancestors, and future generations. Solidarity is viewed as an active moral commitment to care for the well-being of others, especially the vulnerable. In contrast to Western individualistic perspectives, which often regard personhood as an inherent moral status conferred by biological existence, in African thought, as posited by Menkiti (1984: 171), personhood is “earned rather than assumed. A human being becomes a person through immersion in community and moral maturity”. In this context, personhood is not automatically granted at birth; instead, it must be acquired through ethical conduct, fulfilling social roles, and participation in community life. Menkiti further argues that personhood is a developmental process, meaning that a human being must undergo a form of social and ethical growth to be recognized as a person in the full sense. Thus, personhood is a status or condition that a human being may or may not fully achieve, depending on their relationships with others and the way they live their lives.

Kwame Gyekye (1992: 109) agrees that human beings fully realize their personhood through social relations. However, he also argues that personhood is innately possessed by virtue of one’s ontological status as a human being. This innate potential becomes meaningful only through active engagement in communal life. Therefore, Gyekye’s argument strikes an important balance between individual autonomy and social belonging. Similarly, Wiredu (1992: 193) highlights that while personhood is inherent from birth, it is the exercise of moral agency and rationality that ultimately defines it.

For Wiredu, it is the capacity to make ethical judgments and act upon them that distinguishes a person. He acknowledges that human beings are socially embedded and that ethical expression is cultivated within the social world. However, he contends that the community is not the only judge of personhood. Collectively, these views affirm both the communal foundation of human existence and the moral responsibilities that sustain it. While each scholar offers a distinct perspective on the concept, they all reject the idea of personhood as a static condition. Instead, they converge on the understanding that personhood is relational and that community is essential for the realization of an individual's full moral and social self.

3.3.2 Ubuntu

Ubuntu is one of the most distinctive features of African communitarian ethics, particularly within Bantu-speaking communities in sub-Saharan Africa (Eze, 2008: 387). As a cultural worldview, Ubuntu is one of the ethical frameworks that explains how personhood is cultivated and expressed in a community (Munung et al., 2021: 378). Thus, moral identity is fundamentally shaped by one's connection to others. At its core, Ubuntu is a moral theory that emphasizes the unity of humanity and the ethical significance of interdependence, often summarized by the Zulu maxim: *Umuntu ngumuntu ngabantu* (A person is a person through other persons) (Metz, 2011: 533). It expresses the notion that human existence is inherently collective, emphasizing that the pursuit of harmonious social relationships is central, and individual well-being is closely linked to the well-being of the community.

According to Michael Eze, the essence of Ubuntu lies in the belief that humans are fundamentally interconnected, and that identity, dignity, and moral worth are defined not in isolation but through relationships with others (Eze, 2008: 387). Therefore, the above maxim maintains that one's existence and self-realization are deeply rooted in connections with family, community, ancestors, and even future generations. This concept originates from Mbiti (1990: 141), who emphasized that traditional African thought values the interconnectedness of individuals. He stated, "the individual does not and cannot exist alone. He owes his existence to other people, including those of past generations and his contemporaries" (Mbiti, 1990: 141). This insight highlights Ubuntu's broad sense of interconnectedness, encompassing not only the living members of the community but also ancestors and future generations. Consequently, any event that affects an individual will inevitably resonate throughout the larger social fabric, reinforcing the deeply communal nature of human existence from an African perspective.

3.3.3 Human Dignity

In African communitarian ethics, human dignity is understood as the moral worth of an individual that arises from their inherent life force and, more importantly, from their ability to form meaningful, cooperative, and empathetic relationships within a community (Wiredu, 1992: 192; Gyekye, 1997: 50; Metz, 2012: 21). Thaddeus Metz (2012) identifies two central conceptions of dignity rooted in African moral thought: vitality and community. The vitality conception emphasizes the metaphysical idea that human beings possess a unique life force or creative energy that sets them apart from other forms of life. Drawing on Bantu philosophy, Metz argues that human dignity is not solely based on the biological fact of being human, but also on the belief that humans hold the greatest share of this vital force. This force can be strengthened or diminished through experiences such as health, happiness, suffering, or injustice. This perspective is influenced by both indigenous African metaphysics and Christian thought, which regards life itself as sacred because it originates from God (Metz, 2012: 24).

Metz's second conception emphasizes community as the essential source of human dignity. In this view, dignity is not merely a metaphysical status; it is cultivated through meaningful relationships with others. The essence of being human, according to Metz, lies in our ability to foster social harmony, empathy, and solidarity. He defines community through two interconnected dimensions: identity, which involves recognizing oneself as part of a collective, and solidarity, which entails acting cooperatively and compassionately to promote the well-being of others (Metz, 2012: 26). From this perspective, dignity is expressed and affirmed through participation in shared social life. Therefore, any violations of this capacity, such as exclusion, exploitation, or harm, constitute a denial of one's dignity.

This relational approach to dignity is widely recognized in African philosophy. For example, Kwame Gyekye (1997: 64) asserts that human dignity is partially intrinsic and grounded in the ontological status of being human. However, he emphasizes that its full expression depends on ethical conduct within the community. Similarly, Wiredu (1996: 189) connects dignity to rationality and moral agency but highlights its social dimension, noting that individual worth is confirmed through human relationships. Both scholars agree that human dignity, like personhood, is not a static condition; rather, it is a status affirmed through active participation in a moral community. Ultimately, Metz argues that a community-based understanding of dignity better explains why human rights, including social inclusion and access to justice, are morally binding. In contrast, Western theories often emphasize autonomy or rationality as the

foundation for dignity, while African communitarian ethics locate dignity in the ability to live harmoniously with others.

3.3.4 Moral Obligations Towards the Community and Future Generations

In African communitarian ethics, moral obligations are fundamentally tied to the belief that an individual's identity, purpose, and moral duties are interconnected with their community and the welfare of future generations. This perspective is clearly articulated by Mbiti (1990: 108), who argues that actions should contribute to the well-being of the community rather than serve individual self-interests. He emphasizes the importance of preserving traditions, religious beliefs, and customs to ensure that future generations remain spiritually and culturally connected. Conversely, Gyekye (2004: 13) asserts that while individuals do have rights, these rights exist within a framework of social responsibility. He contends that moral obligations require a balance between personal autonomy and communal harmony. This means that while individuals have the freedom to make choices, those choices must not undermine the collective identity of the community. Therefore, ethical decisions made today should consider their long-term impact on social structures, cultural heritage, and moral values. This reinforces the principle that individual actions should contribute to the greater good of both the present community and future generations.

Wiredu (2008: 335) describes African communitarian ethics as rooted in kinship-based social structures that shape both moral obligations and personal identity. For Wiredu, community represents not merely a gathering of individuals but a shared commitment to collective well-being, harmony, and mutual flourishing. Gyekye (2004: 16) reinforces this view, defining the common good as the realization of peace, dignity, freedom, respect, security, and human potential, all of which depend on the individual's alignment with the community's interests. Mbiti (1990) also highlights the preservation of cultural integrity as a central moral duty, noting that traditions and values bind individuals to their ancestors, spiritual heritage, and social responsibilities. Eze (2008: 393) further argues that maintaining cultural integrity requires both preserving core cultural values and negotiating change responsibly, to prevent cultural dilution while allowing for meaningful adaptation.

3.3.5 Afrofuturism as an Extension of African Communitarian Ethics

Scholars such as Ademola Fayemi, Cletus Andoh, Cornelius Ewuoso, and Onyango Ouma argue that Afrofuturism extends the ethical principles rooted in African communitarian thought, including personhood, community, and ancestral continuity, into imagined future

scenarios. These scenarios often involve advanced technologies and other speculative conditions that traditional ethical frameworks may not directly address. Fayemi (2018:71) conceptualizes Afrofuturism as a critical African envisioning of a posthuman future that is deeply rooted in the continent's history, culture, religion, and philosophy, while also engaging with the changing landscapes of science and technology. He suggests that Afrofuturism should not be viewed solely as science fiction but instead as an ethical and ontological task that integrates African concepts of identity, kinship, and moral responsibility into imagined technologically advanced futures (2018:71).

Furthermore, Fayemi explains that in African thought, personhood is a dynamic status that is conferred socially and achieved through ethical conduct and active participation in community life (Fayemi, 2018: 69). This perspective can be projected into the future, suggesting that Afrofuturism serves as a philosophical and ethical framework for imagining how African values, such as communal solidarity, intergenerational responsibility, and respect for ancestors, can remain central even in a technologically advanced world. In this way, Afrofuturism can be seen as a natural extension of African communitarian ethics, both of which aim to sustain a vision of moral selfhood grounded in community, continuity, and ancestral guidance.

Andoh (2011: 73) also provided an important ethical foundation for viewing Afrofuturism as an extension of African communitarian thought, particularly concerning bioethics and emerging technologies. His arguments about cultural integrity, social responsibility, and moral negotiation in the context of scientific advancement align with the concept of Afrofuturism. Andoh asserts that African ethics requires any technological or scientific advancements to respect and integrate communal values, especially the obligations we owe to our ancestors and future generations (Andoh, 2011: 73). He emphasizes that decisions should not be based solely on individual autonomy or technological capability; rather, they must also consider the preservation of the cultural and spiritual fabric of the community. This perspective aligns with the notion that Afrofuturism serves to safeguard African identity and cultural narratives in speculative futures shaped by science and technology.

Consequently, these scholars represent an emerging component of African philosophical thought that merges the speculative, future-oriented outlook of Afrofuturism with the deeply relational and ancestor-conscious ethics of African communitarianism. Under this interpretation, Afrofuturism should not be understood as an escape from African traditions, but

rather a creative and ethically grounded extension of these traditions into futures shaped by technology and global change (Fayemi, 2018: 70; Andoh, 2011: 74; Ewuoso, 2022: 15). Unlike transhumanism, which often emphasizes the transcendence of human biological limitations and the enhancement of individual capacities, Afrofuturism situates technological innovation within relational, communal, and intergenerational ethical frameworks. It emphasizes accountability to ancestors, the living, and future generations, ensuring that technological interventions do not disrupt culturally embedded understandings of personhood (Ouma, 2021: 110). Therefore, Afrofuturism respects the lived experiences of ancestors, acknowledges the moral responsibilities of the present, and upholds the stewardship owed to future generations. As a philosophy, it envisions a future where African cultures not only survive but thrive, reaffirming the importance of these ethical relationships in technologically mediated futures.

3.3.6 African Communitarian Ethics and Human Germline Enhancement

As noted in the literature review, Africa has received limited attention in the current debate on human germline enhancement. Fayemi (2018: 54) argues that the philosophical idea of transhumanism, which has been the subject of countless encyclopaedia volumes in Western philosophical circles, has received very little attention in African philosophical literature. Despite transhumanism originating in the West due to noteworthy technological advancements in bioethical research, attention to bioethics in the African setting remains significantly limited (Fayemi, 2018: 54). Considering that philosophical ideas often emerge from the unique influences of distinct social contexts; it is reasonable to suggest that the differences in the intensity of discussions on personhood and transhumanism between Western and African philosophical traditions can be attributed to variations in cultural differences. However, Fayemi argues that this perspective is limited and should be challenged. He asserts that the intelligibility of concepts originating in one cultural region can still be understood, recognized, and appreciated in other cultural and geographical contexts despite cultural differences. Therefore, according to Fayemi (2018: 54), we should ask ourselves: "What theoretical dimension and import can the trend in Western thoughts on transhumanism add to a re-evaluation, reconstruction, and better understanding of African conceptions of personhood, and vice versa?"

Furthermore, Fayemi posits that using transhumanist interventions to enhance human cognition and free individuals from perceived biological constraints may not have adverse effects on the

human existential condition and the criterion for personhood in an African context. Since transhumanism emphasizes overcoming inherent human limits by embracing science and technology, it serves as a means to actualize personhood by creating avenues for an enhanced capacity to appreciate life in all its facets (Fayemi, 2018: 72; Ouma, 2021: 110). In addition, any potential conflict between transhumanism and traditional African concepts of personhood stems from the misconception that personhood is "a fixed, immanent state and recognition of being a person" (Fayemi, 2018: 73). An afrofuturistic conception of personhood, however, is best understood as a result of dynamic socio-cultural, economic, and technological history as opposed to being a constant and unchangeable aspect of human nature. Fayemi argues that "African states can, and do have a duty" to improve the human situation by adopting technologies that not only advance personhood but also can improve humanity (Fayemi, 2018: 73).

Cletus Andoh (2017: 43) asserts that the primary contemporary challenge lies in fostering collaboration among researchers, society, and government to engage in a dialogue about the values promoted by advancements in genome editing technologies. This entails discussing the values we uphold and aim to progress within the community. Moreover, Donrich Thaldar (2022: 9) advances the integration of African communitarian values with future-focused ethical and legal questions in biotechnology. In his exploration of human dignity within the legal and bioethical landscape, Thaldar suggests that emerging technologies like genome editing must be approached with a strong philosophical commitment to human dignity and relational existence, concepts central to African communitarian ethics (Thaldar, 2022: 9). He argues that the pursuit of technological advancement, a key feature of Afrofuturist thought, must align with Africa's moral vision of community, dignity, and intergenerational responsibility. This position closely mirrors the Afrofuturist idea that future technological worlds must reflect culturally grounded ethical principles rather than adopt value-neutral or Western-dominated ethical standards.

3.4 Critiques of African Communitarian Ethics

Munamato Chemhuru (2018: 37) noted that one major critique of African communitarian ethics is the idea that African societies are inherently and exclusively communitarian, thus neglecting the protection and promotion of individual human rights. This is mainly because the human rights discourse puts exclusive emphasis on the rights of the person (Chemhuru, 2018: 42). Further, Chemhuru holds that while communitarianism is a valuable representation of the

African way of life, the exaggerated radical notion suggesting that individual existence is impossible without the community should be dispelled due to its excessive emphasis on the community at the expense of individuality (Chemhuru, 2018: 44). He also notes that the concept of communitarianism, understood as a form of coming together as a community, emphasizing collective responsibility towards the common good and human flourishing as opposed to individual existence is not new and exceptional to African philosophy. Nevertheless, there appears to be a presentation that suggests communitarian philosophy is exclusively distinctive to the continent, despite its broader existence across the world (Chemhuru, 2018: 44).

Precious Obioha (2014: 14) argues that in the African understanding of personhood grounded in community, various perspectives emerge regarding the extent to which it fosters human well-being, the pursuit and fulfilment of human potential, and personality. When the life of an individual is closely intertwined with the community, questions arise about the fundamental individuality of the human person. Does this imply that the individual lacks inherent identity, distinct from the identity conferred upon them by the community? Furthermore, Amitai Etzioni (2003) challenges the idea that the self is simply a product of a defining collective, submerged in a community. Similar to communities, the human individual is not a static, one-dimensional, or undifferentiated entity; rather, it is complex and dynamic (Etzioni, 2003). The construction of the 'self' occurs not through a singular unified identity but through a network of diverse identities. Therefore, considering the moral self as socially shaped within a singular shared identity is an illusion because the self may be shaped within multiple intersecting and sometimes conflicting communities (Etzioni, 2003).

3.5 Justification for selected theories

The primary objective of this study is to critically examine how the Zulu ontological understanding of the sanctity of life shapes ethico-cultural responses to human germline enhancement. To begin this inquiry, the study employs principlism, a widely used framework in healthcare and biomedical ethics. Its relevance lies in the fact that human germline enhancement is embedded within biomedical practice, where ethical decision-making must be systematic, transparent, and established in moral principles. Principlism, therefore, provides a structured starting point for evaluating the ethical challenges raised by germline technologies, particularly in pre-clinical contexts where emerging technologies challenge existing moral

intuitions (Fayemi, 2021: 48). Each of its core principles serves as an initial lens for assessing the moral tensions that arise when altering the human genome.

However, principlism alone is not sufficient for a study grounded in the lived experiences and moral worldviews of the Zulu people. For this reason, the analysis is complemented by African communitarian ethics, which functions as both a descriptive and prescriptive framework. Descriptively, it illuminates the culturally embedded moral concepts, such as relational personhood, and the interconnectedness between the living, the departed, and a supreme or divine presence, that shape Zulu understandings of life, moral status, and human flourishing. This enables a culturally grounded interpretation of how Zulu communities are likely to assess human germline enhancement. Prescriptively, African communitarian ethics articulates the moral obligations that individuals and communities have toward their ancestors, descendants, and the larger society. Thus, setting ethical limits and responsibilities concerning the use of germline technologies.

Together, principlism and African communitarian ethics form a complementary theoretical foundation for the study. Principlism offers the universal, structured, and clinically oriented tools needed to evaluate emerging biomedical interventions, while African communitarian ethics provides the cultural depth and contextual sensitivity necessary for understanding moral reasoning within Zulu communities. Their integration ensures that the ethical analysis is both globally informed and locally grounded. This is particularly valuable for assessing technologies that significantly impact identity, lineage, and future generations.

3.6 Conclusion

This chapter examined the two ethical theories that will guide the study: principlism and African communitarian ethics. It began by defining each theory and its key proponents, highlighting the implications of adopting these in light of the complexities surrounding human germline enhancement technologies. The chapter then discussed several criticisms that have been raised against each of these theories.

Under principlism, it was explained that this approach is regarded as the most prominent theory providing a framework to support moral decision-making in clinical settings. The four key principles emphasized are respect for autonomy, beneficence, non-maleficence, and justice.

The chapter delved into each principle independently, illustrating how the application of human germline enhancement aligns or conflicts with each one.

Concerning respect for autonomy, the chapter highlighted that autonomy centres around a person's ability to make informed decisions without external coercion. Consequently, individuals have the option to decide whether to enhance their own capabilities and those of their prospective children. However, considering the broader implications for the entire human species, the chapter raised the question of whether there should be limitations on parental autonomy and explored the reasons behind such a consideration.

Regarding beneficence and non-maleficence, the chapter explained that these closely related principles are often presented as a unified principle. Beneficence focuses on our obligations to help others, provided that the costs are reasonable, while non-maleficence emphasizes avoiding harm. The chapter showed that applying beneficence requires weighing the potential benefits of human enhancement against its risks and costs, whereas non-maleficence emphasizes preventing harm that could result from such technologies.

Lastly, the principle of justice was described as a guideline rooted in equity and fairness. In this context, the chapter highlighted a central ethical concern: human germline enhancement may worsen existing social inequalities, particularly if access is limited to wealthy groups.

The chapter then discussed African communitarian ethics, engaging with the perspectives of various prominent scholars in the field, including John Mbiti, Ifeanyi Menkiti, Kwame Gyekye, and Kwasi Wiredu. It introduced core concepts such as personhood and Ubuntu as the philosophical foundation of these ethics, along with the common moral obligations that are central to African ethical thought. Additionally, the chapter considered Afrofuturism as a forward-looking application of these ethical principles.

The chapter emphasized that, from an African perspective, germline enhancement should not be seen solely as an ethically problematic practice. Instead, it represents an opportunity for the continent to educate itself on how such technologies can advance personhood and contribute to the overall improvement of humanity. This informed perspective is crucial for making decisions that align with culturally grounded ethical frameworks, which can effectively regulate such technologies within the African context. This discussion was followed by

critiques of African communitarian ethics and a justification for using these theories to guide the study.

The next chapter presents the research methodology employed in the study, detailing the research design, sampling method, sample size, and the research questions that guided the study. It will also explain the rationale behind the chosen data analysis strategy.

CHAPTER FOUR
RESEARCH METHODOLOGY

4.0 Introduction

In the previous chapter, the study outlined the theoretical frameworks guiding the research, noting that principlism and African communitarian ethics will be used to evaluate, describe, and prescribe during the discussion and analysis of the data. The current chapter provides a detailed explanation of the research methodology and design, along with the justifications for each approach.

Research is defined as a systematic and organized process for collecting, arranging, and analysing data to deepen understanding of a particular phenomenon, address a research problem, or generate new knowledge that informs decision-making (Sakyi et al., 2020: 296). To achieve this, the researcher must adopt a coherent strategy that integrates the various components of the study, commonly referred to as the research design (Thakur, 2021: 53). As John Creswell (2008: 5) notes, research designs outline the procedures for conducting a study, incorporating both general assumptions and specific approaches to data collection and analysis. In contrast, research methods refer to the tools or instruments used to gather data (Sakyi et al., 2020: 296).

This chapter discusses the research objectives and the methods used to achieve them. It presents the methodology employed in the study, including the research design, the study area, sampling methods, and the sample size. Additionally, the chapter elaborates on the specific interview process adopted and the strategy of inquiry employed in analysing the data. The chapter concludes with an outline of the research questions that guided the one-on-one interviews.

4.1 Nature and Scope of the Study

Given that the primary purpose of this study is to critically examine how the Zulu ontological understanding of the sanctity of life shapes ethical and cultural responses to human germline enhancement, a qualitative empirical methodology was adopted. Primary data were collected through semi-structured one-on-one interviews with Zulu participants. These interviews provided insight into their ethical views, cultural beliefs, and interpretations of human germline enhancement. The interview data were analysed thematically and used to answer the key

research question: How does the Zulu ontological understanding of the sanctity of life shape ethico-cultural responses to human germline enhancement?

The study also included a comprehensive theoretical component, which focused on addressing the foundational 'what' and 'how' questions, including: What is the nature of human germline enhancement? What are the key ethical issues associated with it? And how can insights from Zulu ontology on the sanctity of life, together with principlism and African communitarian ethics, guide the development of a culturally grounded bioethical framework for human germline enhancement in Africa? These questions were examined through a critical review of scholarly literature, including books, journal articles, and credible online sources. By combining empirical findings from interviews with insights from the literature, the study develops a comprehensive understanding of how Zulu ontology shapes ethical and cultural responses to human germline enhancement.

The collection of primary data through the interviews was further divided into two parts. The first group of respondents was composed of Zulu community experts, including traditional healers, community leaders, and senior community members. The aim was to gain their understanding of how Zulu cultural and ethical beliefs could inform their perception of human germline enhancement. The second group of respondents consisted of Zulu people from the urban areas of Pietermaritzburg, categorized by age into young adults (20-39 years), middle-aged adults (40-54 years), and seniors (55 years and above). The objective was to gather the views of individuals who are considered modern thinkers, relatively influenced by exposure to globalization and formal education, regarding their perception of human germline enhancement.

4.2 Research Method/Approach

The study employs a qualitative approach as its research design. According to Michael Belotto (2018: 2623), qualitative research is most suitable when crucial variables related to a particular subject of inquiry are yet to be discovered. The value of this approach lies in its capacity to enable the researcher to comprehend a phenomenon by exploring initial suspicions and developing preliminary theories. Shidur Rahman (2017: 103) defines qualitative research as any research that does not rely on statistical methods or other forms of quantification to obtain findings. Instead, it involves studying individuals' lives, lived experiences, behaviours, emotions, and feelings, as well as investigations into organizational functioning, social

movements, cultural phenomena, and interactions between nations. This type of research provides a deeper understanding of the subject matter studied, as it allows researchers to explore various aspects of human behaviour and interaction in a more in-depth way. Rahman further describes qualitative research as an interpretive technique that seeks to uncover the meaning of naturally occurring phenomena in the social world through description, decoding, and translation. Thus, the approach's concern with multiple perspectives fundamentally explains its multimethod approach to research (Rahman, 2017: 103).

Using a qualitative approach was appropriate in this study as it sought to gain insight into the respondents' perceptions, beliefs, and values regarding human germline enhancement technologies. To achieve this, the study adopted an open-ended inquiry method that enabled a thorough exploration of detailed responses to better understand and explain the phenomena under discussion. The study went beyond narrating and describing the practices of the Zulu community; it also adopted an analytic approach to critically evaluate the findings (Belotto, 2018: 2623).

4.2.1 Strategies of Inquiry

According to Creswell (2003: 18), qualitative research often draws on constructivist assumptions, recognizing that individuals interpret their experiences in diverse ways, shaped by social, historical, and cultural contexts. The purpose of such an approach is not merely to describe these meanings but to develop a theoretical understanding that reflects their complexity. Creswell identifies five strategies of inquiry used in qualitative research, namely, narrative research, phenomenology, ethnography, grounded theory, and case studies (Creswell, 2003: 18). This study adopts the grounded theory strategy originally developed by sociologists Barney Glaser and Anselm Strauss (1967), who define it as an approach in which theory emerges systematically from the continuous collection and analysis of data (Yu & Smith, 2021: 554). Ultimately, the objective of this approach is to formulate a theory that is firmly anchored in empirical evidence.

As Sharon Kolb (2012: 83) explains, grounded theory involves a multi-stage process of data collection, refinement, and categorization. This aligns with Creswell's view that grounded theory aims "to derive a general, abstract theory of a process, action, or interaction grounded in the views of participants" (2003: 18). This process includes constant comparison of data with emergent categories and the use of theoretical sampling to identify participants who can

clarify, deepen, or challenge emerging insights. Using analytical induction, the researcher moves from concrete observations to broader conceptual patterns, which form the foundation of a theoretical explanation (Draper, 2004: 643). Consequently, as highlighted by Yu and Smith (2021: 555), since grounded theory generates theory directly from participants' experiences, it often yields insights that enhance understanding and guide ethical or practical decision-making.

This strategy is appropriate for the present study because the research aims to develop a theory explaining how Zulu understandings of the sanctity of life shape ethical and cultural responses to human germline enhancement. Grounded theory allows the researcher to derive conceptual categories from interview data, such as notions of life, ancestry, moral responsibility, communal belonging, or spiritual authority, and progressively refine these into a theoretical model. Importantly, in this study, grounded theory does not operate in isolation from established frameworks. Rather, it works in dialogue with pre-existing theoretical lenses, including Zulu ontology, principlism, and African communitarian ethics. These frameworks inform the interpretation of emerging categories and assist in identifying how participants' views converge, extend, or contest existing ethical perspectives. In this way, grounded theory provides the methodological mechanism through which culturally specific empirical insights are integrated with established ethical traditions to develop a culturally grounded bioethical theory.

Finally, grounded theory supports comparison between the emergent theory from Zulu participants and broader global debates on human germline enhancement. This comparative element strengthens the analytical depth of the resulting theory and positions it as a distinctly African contribution within both local and international bioethical discourse.

4.2.2 Study Area

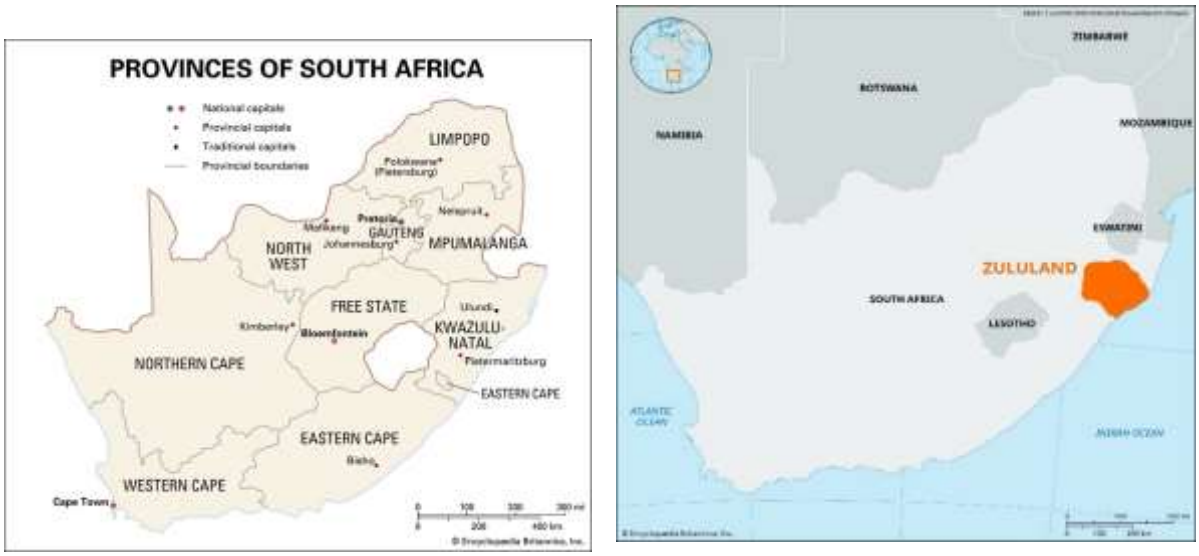

Fig. 1: Map of South Africa, showing the different provinces (on the left), and another map of South Africa, showing where the Zululand region is situated (on the right) (Adapted from Encyclopaedia Britannica, 2023).

The study takes place in KwaZulu-Natal, a province located in the eastern region of South Africa. KwaZulu-Natal, also known as the Zulu Kingdom or Zulu Empire, is one of the nine provinces of the country. Before the nation's independence, KwaZulu-Natal was known as Natal, and it was recognized as the legal homeland of the Zulu people of the country. Today, KwaZulu-Natal is home to a diverse range of ethnic groups; however, nearly four-fifths of the population identifies as Zulu. The IsiZulu language, along with a rich heritage of ceremonies, rituals, and folklore that reflects various tribal allegiances, has enabled many black residents of the province to preserve a significant portion of their cultural identity. Additionally, Bantu languages are spoken by a substantial portion of the African population of black descent. KwaZulu-Natal consists of both urban and rural areas (Encyclopaedia Britannica, 2023).

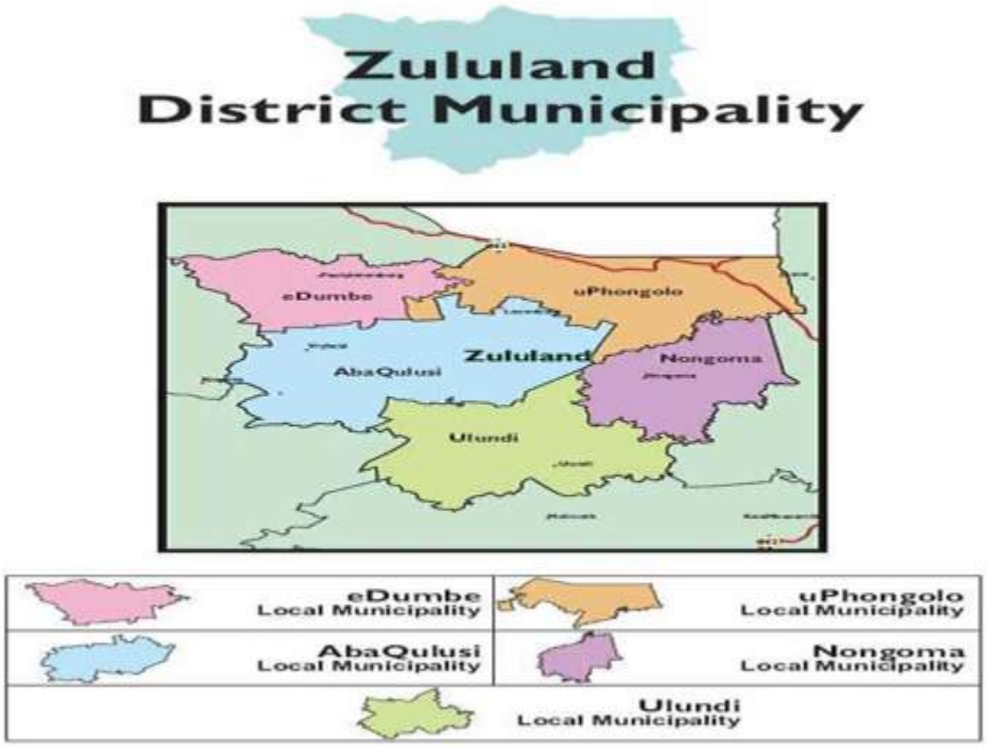

Fig. 2: Map of Zululand, showing the different local municipalities (Adapted from Trade & Investment, KZN, n.d).

Zululand is situated in the north-eastern section of KwaZulu-Natal. It is a traditional region constituting the largest district in the province. The region is divided into five municipalities, with Nongoma being one of them. Nongoma, derived from the Zulu word "ngome", which means "mother of songs", is also known as the Royal City of the Zulu Nation - IHlalankosi. This is where the reigning Monarch resides, and therefore, the municipality is considered the Heart of the Zulu Kingdom. Nongoma is thus an area rich in symbolism and tradition. It is considered the area where the age-old Zulu culture remains today. The Zulu royal family continues to fulfil significant ceremonial duties in this area, ensuring the preservation of the cultural heritage. Nongoma is predominantly a rural municipality with 98% of its population living in rural areas (Glazier, 2016).

The empirical aspect of this study focuses on Zulu communities in South Africa. The selected research sites are Mbonomuhle Community, situated in the Mncwembe area of Nongoma, and Pietermaritzburg, specifically Pelham and Lincoln Meade. Pietermaritzburg is the second-largest city in KwaZulu-Natal, located in the central part of the province (as seen in Figure 1 above). Its Zulu name, uMgungundlovu, popularly translated as "Place of the Elephant" or "The elephant wins", is the name used for its district municipality. Pietermaritzburg is

considered an emerging metropolitan area (Wells, 2008). As previously mentioned, the Nongoma area is known for its strong preservation of Zulu cultural traditions, which is the primary reason why it was chosen for this study. Pietermaritzburg was chosen because the researcher lives and works in this area.

4.2.3 Population of the Study

The population of the study refers to the set or groups of all the units that form the subject of one's investigation. Depending on the study's objectives, the unit of study can vary and include entities such as individuals, objects, living beings, time, incidents, events, words, places, and institutions (Shukla, 2020: 1). The study's population is divided into two categories, both comprising of men and women: The first category consisted of Zulu community experts, including traditional healers, community leaders, and senior community members. The aim was to gain insight into how Zulu cultural and ethical beliefs could shape their perspectives on human germline enhancement. From this category, the study obtained indigenous knowledge about the beliefs, practices, and ethics of the Zulu people. The second category comprised young and senior Zulu residents living in the urban areas of Pietermaritzburg. This category included academics, teachers, social workers, engineers, and students, offering the study a more cosmopolitan outlook on human germline enhancement technologies.

Table 4.1 The Rural Respondents

NO.	GENDER	AGE	DESCRIPTION
1.	Female	56	Senior Member
2.	Female	50	Community Leader
3.	Male	62	Senior Member
4.	Female	58	Senior Member
5.	Female	47	Community Leader
6.	Female	51	Traditional Healer
7.	Male	60	Traditional Healer
8.	Male	58	Senior Member
9.	Female	63	Traditional Healer
10.	Male	56	Senior Member

Table 4.2 The Urban Respondents

NO.	GENDER	AGE	DESCRIPTION
1.	Male	35	Engineer
2.	Female	41	Social Worker
3.	Male	26	University Student
4.	Male	33	University Lecturer
5.	Female	37	High School Teacher
6.	Male	35	University Lecturer
7.	Female	32	Work-In-Progress Specialist
8.	Female	58	Social Worker
9.	Female	24	University Student
10.	Female	32	Compliance Officer

4.2.4 Sample and Sampling Technique

Sampling refers to the process of selecting specific observations to gain insights into a larger population of interest. It involves choosing a representative portion of the population (Abutabenjeh & Jaradat, 2018: 243). Sampling is essential in research studies since it is too costly and time-consuming to survey an entire population (Bhardwaj, 2019: 158). Pooja Bhardwaj notes two kinds of sampling methods: probability and non-probability sampling. She defined probability sampling as a method where each member of the population has a known probability of being selected in the sample (Bhardwaj, 2019: 158). This means that in cases where the population is highly homogenous, the likelihood of each member being chosen in the sample is notably high. With non-probability sampling, each unit in a population lacks the probability of being chosen. In other words, this type of sampling does not select units from the population in a mathematically random manner (Alasuutari et al., 2008: 22).

Participants for the one-on-one interviews were selected using non-probability sampling, which allows the researcher to exercise informed judgment when identifying individuals most likely to provide rich and relevant data. This study primarily employed purposive sampling, a method involving the deliberate selection of information-rich participants based on their relevance to the research topic (Naderifar et al., 2017: 2). Purposive sampling was the most appropriate strategy because the study required insights from individuals knowledgeable about

Zulu ethical beliefs, ontological understandings, and cultural responses to human germline enhancement.

Mahin Naderifar et al. (2017: 2) outline six non-probability sampling methods used in qualitative research: purposive sampling, quota sampling, convenience sampling, voluntary response sampling, snowball sampling, and consecutive sampling. While purposive sampling involves selecting participants according to the researcher's judgement, quota sampling selects individuals according to predetermined subgroup sizes; convenience sampling involves selecting participants who are easily accessible due to proximity or availability; voluntary response sampling depends on individuals choosing to participate on their own initiative, often resulting in responses from those with a strong interest or motivation; snowball sampling expands the sample through referrals from initial participants; and consecutive sampling includes all eligible individuals until the required sample size is reached. Of these approaches, purposive sampling best aligned with the study's aim of gathering perspectives from two categories of Zulu participants: those grounded in traditional beliefs, ethics, and ontology, and those representing more urban, modern viewpoints.

The study's sample size consisted of twenty (20) respondents, divided equally into two categories. This number was selected because the research sought to obtain in-depth, contextually rich insights rather than statistically representative data. As noted by Naderifar et al. (2017: 2), smaller samples in qualitative research allow for detailed engagement with participants' experiences and perspectives. The selection of twenty participants also enabled a balanced comparison between rural and urban contexts, with ten (10) respondents drawn from each setting. The first group, referred to as the 'Rural respondents', comprised closely related Zulu individuals residing in Nongoma, Zululand. These respondents were selected for their active engagement with Zulu cultural traditions and their ability to articulate the historical and ethical foundations of these practices. The second group, categorized as the 'Urban respondents' residing in the urban areas of Pietermaritzburg, were purposively included to provide contrasting perspectives to those of the more traditionally orientated rural respondents.

Participants were primarily identified through purposive sampling (thirteen participants), allowing the researcher to intentionally select individuals who possessed relevant cultural knowledge and experience related to Zulu ethical traditions. In addition, seven participants were identified through snowball sampling, including traditional healers and senior community

members who were recommended by the initial participants due to their recognised authority or experience within their social contexts. This method is efficient and cost-effective, making it easier to reach individuals who might otherwise be difficult to identify or access (Naderifar et al., 2017: 2).

The ages of the participants were also an important dimension of the sampling strategy. Senior participants were included because they often serve as custodians of cultural knowledge and are more familiar with the historical transmission of Zulu ethical traditions. At the same time, the inclusion of younger adult participants enabled the study to capture contemporary interpretations and possible transformations of these traditions within modern social contexts. This generational diversity allowed the research to explore how ethical understandings are preserved, interpreted, and potentially reshaped across different age groups.

While the findings from this sample are not statistically generalizable, the combined use of purposive and snowball sampling facilitated the inclusion of diverse cultural perspectives, enhancing the depth, contextual sensitivity, and potential transferability of the findings. By engaging participants who are embedded within the Zulu cultural and social context, the study captures shared moral assumptions, values, and beliefs that inform ethical reasoning within the community. This diversity strengthens the study's capacity to contribute to the development of a grounded ethical theory that is rooted in African contexts while engaging meaningfully with broader global bioethical debates.

4.3 Research Methods

4.3.1 Interviews

According to Paul Gill et al. (2008: 291), there are many approaches to gathering data in qualitative research, including observations, visual or textual analysis from books or videos, and individual or group interviews. Among these, focus groups and interviews are the most commonly used techniques. For this study, semi-structured one-on-one interviews were selected as the primary method of data collection. Gill et al. (2008: 292) explain that interviews enable researchers to explore participants' views, beliefs, experiences, and motivations in depth. Semi-structured interviews are particularly valuable because they use a set of guiding questions to ensure coverage of key topics while also allowing flexibility for both the interviewer and participant to pursue emerging themes. This adaptability enables participants

to raise issues they perceive as important, even if not initially anticipated by the researcher, thereby enriching the overall quality of the data. Furthermore, one-on-one interviews allow for deep observation of non-verbal communication and clarification of ambiguities related to complex or sensitive aspects of the study.

As a researcher who is also a member of the Zulu ethnic group, my positionality inevitably shaped the research process. My insider status provided advantages, such as cultural familiarity, linguistic fluency, and ease of access to participants without the need for an interpreter. These factors facilitated rapport-building and encouraged participants to speak openly about culturally sensitive matters, including their views on the sanctity of life. While this positioning encouraged deeper engagement, it also required reflexivity, which refers to the constant awareness of how the researcher's own background, assumptions, and positionality might influence the research. This was necessary to ensure that interpretations remained grounded in participants' perspectives rather than assumptions informed by the shared cultural background.

All the participants provided written consent for the interviews to be audio recorded, and supplementary notes were taken where applicable. Interviews were conducted to obtain direct, first-hand information from both rural and urban respondents. IsiZulu and English were used as the preferred languages of communication, which further facilitated mutual understanding and comfort during the interviews. Each interview lasted between thirty (30) and forty-five (45) minutes.

4.4 Data Presentation and Analysis

Kolb (2012: 84) defines data analysis as a systematic process of sorting, organizing, and interpreting information derived from interview transcripts, field notes, and other forms of collected data in order to deepen understanding and enable effective presentation of the research findings. Similarly, Adesina Babajide (2022: 1) describes data analysis as the inspection, cleaning, and modelling of data to uncover meaningful information, guiding judgments, and supporting empirical decision-making. Both definitions highlight that data analysis comprises a series of interconnected procedures designed to organize, refine, and synthesize the data gathered so that it can meaningfully address the research questions. In this study, the analysis began with the transcription and translation of the interviews from IsiZulu to English to ensure linguistic and conceptual accuracy. A qualified language specialist

translated and verified each interviewee's responses, after which the researcher summarized the key points from each transcript. This process ensured that the data retained its original meaning while remaining accessible for detailed analysis.

The study is anchored in the constructivist/interpretivist paradigm. According to Beaumie Kim (2001: 2), "Social constructivism emphasizes the importance of culture and context in understanding what occurs in society and constructing knowledge based on this understanding". In essence, it proposes that a person's behaviour and values are shaped by the cultural and normative systems in which they are embedded. Complementing this, Kivunja and Kuyini (2017: 33) explain that the interpretivist paradigm seeks to understand and interpret the subjective meanings that individuals assign to their experiences. Hence, the researcher's task is not to impose external interpretations but to access the participant's perspective and grasp how they make sense of their world. Central to this paradigm is the notion that reality is socially constructed, which is why scholars sometimes refer to it as the constructivist/interpretivist worldview.

This paradigm is particularly appropriate for the present study, as the purpose of the one-on-one interviews was to explore the respondents' worldviews and understand how these shape their perceptions of human germline enhancement. Consequently, data collection and analysis were guided by grounded theory in alignment with the constructivist/interpretivist paradigm. Grounded theory relies on procedures such as coding, constant comparison, and interpretation to build understanding directly from the data (Yu & Smith, 2021: 555). Kolb (2012: 83) describes the constant comparative method as an approach in which data collection, coding, and analysis occur simultaneously, allowing concepts to be refined as new data emerge. This method enables the development of a theory that remains rooted in the data while being sufficiently coherent and integrated for further analytical exploration

4.5 Validity, Reliability, and Rigor

In qualitative research, validity refers to the integrity, appropriateness, and accurate application of the methods used, as well as the extent to which findings faithfully reflect the data (Noble & Smith, 2015: 34). It is concerned with the plausibility, credibility, and trustworthiness of the data, which should withstand scrutiny (Bashir et al., 2008: 35). Reliability, on the other hand, describes the consistency and dependability of the analytical procedures employed. Both validity and reliability contribute to the rigor of a study, which Muhammad Bashir et al. (2008:

41) define as the systematic application of processes that ensure trustworthiness in data collection, analysis, and interpretation.

To ensure validity, this study deliberately engaged participants considered custodians of Zulu cultural knowledge, including community, traditional healers, and senior community members. Participants were provided with the interview questions in advance, allowing them time to reflect, gather relevant information, and prepare thoughtful responses. This procedure not only improved the accuracy of the information shared but also respected participants' agency and knowledge.

Reliability was strengthened through careful documentation, transcription, and translation processes. Participants gave their consent for interviews to be audio recorded, and where necessary, responses were transcribed into IsiZulu by a professional transcriber before being translated into English. Similarities in participants' accounts were noted to confirm consistency, while divergent perspectives were fully recorded and considered to capture the range of experiences and beliefs. The use of the grounded theory strategy of inquiry further supported systemic coding, constant comparison, and interpretation of the data, ensuring that conclusions were firmly grounded in participants' perspectives.

Rigor was additionally supported through systematic measures to ensure ethical and trustworthy research practice. Ethical clearance was obtained from the University of KwaZulu-Natal Humanities and Social Research Ethics Committee (HSSREC) with reference number: 00004717/2022. Permission to conduct research within the Mncwembe area, Nongoma, was granted through a gatekeeper's letter from the Mbonomuhle Community leader, ensuring adherence to cultural protocols and community norms. Ethical considerations included voluntary participation, the right to withdraw at any stage, and informed consent. To protect confidentiality and anonymity, pseudonyms were assigned to all participants: the rural group was labelled Rural Respondents (RR1-RR10) and the urban group Urban Respondents (UR1-UR10). Data were securely stored throughout the study. As previously mentioned under 4.3.1, the researcher continuously exercised reflexivity to ensure that their positionality as a member of the Zulu community does not influence data collection and interpretation, thereby strengthening the credibility, ethical integrity, and overall rigor of the research.

4.6 Study Limitations

Qualitative research is often criticized for being subjective and uncontrolled. Since the study adopted a constructivist/interpretivist paradigm, it acknowledges that researchers cannot entirely detach themselves from their values and beliefs during the research process (Kivunja & Kuyini, 2017: 33). Therefore, this implies that despite the efforts to approach the study with impartiality, the researcher's assumptions may have influenced the analysis. However, it is crucial to highlight that the researcher took steps to address these limitations by ensuring that the study's themes were guided by existing literature rather than the researcher's preconceptions. Participants also contributed additional topics for exploration.

Secondly, the study recognizes that the small sample size may limit the generalizability of the findings due to time and resource constraints. Nevertheless, due to the homogeneity of the various Zulu ethnic groups across different regions, the study is confident that the views collected are sufficient to form a considerable representation of the Zulu population in South Africa. Another challenge that the study faced was the challenge of accurately capturing the essence of certain Zulu terminologies, particularly when interviewing the group of rural respondents. Even though the researcher is Zulu and speaks IsiZulu, the researcher experienced some difficulties translating some of the important research variables, such as sanctity of life, intrinsic value, dignity, and moral status, into IsiZulu. This raised concerns that the true essence of certain words may have been lost in translation. To overcome this challenge, the researcher employed multiple strategies: Google Translate was used for some terms, and for concepts that could not be directly translated, questions were phrased in several different ways to compare responses and assess consistency. Following this process, the interview guide was fully translated into isiZulu, including clear explanations of human germline enhancement and the concept of sanctity of life, ensuring that participants could understand and engage with the key variables.

4.7 Conclusion

This chapter outlined the methodology and design of the research. It demonstrated that the study utilized both theoretical and empirical approaches. The theoretical component consisted of important literature, which was critically reviewed to address the study's key objectives. The empirical aspect included one-on-one interviews between two group categories, namely, 'rural' and 'urban' respondents. The former category provided primary data on the ontology, ethical beliefs, and traditional values of Zulu people concerning human germline enhancement, while the latter category provided a more cosmopolitan outlook on the topic. The study's population

was the Zulu people from South Africa, specifically in the Nongoma and Pietermaritzburg areas of KwaZulu-Natal. The sample size comprised twenty (20) respondents, with an equal distribution between the 'rural' and 'urban' categories. Non-probability sampling methods, purposive and snowball sampling, in particular, were used to identify the respondents. These methods were chosen because they allowed for subjective judgment in selecting individuals from the population.

The chapter also discussed the study's strategy of inquiry, which was identified as qualitative, as the study aims to explore a social phenomenon and reveal, interpret, and understand the viewpoints and perceptions associated with human germline enhancement technologies. Hence, the study adopted the constructivism/interpretivism paradigm approach for its data presentation and analysis. Lastly, the chapter stated that the study uses grounded theory as its research design since it aims to generate a theory by extrapolating and generalizing from the information gathered.

The next chapter presents the study's findings from the one-on-one interviews. These are presented thematically, paving the way for the discussion and analysis of the findings.

CHAPTER FIVE
PRESENTATION OF FINDINGS

5.0 Introduction

The preceding chapter outlined the research methodology and design, including the sampling methods, sample size, interview procedures, and data analysis approach. This chapter presents the findings from interviews conducted with traditional Zulu community experts in Nongoma and urban participants from Pietermaritzburg. The main aim was to gather perspectives on Zulu cultural and ethical views regarding human germline enhancement. The information collected is compared between the two groups and addresses how the Zulu understanding of the sanctity of life shapes their ethical and cultural responses to human germline enhancement.

The findings are categorized into themes based on the topics outlined in the literature review and the responses to the interview questions. These themes include the applications of human germline enhancement, safety and efficacy concerns of germline enhancement technologies, the impact of parental genetic choices on future generations, socio-cultural and religious implications of human germline enhancement, and the parallels between Zulu cultural practices and human germline enhancement. The themes reflect the breakdown of key areas of concern between transhumanists and bioconservatives in the debate on human germline enhancement.

This chapter explores the insights from the Zulu people to understand how their ethical and cultural viewpoints align with or diverge from the global discourse, providing a unique lens through which to examine and contribute to the broader ongoing conversation on human germline enhancement.

5.1 The Study's Respondents

5.1.1 The Rural Respondents

As indicated in the previous chapter, ten (10) respondents were interviewed under the category of 'rural respondents'. This group consisted of six (6) females and four (4) males, including community leaders, traditional healers, and senior members residing in the Mncwembe area of

Nongoma. The primary language used during the interviews was IsiZulu, with some English used in certain instances. The respondents were provided with the interview schedule in advance, allowing them to review their information and provide well-informed responses. A numbering system of 1 to 10 was used to identify each respondent.

5.1.2 The Urban Respondents

The second group also comprised a total of ten (10) young adults, middle-aged adults, and senior Zulu residents living in the urban areas of Pietermaritzburg (Pelham and Lincoln Meade). The group also consisted of six (6) females and four (4) males, including university lecturers, social workers, university students, a high school teacher, an engineer, a compliance officer, and a work-in-progress analyst. This offered the study a more contemporary outlook on human germline enhancement technologies. The interviews were conducted mainly in English, with some isiZulu used in certain places. The same numbering system of 1 to 10 was used to identify each respondent in this category. Both rural and urban respondents were provided with a brief overview of human germline enhancement. The interview schedule also included a definition of the sanctity of life to assist the respondents in understanding the ethical controversies surrounding human germline enhancement.

5.2 Theme 1: Applications of Human Germline Enhancement

As outlined in the literature review (Chapter Two), genetic modifications can occur in two forms: somatic (non-reproductive) cells and germline (reproductive) cells, the latter being heritable across generations. Somatic modifications are currently being explored in clinical trials aimed at treating genetic conditions, such as cancer, blood disorders, and blindness, whereas germline modifications remain restricted due to unresolved safety concerns (Van Dijke et al., 2021: 466). However, scholars including Athanasios Alexiou, Catarina Rebelo, and Abdijit Mitra, note that research continues to explore applications beyond therapy, such as extending life expectancy, enhancing disease resistance, enhancing physical and cognitive traits, and even advancing the prospect of ‘designer babies’ (Alexiou et al., 2020: 63; Rebelo et al., 2022: 4, and Mitra, 2021: 1). Below is the presentation of the findings related to the types of applications the respondents perceived as beneficial, as well as those they felt hesitant about, along with their reasons for these views.

5.2.1 The Rural Respondents’ Views

All the rural respondents stated that they had no prior knowledge of human germline enhancement. When asked about the type of applications they perceived as beneficial, six participants identified the technology's ability to enhance prospective babies' resistance to diseases, particularly genetic conditions, as the only application they found valuable. Rural Respondent 3 stated that other applications of germline enhancement, aside from disease resistance, are not appealing to him because they seem too complex and lack a sense of urgency, whereas disease resistance can save lives, making it a more practical and valuable option for him. He indicated that *treating genetic diseases such as cancer can be very expensive, so preventing such diseases through hereditary means could reduce the economic burden associated with medical expenses, which could significantly impact overall community health*. Similarly, Rural Respondent 8 expressed that: *in our area, there is limited access to healthcare facilities and services, resulting in people dying from easily treatable diseases. Therefore, improving disease resistance could reduce the dependence on healthcare infrastructure.*

Two rural participants mentioned that they also considered other applications, such as cognitive enhancement and extended life expectancy, to be more valuable. Rural Respondent 5 stated the following:

> If I had access to these technologies, I would enhance my children's cognitive abilities with the hope that they would utilize their intelligence to improve my family's financial situation. My child could pursue higher-paying jobs or even start their own business, creating a better future for our family and the community's future generations.

In addition, Rural Respondent 10 expressed that: *It is so painful to see your child die before you, so for me, it would be important to enhance their resistance to diseases as well as extend their life expectancy.* Two rural respondents expressed concern, stating that they find these technologies problematic. Rural Respondent 6 highlighted an observation regarding the intense competition among parents in Africa, particularly concerning their children's achievements in academics and sports. She stated that wealthy parents might enhance their children's cognitive abilities, potentially leading to jealousy among other children and parents. She noted:

> This is something that we already see happening today. Depending on their beliefs, some parents even go to extreme lengths, such as using witchcraft, to sabotage their children's competitors in school. Parents might also augment their children's physical attributes to ensure success in sports, given the availability of special

> scholarships and the potential for lucrative careers in athletics. To each their own, but I foresee a lot of potential problems with this technology.

Rural Respondent 9 similarly pointed out that:

> This technology could be beneficial because it would allow for the birth of an ideal child, reducing the chances of any deformities and potentially enhancing their intelligence. However, as a traditional healer, it is taboo to mess with the genetic makeup of a person. Doing this would disrupt the deep connection we share with our ancestors. For example, certain illnesses are believed to serve as a way for our ancestors to draw our attention to issues that need to be addressed in our homesteads. I'm not saying it's good for people to get sick, but this is a reality we've come to accept.

5.2.2 The Urban Respondents' Views

Six urban respondents stated that they had no prior knowledge of human germline enhancement. The remaining respondents indicated that they had encountered some information on various aspects of human enhancement through internet sources, including articles, videos, and even science-fiction movies. Urban Respondent 1 shared that he had recently watched a science-fiction movie called *They Cloned Tyrone,* which revolves around a group of three acquaintances who uncover a government cloning conspiracy to surveil and control their citizens. He said: *If stories like these are being told, it might be a sign that we're closer to having access to such technologies, or they might already exist.* Urban Respondent 4 mentioned coming across an article on the same topic, but he was unaware of other potential applications of the technology. He said:

> To some extent, I was aware of the concept of human enhancement, but I primarily understood it as exploratory experiments conducted in America, aimed at gaining deeper insights into the human brain. The article discussed a group of scientists who joined forces to explore the idea of potentially using reproductive technologies to enhance foetuses, with the goal of creating more individuals with high IQs, similar to that of Albert Einstein. I was obviously baffled by this, and since they said it was an exploratory study, I thought they were talking about something far into the distant future.

Urban Respondent 6 expressed that he believed concepts of human enhancement, such as cloning, often depicted in science-fiction movies, were purely fictional. He mentioned having

come across an online video advertising growth hormone pills for children to increase their height. He added: *I had no idea that human enhancement had advanced to the point where a child's intelligence could potentially be enhanced before birth. I strongly believe that for every positive, there is a negative, and yet the media does not provide enough information about the downsides of such advancements. You really have to search for such information.* Urban Respondent 7 also recalled coming across a video on social media a few years ago that speculated that Hollywood stars, including Beyoncé, had undergone a medically assisted pregnancy through in-vitro fertilization for their pregnancies. She noted: *The video further explained that more than 40 percent of all IVF births result in multiples- twins, triplets, or even more babies. I think IVF serves as a gateway to more advanced forms of reproductive technology, such as germline enhancement.*

When asked about the type of applications they considered beneficial, all of the urban respondents identified disease resistance as particularly valuable. The majority noted that it would help reduce or even eliminate expenses related to doctors and hospital fees. Urban Respondent 2 mentioned that: *Knowing that your child or loved one is less likely to contract life-threatening or debilitating diseases can provide a strong sense of mental well-being and peace of mind.* Urban Respondent 4 stated: *I think it would be a good initiative to have the opportunity to proactively pass on stronger, healthier genes to our offspring and ensure that our descendants are less susceptible to diseases.* Urban Respondent 8 said: *Although it's scary to think about modifying people's genes if it's to make them resistant to all these serious diseases like cancer and diabetes, then I think it could be a great thing, as this will lead to fewer hospital visits and reduced healthcare costs.* Similar to the point of looking out for one's descendant, Urban Respondent 10 expressed that:

> Disease resistance is the only application that scientists are supposed to be worrying themselves about because many families suffer from genetic diseases to the point where bloodlines are lost, so if there's a way to guarantee the protection of a bloodline, then definitely, this technology should be explored, but I would prefer it to be as minimally invasive as possible.

Five of the nine respondents indicated that they believed cognitive enhancement would also be valuable. Urban Respondent 3 said that: *Having a nation of intelligent people would likely drive economic growth, which would increase the chances of the country achieving first-world status, and we could enjoy financial stability.* Urban Respondent 5 emphasized that: *I believe*

if the next generation had higher IQs, this would enhance their problem-solving skills and improve the way they make decisions, leading to innovations that could improve their quality of life and benefit society and even the world. Who knows, maybe they can even come up with solutions to critical things like climate change. Urban Respondent 6 expressed: *Who wouldn't want their child to be the brightest in their class? That is why we have school events that celebrate the high achievers in schools, so if I could afford it, I would enhance my child's cognitive abilities.* In addition, Urban Respondent 7 said:

> Technology has brought about a lot of positive things in our lives, and all the advancements in healthcare prove that we are improving our lives for the better, but I have reservations about using technology to intervene with babies before they are even born. So much can go wrong with technology; we can't rely on it with something as sensitive as this.

Lastly, Urban Respondent 1 also expressed some scepticism towards the technology. He remarked: *I believe this would give humans too much power. If I had to choose, I would enhance my child's intelligence because it would equip them with the necessary skills to improve their lives.* Competitiveness and a lack of trust in the technology were not the participants' only concerns. They also expressed significant apprehension about the potential misuse, safety, and efficacy of the technology, leading to the next theme.

5.2.3 Summary of Theme 1's Findings

Both rural and urban respondents showed a strong interest in the disease-resistance application of human germline enhancement. They emphasized that this application seems to have practical and life-saving benefits, which could potentially reduce reliance on healthcare infrastructure. All the rural respondents stated that they were unaware of germline enhancement before this study, with six rural participants identifying resistance to diseases, particularly against genetic conditions, as the most valuable application. They viewed enhancements unrelated to diseases as overly complex and not urgent. Additionally, two rural respondents valued cognitive enhancement, and one also mentioned extended life expectancy, linking these applications to improved family financial status and as a means of reducing the emotional burden associated with losing a child.

Similarly, six urban respondents reported no prior knowledge of human germline enhancement, while the remaining respondents were familiar with related topics such as IVF and cloning

through the internet or science fiction movies. All the urban respondents prioritized disease resistance, viewing it as a potential way to reduce medical expenses. Furthermore, five respondents valued cognitive enhancement, believing it could boost the country's chances of reaching first-world status, improve financial stability, and enhance problem-solving skills and decision-making, ultimately fostering innovations that benefit society and improve overall quality of life. However, one respondent expressed concerns about the sensitivity of using the technology on unborn babies, mentioning issues of precision and potential off-target effects. Another respondent expressed scepticism about the technology's overall reliability.

5.3 Theme 2: Safety and Efficacy Concerns of Human Germline Enhancement Technologies

As discussed in the literature review, human germline enhancement remains a highly controversial and heavily regulated area of bioethics worldwide. These procedures are not yet considered ready for clinical applications, though some argue that continued research is necessary to assess the long-term effect of such enhancements (Thaldar et al., 2022: 16). The primary concerns regarding safety and efficacy involve unintended or imprecise modifications, commonly known as off-targets. Brokowski and Adli (2020: 89) emphasize that despite advancements that may reduce risks, even minor alterations could have significant and potentially harmful consequences for patients and future generations, the full extent of which remains unknown. The challenge is that the effects of genetic alterations in human germline cells may not fully manifest until several generations have inherited these changes (Pang and Ho, 2016: 59). Given that germline modifications are permanent, it is imperative that these procedures are conducted with extreme precision and that suitable guidelines for clinical trials are established (Brokowski & Adli, 2020: 89). Public perception and confidence in the safety and efficacy of germline enhancement technologies play a crucial role in shaping the attitudes toward their development and use. The following is a summary of the key findings related to this theme.

5.3.1 The Rural Respondents' Views

When asked about their reservations or concerns regarding the safety and efficacy of human germline enhancement technologies, all of the rural respondents expressed serious concerns regarding the issue of potential misuse, off-target effects, and long-term implications. Rural Respondent 1 stated: *I believe it is our duty to alleviate human suffering caused by genetic diseases and disabilities and to use our resources to improve the human condition. But on the*

other hand, we risk exposing ourselves to something that could potentially harm us and alter the human race permanently. For instance, she cautioned that: *…enhancements could be used not just for medical purposes but to create physical or intellectual advantages that could deepen societal inequalities or even lead to a loss of individuality because people might pursue extreme modifications in a bid to stand out.* Rural Respondent 2 indicated that: *Yes, the technology promises a lot of positive things, but it also appears to be very unpredictable, and the fact that we can only fully trust it over several lifetimes seems very scary, leading me to believe it would be unethical to pursue.*

Rural Respondents 3, 5, and 7 expressed similar concerns about the potential off-targets and long-term effects. Respondent 3 stated: *I know the intention would be to help make our lives easier, but what if the unintended alterations result in disfigured people? There's nothing you can do then; the damage is already done. As a parent, I would be filled with immense regret.* Respondent 5 said:

> The scientists admit that the technology isn't ready because it can lead to unintended modifications. What if the enhancement doesn't even work? Just imagine parents paying for their child to be super intelligent, only to find out after birth that it didn't happen, or worse, the child was accidentally harmed in a way that can never be undone. We should just let nature take its course.

Respondent 7 also replied:

> For me, this is unnecessary. What if this leads to new diseases and health issues down the line? Life is delicate, and we can't pretend to fully understand the complexities of nature. I worry that through technology, we are drifting further from our traditions, which are what connect us to our ancestors. Interfering with nature in this way could have negative consequences. This technology might not work for us, or we could experience worse off-target effects, as a sign that our ancestors disapprove. Their wisdom has always guided us, and we must be careful not to disrupt that balance.

On the view that human germline enhancement might be seen as unnecessary because it fundamentally clashes with the African ontology, Rural Respondent 9 posited:

> Living in a world where people are immune to diseases sounds incredible, but I also believe we would be taking a huge risk, given that we would need to test these technologies now, without fully understanding the long-term consequences, which

might only become clear after many years. Our ancestors thrived without modern technology, relying on natural herbs to treat various diseases. These herbs continue to be effective, and as a traditional healer, I can confidently say that our knowledge of herbal medicine has also advanced. Even if you don't believe in traditional medicine, the current technology has progressed to the point where people are living longer and healthier lives. We've done well for our generation, and I see no need to go as far as altering our children before they are even born. This is not only unnecessary, but in fact, I believe it is wrong that we are even entertaining the idea.

5.3.2 The Urban Respondents' Views

Similar to the views of the rural respondents, all the urban respondents expressed serious concerns regarding the potential misuse, off-target effects, and long-term implications of germline enhancement technologies. Three urban respondents shared the following about the potential misuse of the technology:

Urban Respondent 2 mentioned that:

> If the technology is not used for strictly therapeutic enhancements like preventing genetic diseases, then it will definitely lead to exploitation for superficial desires. This will deepen harmful stereotypes and ideals, and people will compete for beauty, intelligence, and even athleticism, whereas currently, these attributes depend on genetic chance and individual effort.

Urban Respondent 3 echoed similar concerns, stating: *This is dangerous territory. We already have millions of people undergoing plastic surgery despite knowing the risks of adverse reactions. It could be that these corporations are just seeking fame or profit because the idea of creating a world of "perfect" people is unrealistic.* Lastly, Urban Respondent 6 indicated concern about the cost and accessibility of the technology, stating: *I believe the underlying intention behind this technology is to commodify human traits. I think access to these technologies will be costly, which may lead to a situation where genetic traits become luxury items.* Additionally, two urban respondents raised concerns regarding the issue of off-target effects. Urban Respondent 8 remarked:

> I get that the concept is to enhance our lives by making us smarter, immune to diseases, or live longer, which sounds good on paper. However, I can't help but wonder what would happen if these modifications altered people's personalities, causing them to behave in ways that are no longer 'normal' to their families. We

> already know that people react differently to certain injections, so how can we be sure each genetic modification will succeed? I'm very doubtful that the technology will ever guarantee zero off-targets, and we may not be able to fully control or predict the outcome of these enhancements.

Similarly, Urban Respondent 9 added:

> I'm sure they've been trying to perfect these modifications for decades now, but they're still failing because we're dealing with human beings, not plants or mice. Human genetics is incredibly complex and unpredictable. For me, the potential for harm, especially to future generations, far outweighs any possible benefits.

Also, on this theme, several urban respondents reflected on the potential long-term implications of human germline enhancement, and these were the key responses: Urban Respondent 1 expressed concerns about the irreversible nature of these modifications, stating:

> One of my biggest fears is that once these changes are made, they're permanent and passed on to future generations. We can't predict how these genetic modifications might evolve over time, and future generations will have to live with our mistakes. Once the genetic code is altered, there's no going back. I would prefer we stop at somatic alterations, where individuals can choose to make changes to their own genomes and not pass them on.

Echoing this sentiment, Urban Respondent 3 also commented on the potential for long-term implications on society as a whole. He posited:

> Over generations, the use of germline enhancements could fundamentally alter our understanding of what it means to be human. If we start manipulating traits like intelligence, physical appearance, or even life expectancy, we risk creating a society where natural human variation is no longer valued. And beyond that, putting aside unnatural causes like accidents, do humans really want to live longer than we currently do? Will we have enough resources to sustain us?

Finally, Urban Respondent 6 highlighted the societal pressure that may emerge if the technology becomes widely accepted: *…once this technology is proven safe, parents may feel compelled to enhance their children just to keep up with the societal expectations of the time.* This response ties into the subsequent theme regarding the issue of consent from prospective persons.

5.3.3 Summary of Theme 2's Findings

Both rural and urban respondents expressed significant concerns about the potential misuse, off-target effects, and long-term consequences of human germline enhancement. For the rural group, one respondent acknowledged that while it is important to alleviate human suffering caused by genetic diseases, there is also the risk of introducing permanent and harmful changes to the human race. Another respondent acknowledged the promise of the technology but emphasized its unpredictability and the limited understanding of its long-term effects. This sentiment was echoed by three other respondents who shared concerns about unintended consequences, with one noting that although the goal may be to improve lives, unintended genetic alterations could lead to irreversible physical deformities, ultimately advocating for allowing nature to take its course.

Two respondents expressed apprehension about the cultural and spiritual implications of germline enhancement. One respondent pointed out that there might be a clash between technological advancements and traditional values, suggesting that such technology might not align with African cultural practices deeply rooted in ancestral veneration. He expressed that adverse off-target effects could be interpreted as disapproval from ancestors. Lastly, one respondent questioned the need for human germline enhancement, considering that modern technology, traditional medicine, and improvements in healthcare have already significantly enhanced health and longevity. Thus, deeming the technology unnecessary.

Under the urban category, three respondents emphasized the dangers of using the technology for non-therapeutic purposes, stating that this could exacerbate harmful stereotypes and create competition over traits such as beauty, intelligence, and athleticism, which currently rely on genetic chance and individual effort. One respondent compared human germline enhancement to the existing trend of plastic surgery, where people often risk their lives for aesthetic purposes, questioning whether the corporations driving these enhancements are motivated more by profit than by genuine concern for human well-being. Another respondent cautioned that the consequences of altering the genetic code may not become apparent until it is too late and future generations are forced to live with irreversible changes. Additionally, one respondent stated that he believes the underlying intention of this technology is to commodify human traits, turning desirable genetic traits into luxury items.

Two urban respondents specifically emphasized the risk of off-target effects. One respondent explained that just as individuals react differently to medical treatments like injections, genetic modifications could also have unpredictable outcomes. She expressed doubt that the technology would ever fully eliminate off-targets. Lastly, another respondent echoed this concern, highlighting the complexity and unpredictability of human genetics, arguing that the potential harm to future generations far outweighs any potential benefits.

5.4 Theme 3: The Impact of Parental Genetic Choices on Future Generations

As highlighted in the literature review, human germline enhancement raises critical concerns about autonomy and informed consent, particularly regarding the reproductive rights of prospective parents and their future offspring (Ishii & Beriain, 2019: 370). In most medical situations, decisions are based on the principle of informed consent. This allows individuals to understand the potential risks and benefits and make their own choices. However, with germline enhancement, it is inherently impossible to obtain consent from future generations who will be directly affected by these genetic modifications. Cavaliere et al. (2019: 80) note that this ethical dilemma emphasizes the challenge of balancing the reproductive rights of parents with the autonomy of unborn individuals. This issue often polarizes opinions, particularly between transhumanists and bioconservatives. Transhumanists argue in favour of prospective parents having the right to pursue genetic enhancements, believing they are acting in their children's best interests. In contrast, bioconservatives view such interventions as overly invasive, raising concerns about the commodification of genetic traits, which could diminish the personhood of future generations. Participants were asked to comment on the possible consequences of prospective parents choosing their children's genetic traits and how these decisions could impact future generations. The key findings related to this theme are outlined below.

5.4.1 The Rural Respondents' Views

Most of the rural respondents expressed concerns about the potential harm in selecting genetic traits for their future descendants. Rural Respondent 3 reflected on the dynamic nature of human evolution, expressing doubt about the current generation's ability to predict what future generations will value. He stated: *As humans, we are constantly evolving. I don't think it's right to assume we know what traits future individuals will consider valuable. What if, by making these assumptions, we unintentionally cause problems for our descendants and impact their overall well-being?* Rural Respondent 4 spoke about the irreversibility of genetic changes, stating that:

> What scares me is that these changes are irreversible. Many of us believe in the phrase: *Siyizihambi emhlabeni, kodwa masishiye izigcawu ezinhle.* Meaning, life is not permanent; we are merely passing through, so we need to leave behind positive footprints for those to come. It just seems unfair to make such critical decisions that not only impact us but also affect future generations, especially when there's no certainty that these changes will be beneficial in the long run.

Furthermore, Rural Respondent 5 argued that selecting specific traits can be detrimental because it imposes limitations on the child's autonomy. She said:

> Choosing specific traits for a child can be harmful. It's like turning the child into a robot to fit someone's agenda. Determining traits like life expectancy is particularly tricky, as investing heavily in this area may be futile. What if, when the child grows up, their lifestyle doesn't even align with the predicted expectations?

Similarly, Rural Respondent 7 expressed concerns about undermining personal agency and individuality. He mentioned that: *…genetic modifications undermine the value of everyone having a say in their own lives and developing their unique gifts and talents. So, directly altering someone's genetics based on what you, as the parent, believe is important ultimately diminishes this intrinsic value.* Rural Respondents 6 and 9 expressed deep reservations about parents who might want to participate in human germline enhancement, focusing on how these modifications could disrupt core beliefs about family and culture within the Zulu community. Respondent 6 argued that parents who would engage in germline enhancement would be deliberately defying deeply held Zulu beliefs regarding the vital role of ancestors in guiding and protecting future generations:

> If you are a firm believer in the blessings that come with honouring your ancestors, you will realize that this practice would be one definite way of cutting them off in your life. In IsiZulu, we say, *Umuntu akazalwa yedwa, uzalwa nomlando wakhe*[2]. So, when you interfere with sacred things like genetics, you disrupt the natural order and disrespect the wisdom of your ancestors, who guide and protect us. Essentially, you risk killing the relationship that you or your future descendants could have with their ancestors.

[2] "A person is not born alone; they are born with their history". This Zulu proverb conveys that an individual is always connected to their lineage, history, and broader community, emphasizing the interconnectedness of past, present, and future generations.

Rural Respondent 9 echoed similar sentiments, highlighting the potential conflict with traditional Zulu practices, saying:

> While having such choices may seem appealing, we must consider how these enhancements would affect our social norms. We believe genetic traits like the shape of a child's eyes, ears, or nose aren't just physical features; they serve as confirmation that the child belongs to a particular family. For example, during 'ukubikwa kwesisu', when a man's family is informed that a woman is pregnant, these physical traits are carefully examined after the baby is born, helping to determine the acceptance or rejection of the child by the family. Deliberately altering these features for non-essential reasons could undermine this important tradition.

Conversely, Rural Respondent 10 expressed optimism toward germline enhancement, highlighting the younger generation's strong belief in technology. He posited that once safety and informed consent concerns are fully addressed, many Africans, including Zulu people, would likely adopt the technology. He stated:

> Isn't the goal to improve our lives by eliminating diseases and enhancing our mental abilities? If the technology is proven safe, then what would stop us from using it? I'm sure the introduction of immunizations for babies or even the vaccines that we've grown accustomed to faced similar debates. While we identify as Zulu, *iningi lethu asisawalandeli amasiko ethu nemithi asisakholelwa kuyo*[3]. So, I personally wouldn't judge the parents who would want to do this and have the means or funds to do so.

5.4.2 The Urban Respondents' Views

Four urban respondents expressed concerns about the potentially harmful effects of germline enhancement on future generations. This included fears of unintended consequences, loss of natural diversity, and infringement on the autonomy of future generations. Urban Respondent 1 stated that: *My biggest worry is that altering one gene could unpredictably affect other traits, possibly causing harmful outcomes that might not be immediately apparent, and there'd be no way to reverse such changes, leaving future generations burdened with unknown illnesses.* Urban Respondent 4 mentioned that *parents might be fixated on wanting their children to be "flawless," leading to everyone becoming too similar. We will lose the natural genetic diversity, which is what enriches humanity.* Urban Respondent 5 echoed this concern, stating:

[3] Most people no longer follow traditions or believe in traditional medicine. This indicates that many Zulu people, especially younger generations, have abandoned cultural practices and lost faith in traditional African medicine.

> The beauty of every birth lies in discovering a child's unique talents and capabilities. Pre-selecting these traits undermines this natural process and raises profound questions about the value of human life and the extent of parental control. Giving parents too much authority over a child's genetic makeup is problematic. There's no guarantee that the child will grow up to use these enhancements as intended by the parents. It's crucial to let nature take its course. A parent's role is to guide and support, allowing the child to develop into who they choose to be. Taking a controlling approach is harmful.

In contrast, four urban respondents similarly pointed out that proactive genetic planning could be beneficial, arguing that equipping future generations with advantageous traits might better prepare them for upcoming challenges and opportunities. Urban Respondent 2 stated: *Parents already make decisions about their children's futures through education and healthcare, so why not use genetics to ensure their kids never fall sick again? This will definitely give them a better life.*

Furthermore, Urban Respondent 7 indicated that *we already have interventions like IVF, where eggs are fertilized outside the body*. She added:

> While IVF is primarily used to address infertility, it demonstrates human control over reproduction. Consent from future generations isn't a major concern with IVF because parents are assumed to act with good intentions. As long as these enhancements are aimed at improving things like mental capacity and not for trivial reasons, such as eye colour, the technology can actually be used to create better living conditions for future generations.

Urban Respondent 8 shared similar sentiments but stressed that the technology must be approached with extreme caution, highlighting that: *…focusing on disease resistance is the most beneficial path forward, that way, future generations will live longer and healthier lives.* Urban Respondent 10 stated: *…if done right and all the safety issues have been addressed, parents can empower their kids and place them in a better position to succeed in certain environments or professions, as well as improve their overall health and quality of life.* Lastly, Urban Respondents 3 and 6's responses overlapped with the broader societal risks of human germline enhancement, such as its potential impact on social inequality and cultural identity, which will be explored in detail in the next theme. Urban Respondent 3 noted that granting parents the authority to select their children's genetic traits could exacerbate inequality, stating:

…if wealthier families have access to enhancements, it could lead to inequality, with those unable to afford these modifications facing discrimination. Urban Respondent 6 emphasized the cultural implications of consent in this context, arguing that it is often viewed through a Eurocentric lens, which prioritizes individual rights, specifically those of the parents, overlooking the broader societal values that may be at play. He continued:

> Many of us believe that parents know what's best for their children, but we may not realize that within the African context, embracing germline enhancement technologies can jeopardize our identities and the unique traits that define us. Using such technologies could disrupt the natural connection that future generations would have with their ancestors, weakening their sense of belonging and cultural identity.

5.4.3 Summary of Theme 3's Findings

The rural participants' responses encompassed a variety of viewpoints regarding the potential consequences of parents choosing their children's traits. Two respondents expressed concerns about the unpredictable effects of selecting traits for future generations, emphasizing that human evolution is dynamic, and attempting to control which traits are passed on could lead to unintended consequences, potentially harming their well-being. Two respondents raised issues about limiting the autonomy and individuality of future generations, arguing that children might be moulded to fit their parents' desires or societal expectations, rather than allowing them to develop their own unique identities and talents.

Two other participants noted that germline enhancement could conflict with traditional values, especially in communities where ancestry and familial physical traits are deeply cherished. They expressed that altering genetic traits could be perceived as severing important ancestral ties, which are seen as essential for protecting and guiding their offspring, potentially resulting in a loss of cultural identity over generations. Conversely, one respondent expressed optimism about the potential benefits of germline enhancement, such as improving the quality of life by eliminating diseases and enhancing cognitive abilities. He pointed out that the younger generation's belief in technology could lead many Africans to embrace such advancements, provided that safety and ethical concerns are adequately addressed.

Four of the urban respondents also showed apprehension about the potentially harmful effects of germline enhancement on future generations, ranging from fears of unintended consequences, loss of genetic diversity, and infringement on individual autonomy. Similar to

the rural participants, the concerns centred on the possibility that off-target effects could result in future generations inheriting unknown health issues or experiencing disruption of other genetic functions. One respondent expressed the possibility that parents might become overly fixated on creating "flawless" children, which could lead to a loss of natural genetic diversity. In contrast, four participants highlighted the potential benefits of proactive genetic planning, arguing that equipping future generations with advantageous traits could better prepare them for future challenges.

One respondent noted that just as parents make choices regarding education and healthcare, they could also make informed decisions about genetics to enhance their children's lives. Another pointed out that existing reproductive technologies, like IVF, reflect human control over reproduction; therefore, as long as the enhancements aim to improve health rather than trivial traits such as beauty, they could create better living conditions for future generations. However, one participant cautioned that germline enhancement could deepen existing inequalities where those unable to afford such modifications face discrimination. The remaining participant emphasized the cultural dimensions of consent, arguing that viewing germline enhancement technologies through a Eurocentric lens may overlook broader societal values and weaken future generations' connection to their ancestors and cultural identity.

5.5 Theme 4: Socio-Cultural and Religious Implications of Human Germline Enhancement

As indicated in the literature review, human germline enhancement raises a variety of ethical, cultural, and religious concerns that are crucial for understanding the potential impact of this technology on different communities. Player and Matsuura (2020: 3) argue that from a socio-cultural perspective, germline enhancement challenges traditional norms regarding human identity and equality. Shozi and Thaldar (2023: 6) further emphasize that altering genetic traits not only disrupts these norms but also risks creating social divisions between enhanced and non-enhanced individuals, potentially exacerbating existing inequalities. Moreover, Liao (2019: 99) argues that the concept of "designing" children with specific traits could erode established views on natural human development and diminish the appreciation for diversity within human populations. This concern is especially pronounced in African religious traditions, where life is viewed as sacred and imbued with spiritual significance from its earliest stages. Shozi (2020: 65) observes that germline enhancement, which often involves modifying or discarding human embryos during its experimental phases, directly conflicts with these

deeply held beliefs about the sanctity of life, raising profound ethical concerns about human intervention in natural biological processes. This practice, often described as "playing God", is predominantly rooted in Christian doctrine, further intensifying debates over the morality of such interference.

These issues illustrate the complexity of understanding how technologies like human germline enhancement could affect social cohesion, as well as cultural and religious values. This theme emerged from the participants' responses when asked: *How might human germline enhancement influence, challenge, or reshape the cultural norms, religious beliefs, and social structures of the Zulu people regarding the sanctity of life?* The key findings related to this theme are detailed below.

5.5.1 The Rural Respondents' Views

The responses from the rural participants highlighted a wide range of potential societal implications of human germline enhancement technologies, encompassing cultural and religious perspectives alongside concerns about socioeconomic disparities and their impact on social cohesion. Five participants expressed concerns about how human germline enhancement may challenge the preservation of traditional beliefs and values among the Zulu people. Both Rural Respondents 2 and 5 expressed similar concerns. Rural Respondent 2 stated that: *...germline enhancements could change the way we perceive culture and tradition as long-standing beliefs, values, and practices passed down through generations, which are elements that provide a sense of belonging and distinguish us from the rest of the world*. Rural Respondent 5 further illustrated this point with an example:

> During the first year of a child's life, we perform a ritual called Imbeleko. This ceremony involves community members offering blessings to the family, and the elders formally introducing the baby to their ancestors. They express gratitude for a successful birth and seek their protection for the child's future. For those who continue to uphold this tradition, altering genetic traits for enhancement may raise questions about the purpose of the ritual. The child's genetic makeup might be perceived not as a natural gift from the ancestors, but as some kind of "human-modified creation."

Rural Respondent 6 expressed concern that genetic modifications could disrupt spiritual connections, which could negatively affect the future generations' transition into the afterlife. She opined:

> Personally, I could never deliberately participate in something that might upset my forefathers. This is a delicate matter; our ancestors play a vital role in guiding our lives and the natural course of events. Changing a child's genetic makeup would not only disrupt this connection, but I believe it would create a spiritual imbalance where the child might feel like they don't belong due to the parents disregarding ancestral guidance. This could anger the ancestors, and once that happens, nothing good will come of it. While it may seem like, initially, future generations will reap all the benefits, and everything might appear fine. My concern is, when they pass on, will they be welcomed by their ancestors?

Similarly, Rural Respondent 7 indicated that germline enhancements might have unfavorable implications on spiritual identity. He said:

> Altering the germline before a person is even born introduces numerous interferences that could affect not only the physical aspects of being human but also the spiritual dimension, which is crucial to one's identity, especially within the Zulu culture. We believe that from conception to birth, *umntwana usuke ehlezi nokhokhokho bakhe*[4]. If the germline is tampered with during this critical stage, would the ancestors still recognize the individual? Could you still be considered to possess a pure spiritual identity?

Lastly, Rural Respondent 9 also raised the practice of *Imbeleko,* stating:

> As I mentioned earlier, I firmly believe germline enhancement would conflict with traditional Zulu customs. Another practice likely to be undermined is the authenticity of *Imbeleko*. We would be lying to ourselves by claiming that our ancestors blessed us with that specific child when, in reality, we as parents altered the genetic makeup to fit our desires. While the ancestors may have played a role in safeguarding the child during pregnancy, our actions would reflect doubt in them, and that we were greedy. Perhaps, the least the parents can do, if they truly believe in their ancestors, they could consult them before initiating the process and heed the guidance they receive from them.

As discussed in the literature review, the Zulu ontology is sometimes rooted primarily in traditional ancestral beliefs that coexist or interact with Christianity (Nwoye, 2017: 37). This

[4] This phrase suggests that before a child is born, they exist in the spiritual realm, among their ancestors.

duality is evident in the responses of two of the rural respondents, who emphasized their belief in ancestors acting as mediators between the living and God (uMveliqangi/uNkulunkulu) as the Supreme Being. Rural Respondent 3 expressed the following concerns:

> Life is a gift from uMvelinqangi and one's ancestors, not something to be manipulated or tampered with. I believe altering genetics in this way would disrupt our understanding of the natural order and the spiritual sanctity that begins at conception. Such changes could result in a loss of cultural identity and diminish our moral clarity regarding the meaning of human life.

Similar sentiments were echoed by Rural Respondent 8, stating:

> I believe uMveliqangi creates life with purpose, and even if challenges arise with conception, we can consult with our ancestors and ask them to intercede on our behalf in asking uMveliqangi for His favour because we believe they are closer to Him. Whatever the outcome, it is His will. Interfering with something so sacred would be seen as disrespecting our traditional and religious values.

The remaining three rural respondents expressed strong religious (Christian) opposition to human germline enhancement, emphasizing that it is akin to assuming the role of God. Rural Respondent 1 stated:

> I believe in uNkulunkulu and that all creation comes from Him. How can we expect Him to bless and protect a child that was not entirely created by Him? In the book of Genesis, *uNkulunkulu wathi asenze umuntu ngomfanekiso wethu*[5]. Therefore, the practice of selecting specific traits and features challenges the belief that uNkulunkulu knows best. By doing so, we would definitely be assuming the role of God; the very act implies that we believe He wouldn't have granted those features otherwise. Who are we to make such decisions?

This response underscores a key implication that human life may come to be viewed as malleable or customizable, potentially disrespecting the divine purpose of each individual. Rural Respondent 4 acknowledged that the only context in which germline enhancements might be viewed positively is when they are used to alleviate diseases. However, she

[5] This is a reference to the biblical passage in Genesis 1:26**,** where God speaks about creating humanity in His own image.

emphasized that this should only be considered in cases where there is a history of genetic diseases in the family that could put the prospective child's life in danger. She elaborated:

> I strongly believe that by altering God's creation, *siyobe sizidonsela amanzi ngomsele*[6]. People are born the way they are, be it how they look or how they think, for a reason. Tampering with the genetic makeup of humans will remove the element of surprise that comes from life as we know it. This challenges and defies the natural order of things and could result in unforeseen problems, possibly as a form of divine retribution or imbalance. If we do this, some may even question the existence of a Creator, making it seem trivial.

Lastly, Rural Respondent 10, while acknowledging technological progress, expressed concerns about how such technology could fundamentally reshape humanity. He stated:

> I understand that the world is progressing and that technology plays a significant role in our lives, so I'm not surprised that this is the direction the world is taking. For years, we've seen movies and videos about people building robots and convincing us that this will benefit humankind. However, this technology introduces the unsettling possibility of creating actual human robots. I fear that future generations could end up resembling machines rather than leaving procreation to God's design. A human being is a creation of God, and everything is perfect just the way He intended it to be.

In addition to their previous responses, Rural Respondents 3 and 5 also provided broader societal implications of unequal access to germline enhancement technologies. Rural Respondent 3 mentioned that one of the immediate implications would be that …*only the wealthy would afford it, and enhanced intelligence, physical capabilities, or resistance to diseases could become exclusive privileges for those who can afford to pay for them*. This could create a permanent divide between the genetically enhanced and those who cannot afford the enhancements. Furthermore, Rural Respondent 5 stated: *In the long run, naturally born individuals may end up being seen as different and probably be bullied, discriminated against, or marginalized.*

5.5.2 The Urban Respondents' Views

[6] A Zulu idiom that describes someone who knowingly or recklessly does something that leads to their downfall.

Six urban respondents highlighted the potential impact of human germline enhancement technologies on society's religious beliefs and values, emphasizing how these advancements could challenge, reshape, or transform traditional spiritual practices and ethical frameworks. Urban Respondent 2 posited:

> One of the core teachings of my church is that every person is born with inherent dignity because we're created in the image of God. Designing people genetically, especially for aesthetic or intellectual improvements, would not be taken lightly within religious groups, as it disrupts this core belief. Doesn't this reduce a person's worth to products of design and engineering?

Urban Respondent 4 touched on the potential disruption of the sacredness of procreation, emphasizing that: *...altering human genetics would remove the sacredness of conception and birth, turning reproduction into a controlled and artificial process.* She further explained that this *...goes against God's intended purpose for our offspring.* Similarly, Urban Respondent 5 spoke about the potential erosion of religious morals and ethics, stating that: *If we normalize germline enhancement for superficial traits such as beauty, intelligence, or social advantage, we risk undermining the religious moral frameworks taught in church, like humility, equality, and acceptance of natural flaws.* Urban Respondent 6's response addressed the controversy surrounding the practice of discarding human embryos during the experimental and selection phases of germline enhancement. He stated:

> I recognize that research is essential for us to fully trust this technology. While Western philosophical understanding may distinguish between an embryo and a fully grown human, I believe that once the egg is fertilized, life has begun, and there are no stages in this process. Therefore, each embryo represents a potential human life, created by uMvelinqangi, and disposing of them undermines the sanctity of life that begins at conception. Such actions may lead to significant societal conflict as they directly contradict the belief that life is sacred and should be respected at all stages.

Furthermore, Urban Respondent 8 pointed out the spiritual implications, asserting that such technologies could diminish the role of faith and prayer in seeking healing. She explained:

> *Okholweni kuyohlezi kunezinqinamba*[7] that test one's dedication to their faith. I believe these are all part of God's plan, providing opportunities for spiritual growth

[7] Faith is not a smooth journey; it comes with trials and tribulations.

> and allowing for divine intervention. While germline enhancement aimed at eradicating diseases may seem beneficial, it risks bypassing the divine role in the healing and testing of faith.

In contrast, Urban Respondent 10 expressed a more accepting view, suggesting that over time, if the technology is focused primarily on preventing serious illnesses or genetic disorders, *…it could be embraced as God's way of granting us wisdom to improve the quality of life and alleviate human suffering.* She added: *I see how it might align with religious values of healing and compassion, but it's important to draw a clear line between healing and enhancement for purely aesthetic reasons.*

Similar to the rural respondents, Urban Respondents 1,7, and 9 highlighted the duality of Christianity and ancestral veneration within the Zulu culture. They reflected on how germline enhancement could challenge deeply held religious beliefs and cultural norms, potentially reshaping how Zulu people approach the balance between the spiritual and physical realms. Respondent 1 stated:

> By engaging in sex, we are naturally participating in the act of creating life, and that is where our role as mere humans starts and ends. When we start choosing and determining specific traits, we enter a domain that is not ours to control. Therefore, we are impeding on creation itself. Our responsibility is to participate in it as naturally as possible. We have various natural methods, such as praying to uMvelinqangi, the Creator, and communicating with our ancestors to ensure we receive the blessings we need. Enhancing for anything rather than alleviating diseases means we're trying to play God, the wrong one at that, and if it's not blessed in the spiritual realm, life could end at any time because you're not protected.

Urban Respondent 7 added:

> We are called to trust in the wisdom of uMvelinqangi and the natural process of life as part of His divine plan. At the same time, ancestral veneration teaches us to honour the guidance of our forefathers, who have long been custodians of our spiritual and physical well-being. While science can offer valuable advancements for the good of humanity, such as disease resistance, any action that disrupts this sacred balance, particularly those that interfere with the Almighty's creation and the ancestral gifts we inherit, could lead to a spiritual imbalance, distancing us from God's purpose and cutting our ties to our ancestral roots.

Urban Respondent 9 further mentioned that:

> Ultimately, participating in germline enhancement will come down to individual choice. Some may opt to enhance their children, while others may choose not to, creating social divisions based on manufactured genetic traits. Unfortunately, we'll see children living lives shaped by the desires of their parents rather than fulfilling the purposes intended by uMvelinqangi or their ancestors.

Urban Respondent 3 indicated that he does not identify as a religious or traditional person. However, he provided the following response:

> It is undeniable that germline enhancement will cause conflict between those who embrace scientific advancement and those who aim to uphold traditional values, whether they are cultural or religious, both of which hold significance within the Zulu culture. I believe this technology could redefine our natural understanding of the progression of life, and in the future, it may lead to most traditional Zulu customs becoming obsolete. Most importantly, the technology will widen the gap between the rich and the poor because not everyone will be able to afford it. Currently, I think the focus should only be on disease prevention.

Lastly, Urban Respondents 4 and 10, in addition to their previous responses, both spoke about the implications of germline enhancement on dignity, each from a distinct perspective worth noting. Urban Respondent 4 stated:

> …if widespread adoption of this technology occurs, it could undermine human dignity by creating a society where those who can afford enhancements may be seen as superior while others may be "downgraded", leading to a loss of the inherent dignity that comes from life as it naturally unfolds. They might even feel or be seen as inferior.

In contrast, Urban Respondent 10 posited that: *…by granting people the opportunity to live healthier and longer lives, not limited by their cognitive or physical flaws, germline enhancement could actually enhance human dignity and empower people to take charge of their genetic legacy.*

5.5.3 Summary of Theme 4's Findings

Both rural and urban participants highlighted various societal implications of human germline enhancement technologies, particularly concerning Zulu cultural norms, religious beliefs, and social structures. Five rural participants expressed concerns about how these technologies

could challenge the preservation of traditional beliefs and values, suggesting that germline enhancements may alter perceptions of culture and tradition. They highlighted that long-standing beliefs, values, and practices such as the Imbeleko ceremony might be questioned because, instead of viewing a child's genetic makeup as a natural gift from their ancestors, it could be seen as a "human-modified creation". The same respondent cautioned that naturally born individuals may be viewed as different or inferior in a society that embraces enhancement, potentially leading to bullying, discrimination, or marginalization.

Another participant raised concerns about spiritual implications, questioning whether enhanced individuals would still be recognized by their ancestors and whether their spiritual identity would remain pure. She also mentioned that unequal access to enhancement technologies could create socioeconomic disparities, where enhanced traits become privileges exclusive to the affluent. Additionally, three respondents expressed strong religious sentiments, asserting that germline enhancement is akin to assuming the role of God. They argued that choosing specific traits challenges the belief that God knows best and has a divine purpose for each individual, which could potentially disrupt the natural order of life. Lastly, one respondent acknowledged the benefits of technological advancements but cautioned that future generations might resemble machines rather than being part of the natural order.

Six urban participants argued that human germline enhancement technologies could potentially diminish human dignity by reducing a person's worth to a product of design. They noted that germline might turn procreation into a controlled, artificial process. Another respondent raised ethical concerns about discarding embryos, which could be seen as disregarding the sanctity of life from conception. Three participants also emphasized that germline enhancement could disrupt the balance between the physical and spiritual realms, potentially diminishing faith's role in healing and distancing individuals from their ancestral roots. They expressed concern that focusing on enhancements, rather than purely on health benefits, could weaken these spiritual connections and create "spiritual imbalances". In contrast, another respondent viewed the technology as beneficial if the focus is on disease prevention, suggesting that such a purpose aligns with divine wisdom aimed at alleviating human suffering. She stressed the need for clear boundaries to prevent trivial or cosmetic modifications.

Lastly, echoing rural respondents, two participants highlighted concerns that germline technology could deepen socioeconomic divides, creating a society where affluent, enhanced

individuals are perceived as superior, which would undermine the traditional Zulu values of social unity and shared identity.

5.6 Theme 5: Parallels Between Zulu Cultural Practices and Human Germline Enhancement

As discussed in the previous themes, the respondents indicated that adopting human germline enhancement technologies might influence certain cultural norms and practices. The key question guiding this theme is: *In what ways, if any, do Zulu cultural practices or rituals align with the goals and objectives of human germline enhancement?* This theme explores the extent to which human enhancement technologies can be mirrored within the Zulu cultural traditions. Below is a presentation of the responses gathered from the participants for each application.

5.6.1 The Rural Respondents' Views

The responses gathered from the rural respondents revealed a strong belief in the vital role of traditional healers within the Zulu community and its cosmovision. They are regarded as custodians of indigenous knowledge and practices passed down through generations. This medicinal knowledge is considered a gift from one's ancestors, intended to promote the well-being of the community. From this perspective, the work of traditional healers can be likened to enhancement technologies, as they aim to improve health and quality of life within the community.

When asked about cultural practices related to extending life expectancy, most of the rural respondents mentioned a healthy lifestyle and expressed that they were unaware of any specific Zulu practices for this purpose. However, three respondents offered the following responses:

Rural Respondent 6 mentioned that:

> There are certain wild animals that are believed to hold the key to longevity, such as the black mamba and the tortoise. The tortoise, specifically, is known for its remarkable lifespan, which goes beyond 150 years. So, we extract oils from specific parts of these animals, mix them with *umuthi*,[8] and make small incisions into the body of the client. Once this combines with the client's blood, his or her body adopts the animal's longevity traits. This practice is believed to enable the person to live

[8] A herbal mixture.

longer than they would naturally[9]. It's about connecting with nature and aligning oneself with the enduring vitality of these creatures.

Rural Respondent 7 stated that:

> It's a natural feeling to want to live longer. To grow old and see your family grow, but there comes a time when the body becomes tired and needs to rest. That is the natural course of life. We believe that with the will of *uMvelinqangi*, the spirit of a person may return through their descendants rather than going the route of putting *umuthi* to extend life because you cannot predict how long you'll live or what kind of life it will be. Some *izinyanga*[10] practice these methods, but sometimes it results in a person becoming like a child again, needing to be fed and bathed. Even though you may still be alive, you will be almost like a living skeleton. I mean, we don't believe in things like euthanasia, so even though you may live a long time and your grandchildren may care for you, you can become a burden to them.

Lastly, Rural Respondent 9 opined:

> I rarely have clients coming in asking for this specifically. I've heard about practices pertaining to life extension, but honestly, it's not part of what I do. The work of *izinyanga* and *izangoma* focuses on holistic healing, maintaining balance between the mental, spiritual, and physical aspects of life. My approach is more curative than preventive, focusing on restoring health by addressing the root cause of the illness. This may result in a longer life, but it remains within the natural limits of human existence. The goal is not to unnaturally prolong life but to address the issues affecting a person's well-being. By restoring balance in these areas, the body and spirit naturally heal, leading to improved health and, in many cases, longevity. Most clients come to me after experiencing some sort of disturbance, often in the form of a mysterious illness. During consultations, I rely on guidance from the individual's ancestors to diagnose the issue and prescribe the appropriate herbs or concoctions, whether for ingestion, bathing, or enema, to restore health. Ultimately, my goal is to help people live long and healthy lives, but the emphasis is always on holistic healing, not on manipulating life expectancy unnaturally.

[9] There is no specific name for this practice, the client just describes what it is they want.
[10] The Nguni word for diviners or herbalists, also known as *izangoma*.

When asked about cultural practices related to disease resistance, eight rural participants stated that the most commonly used traditional medicines during pregnancy are *isihlambezo* and *imbiza*[11]. Rural Respondent 2 expressed that:

> Drinking *isihlambezo* during pregnancy is a traditional practice believed to promote the health of both the mother and the baby. It does not necessarily make the baby resistant to diseases, but it is considered a health measure to ensure that there are no complications during pregnancy and the baby comes out healthy. I used *isihlambezo* throughout all my pregnancies, and I vouch for it because it works, and most of my family members have used it, but of course, now people go to clinics and take pills like folic acid or something.

Similarly, Rural Respondent 5 said:

> A lot of women are advised to drink *isihlambezo* as it is believed it enhances the overall well-being of the pregnant woman, aiding in a smooth pregnancy, easier childbirth, and ensuring that the baby is born strong and healthy. Others also take *imbiza* together with *isihlambezo* for a more powerful effect on strengthening the baby's immune system.

Rural Respondent 6 outlined that:

> In this case, yes, the woman would have to take *isihlambezo* but probably also perform a ritual where we consult the ancestors and be very specific that we're not only talking about a safe birth but we ask for the baby to be resistant to all kinds of diseases and perhaps slaughter a goat as a way to appease them. If it is the will of uMvelinqangi, then I don't see a problem. Our forefathers listen to us; they were once humans like us, so they know that the world evolves. It just depends on whether they consider that specific enhancement valuable or not.

In addition, Rural Respondent 7 expressed that:

> *Isihlambezo* is usually enough as it contributes to the spiritual and physical protection of the baby, and we do believe it makes the baby more resilient to diseases. But in cases where the woman has had previous miscarriages, I normally make her *uLinda*,

[11] Herbal concoctions administered orally as a preventative health tonic during pregnancy.

> which is a waist string made out of wool dipped in *umuthi* for them to wear until they give birth. This one, I guarantee, the baby lives and comes out looking so adorable.

Lastly, Rural Respondent 9 stated the following:

> *Isihlambezo* is a very good mixture; it purifies the mother's body, preventing infections and illnesses during pregnancy, which could also impact the developing baby. By maintaining the mother's health, the baby is more likely to be born in a healthier state, with a better chance of resisting illnesses after birth. We usually add *imbiza* if something comes up during the consultations, like maybe there are evil spirits or bad omens that could harm the baby, then we mix something stronger that is still safe for both the mother and the baby. Then of course the woman has to take care of themselves and eat plenty of leafy vegetables as this also plays a role in strengthening the baby's resilience to diseases.

Relating to physical enhancement, five rural respondents stated that they had no knowledge of any traditional practices that align with this purpose, stating that the general belief is for the child to physically resemble their parents, especially the father, as this connection is vital for the child to be recognized and protected by the ancestors. Rural Respondents 2 and 7 similarly noted that: *…ancestors take great pride in passing down specific physical traits, be it the nose, ears, or complexion, this also goes for spiritual traits like ancestral gifts. These characteristics are regarded as blessings that contribute to the child's future prosperity.*

Rural Respondent 7 further emphasized the above, stating:

> We believe that in some way, the child has to resemble the parents, especially the father, to remove any doubts from the father's side. I've had numerous couples who come for consultations during pregnancy and after the child has been born, just for confirmation that the child belongs to the father. In most cases, the consultation is done when the father's family lives far away, and a proper *Imbeleko* cannot be performed, and in some cases, it's for instances where the woman is pregnant, but the father is suspicious that the child could not be his, then their ancestors will say whether the child is his or not.

Moreover, Rural Respondent 5 said:

> While DNA tests confirm paternity, some traditional people still consult *izangoma* for this. Let's say, in the case of a genetically enhanced child, this practice can be

> done to confirm that the child belongs to the family because the blood will be the same, but I think altering a child's physical traits through scientific means could still create confusion for the ancestors. They are guardians of the family bloodline, and they take comfort in seeing their lineage carried forward naturally. This is believed to be essential for the child's well-being and success in life.

Three rural respondents mentioned that there are general beliefs about certain foods that can be consumed for physical traits like complexion. Rural Respondents 1 and 4 expressed that: *…for lighter skin colour, the pregnant woman needs to eat a lot of cheese, milk, and sour milk.* Further, Rural Respondent 4 stated that: *I only know that if the mother eats plenty of leafy vegetables, the child will have a dark complexion, what we call Indoniyamanzi [12]. However, it's also advised not to consume too much green vegetables like spinach cause the child will have dark patches on parts of the body.*

The two remaining rural respondents indicated that physical enhancement can be mirrored in the practice of *ukuqiniswa,* which enhances strength through somatic methods. Rural Respondent 6 stated that:

> Most of the individuals who come to me for *ukuqiniswa* usually do so because they want to protect themselves from some kind of danger that they know they're going to be exposed to. Small incisions are made on the skin, and *umuthi* is applied to these cuts to seal the protection and ensure its effectiveness. Whether the person gets into a fight or people try to shoot at them, they will not die because some of the oils used in this type of *umuthi* are extracted from certain wild animals, which increases the person's strength and fighting ability and also tricks the vision of the opponent. *Ukuqiniswa* can also be performed on a child who is perceived to be vulnerable to illnesses to strengthen them physically and spiritually. It is also done to ensure that the child grows up strong, healthy, and spiritually protected.

Lastly, Rural Respondent 9 mentioned that:

> *Ukuqiniswa* is not only done to protect a person from harm and danger, but it also makes them more resilient against life's challenges and protects against witchcraft. It also enhances personal strength and fortune. There is also what we call *amabhande,* waist strings that are usually made for young men to enhance their

[12] A Zulu phrase, directly translated as "the berry of the waters" used to describe a dark-skinned beautiful girl.

> fighting abilities. However, I sometimes advise against the waist strings as they are too dangerous. When a person who wears them hits someone even once, that person's face will become deformed for a very long time, if not forever, and it can even blind them. It also gives you this urge to be violent.

When asked about cultural practices that align with cognitive enhancement, Rural Respondents 6 and 7 emphasized that enhancing cognitive abilities is only pursued after the child is born, due to the belief that while in the womb, the child's spirit resides in the spiritual realm. Rural Respondent 6 expressed that:

> Tampering with a child's natural development before they are born is seen as interfering with the ancestral plans of the child. If there are signs that the child is struggling intellectually, maybe they're not performing well in school, during consultations, I will connect with the child's ancestors, and they will tell me which *muthi* or *imbiza* should be used to enhance the child's brain. This is not simply a physical remedy, but a spiritual one as well, aimed at realigning the child with their intended path and unlocking the potential that might be spiritually or energetically blocked. After a short while, the child will have no trouble with their studies.

Rural Respondent 7 further shared a story illustrating that cognitive enhancement is approached holistically, based on the belief that the mind's potential is not separate from the body or spirit. Instead, it is something that can be nurtured and enhanced through ancestral guidance and traditional practices. He explained:

> There was a time when I was called to the hospital by the family of a client who seemed mentally disturbed. Upon arriving, my forefathers communicated with me, revealing that the client's ancestors did not want him to follow the medical route, as they had an important message for him. I shared this with the family, explaining that the traditional way of healing was necessary and that the IV drips being used were actually interfering with his spiritual balance, making him appear mentally unstable. Once the client was discharged, I prepared *imbiza*. After just a few days of treatment, the client's mental state improved dramatically. It wasn't just a recovery; his mind seemed sharper and more focused, as though the process had unlocked his true potential. In fact, I would say this experience enhanced him mentally. Since then, he has gone on to live an exceptionally successful life—he now resides in a luxurious home and owns several beautiful cars.

Lastly, Rural Respondent 9 indicated that:

> There are concoctions that we mix specifically for cognitive enhancement, but consultation is very important. Whether an individual or a family is seeking wealth and success, it's during the consultation that we ask uMvelinqangi to grant permission for ancestors to deliver these blessings. There is what we call *imithi emhlophe,* which are herbs that look white in colour, and we instruct the clients to use these during the day, taken orally or by bathing. Depending on how well they do that, they will start seeing a change.

Finally, the participants were asked to share any practices that align with the concept of designer babies. Rural Respondents 1 and 4 similarly emphasized that, due to their religious convictions, the idea of "designing" a baby solely revolves around practices such as seeking God's favour and guidance through prayer. Rural Respondent 1 mentioned that:

> I don't believe the process of ensuring a child's well-being and future success should go beyond the normal. Yes, there are those healthy foods and vegetables that can improve the baby's health and appearance, but that's about it, for me. As long as the child is taken to christening, I trust that uNkulunkulu takes care of the rest.

Rural Respondent 10 acknowledged that he was not aware of any specific cultural practices related to designer babies. However, he expressed an openness to integrating modern technology with faith. He stated that: *Just like other technologies that have been adopted over the years, if germline enhancement is used to alleviate sickness and is safe to use, then maybe that is also part of God's plan.* Furthermore, five rural respondents reiterated that herbal mixtures, whether ingested, used in baths, or applied through blade incisions, are vital for promoting health and well-being. Depending on the desired effect, these practices draw parallels to the concept of designer babies within the Zulu culture. Lastly, Rural Respondents 6 and 9 similarly referred to some of the cultural practices of gender selection as aligning with the concept of designer babies. Rural Respondent 9 explained that she begins by consulting the client's ancestors, after which she prepares *imbiza* for the woman to drink for them to conceive the desired gender. Rural Respondent 6 offered a different practice:

> If a woman previously had daughters and now the couple desires a boy for the next pregnancy, we take the umbilical cord of the previous child to *emsamo wakubomama*[13], mix it with umuthi, and ask the ancestors for a boy. Afterward, the

[13] The maternal ancestral shrine.

> umbilical cord is buried in the yard next to the door. Each time the woman steps over it, it increases the chances of her next pregnancy being a boy, and this practice often proves successful. The same approach is applied if the couple wishes to have twins.

5.6.2 The Urban Respondents' Views

When asked about cultural practices related to extending life expectancy, all the urban respondents stated that they were unaware of any specific Zulu practices directly aimed at increasing one's life span. Their responses highlighted the importance of maintaining a healthy lifestyle, including balanced diets and regular physical activity. Urban Respondent 3 specifically mentioned: *I don't believe there is any cultural practice that can extend their life expectancy. It is only achieved through self-care, regular checkups, and vaccines to prevent diseases like diabetes, which can shorten your lifespan.*

Regarding disease resistance, most of the responses emphasized modern healthcare practices as key to successful births and longevity. Urban Respondents 2, 5, and 8 mentioned *isihlambezo* as the most commonly used traditional medicine during pregnancy. However, they noted that instead of consulting traditional healers, they typically purchase it from herbal shops. Urban Respondents 2 and 8 discussed food taboos during pregnancy. They mentioned the belief that *consuming yellow and orange fruits and vegetables, such as oranges, papayas, mangoes, and butternuts, should be avoided as it is believed to increase the chances of a baby being born with jaundice.* Moreover, Urban Respondent 6 said: *Well, it's important to take prenatal advice seriously because many health issues affecting your baby are discovered there, like taking the correct dose of folic acid, omega-3, and ensuring immunizations are up to date, which also helps enhance cognitive development.* Lastly, Urban Respondent 9 stated that:

> Back home[14], it's common practice that when a child is born with deformities or an unexplained illness that doctors are unable to diagnose, the child is taken to a *sangoma*. Through consultations, the *sangoma* often provides a diagnosis and prescribes herbal medicines, which many believe lead to the child's healing.

For physical enhancement, six urban respondents indicated that they had no knowledge of any cultural practices that resembled physical enhancement. Most of the respondents mentioned modern interventions such as dietary supplements, bodybuilding supplements, and doping, all

[14] The university student indicated she's originally from Bergville.

of which are taken orally, as methods for enhancing physical performance. Again, Urban Respondents 2 and 8 similarly shared some of the recommended foods, stating that *pregnant women are encouraged to consume dairy products such as milk, sour milk, and yogurt for the baby to have a lighter complexion.* And that *eating fish is believed to make the baby fit. These are still widely held beliefs.* Lastly, Urban Respondents 5 and 9 both mentioned that *many people, especially young women, buy certain herbal concoctions from izangoma for vaginal tightening, and men also buy similar remedies to boost their sexual performance.*

When asked about practices that align with cognitive enhancement, five respondents mentioned oral supplements for pregnant women to support the baby's cognitive development, such as iron, zinc, folic acid, and omega-3 fatty acids. Urban Respondents 1, 5, and 9 mentioned the use of *imbiza,* which is ingested to increase cognitive abilities like prolonged concentration. According to Urban Respondent 5, *sometimes parents purchase imbiza from traditional healers for their school-going children.* Urban Respondent 9 shared that: *Back in high school, my friends and I once bought imbiza from a local sangoma after hearing rave reviews. It really clears brain fog and helps you concentrate longer compared to other supplements like Bioplus.* Additionally, Urban Respondent 2 noted that fish is believed to enhance not only a baby's physical fitness but also improve its cognitive development. Lastly, Urban Respondent 8 shared the following:

> I acknowledge that *izangoma* and *inyanga* are gifted with knowledge of *imithi* that have some sort of healing powers, even cognitive enhancement. A friend of mine is a *sangoma,* known for *ukugcaba* children; she is normally busy with this around exam times. It's one of the things she prides herself on.

Finally, when the participants were asked about cultural practices that relate to the concept of designer babies, most of the urban respondents expressed that they were unaware of any specific cultural practices that were parallel to designer babies, apart from prenatal care. Urban Respondent 1 mentioned that: *Even though there may be traditional methods, such as imbiza that people who believe in ancestors may use to enhance themselves, these are all done somatically, and they are mostly used to improve one's health.* Similarly, Urban Respondent 7 noted the following:

> UMvelinqangi and our ancestors play a crucial role in the design of each child. A baby enters the world embodying its intended characteristics and nature. It is only after birth that we closely observe the child's physical and mental development. If

> any concerns arise, we consult medical professionals to assess the situation. However, if no medical diagnosis is found, I would then consider traditional practices, as it would mean that whatever is bothering the child is spiritual.

Lastly, Urban Respondent 10 explicitly stated that:

> All that is currently available is for expectant mothers to get prenatal care, take all the essential vitamins, and prepare to invest in their child's future, but with such technological advancements, if proper regulations are put into place, I believe these innovations could gain traction, particularly if they're aimed at enhancing disease resistance and cognitive abilities.

5.6.3 Summary of Theme 5's Findings

The rural respondents' insights revealed that traditional Zulu practices, while not directly aligned with modern human germline enhancement, encompass a range of objectives that indirectly mirror aspects of genetic modification. Six respondents highlighted the role of traditional healers and herbal medicines, emphasizing that holistic healing and balance between the mental, physical, and spiritual are the focus of practices aimed at longevity rather than unnatural life extension. They mentioned the use of *umuthi*, or herbal mixtures, to enhance health, strength, and resistance to disease. For disease resistance**,** eight respondents noted that traditional herbal remedies like *isihlambezo* are used during pregnancy to promote maternal and child health. This highlights the concept of preparing children for resilience through natural means. Five respondents mentioned that there is a common belief that children should physically resemble their parents, particularly their fathers. This resemblance is seen as important for the child's recognition and protection by their ancestors.

Additionally, three respondents discussed beliefs surrounding certain foods that could influence physical traits, such as complexion. For lighter skin tones, a pregnant woman should consume plenty of cheese, milk, sour milk, and leafy vegetables to help the child develop a darker complexion. The rest mentioned practices, such as ukuqiniswa and the use of amabhande (waist strings) to strengthen physical and spiritual resilience, especially in vulnerable individuals; however, these practices are seen as protective rather than genetic alteration. On cognitive enhancement, three respondents noted that improving cognitive abilities is typically pursued after birth, emphasizing traditional ancestral guidance and herbal remedies like *imithi emhlophe*, which are believed to nurture the child's intended potential.

Furthermore, five respondents likened herbal remedies used for health and well-being to the concept of designer babies, suggesting that the selective use of *umuthi* could reflect some intentions of modern enhancement but within spiritual and ancestral bounds. Two described the alignment between faith, traditional practices, and the concept of desirable traits, whether physical or intellectual, are normally viewed as spiritually guided rather than controlled or determined by parental choices. Lastly, two respondents noted gender-selection practices as a subtle parallel to designing traits, though these are limited and reflect a strong belief in maintaining ancestral and spiritual integrity in child-rearing.

All urban respondents indicated that there were no specific Zulu practices directly focused on life extension; instead, they emphasized the role of a balanced lifestyle, with healthy eating and physical activity as key to longevity. For disease resistance, most participants emphasized modern healthcare practices for prenatal health and successful births. Three respondents mentioned *isihlambezo*, but noted it is often purchased from herbal shops rather than traditional healers. Two respondents also discussed food taboos in pregnancy, such as avoiding yellow and orange fruits to prevent jaundice. Regarding physical enhancement, six respondents mentioned modern interventions such as dietary and bodybuilding supplements, and doping, as methods for enhancing physical performance. Two respondents shared dietary recommendations, similar to those suggested by rural participants, with the addition of fish to promote the baby's health. Two respondents mentioned that herbal remedies for sexual performance are commonly sought after by men and women from traditional healers as a form of physical enhancement.

Five participants cited prenatal supplements, including iron, zinc, and omega-3, as modern aids for cognitive development. Additionally, three mentioned *imbiza* to improve concentration, often used by students. One respondent shared a personal story about using *imbiza* during exams to improve focus. Another respondent noted *ukugcaba*, a ritual practiced by a *sangoma* for enhancing children's focus, especially during exam times. Lastly, eight participants expressed no familiarity with cultural practices akin to designer babies apart from prenatal care as a way to promote the child's health. One respondent noted that they knew of traditional methods, such as *imbiza* that people use to enhance themselves traditionally; however, these are all done somatically, and they are mostly used as a way of improving one's health. One

respondent expressed a belief that divine and ancestral influences shape a child's traits, viewing interventions as mere remedies for health and cognitive issues that arise after birth.

5.7 Reflections Arising from the Fieldwork

Conducting the one-on-one interviews provided valuable insights into both participants' perspectives on human germline enhancement and my own role as a researcher working within a familiar cultural context. As a Zulu researcher interviewing Zulu participants, my insider status shaped both the opportunities and challenges during fieldwork. Several factors helped facilitate open dialogue: speaking in IsiZulu allowed participants to express cultural and ethical concepts more freely, and sharing the interview questions beforehand gave them time to reflect, seek clarification, or consult elders. This preparation was especially important given the technical and unfamiliar nature of human germline enhancement. Their preparedness contributed to richer, more thoughtful responses during the actual sessions.

Cultural norms also shaped how the interviews unfolded. When engaging senior community members and traditional healers, I had to be attentive to culturally appropriate forms of address, ensuring that I addressed them with the same respect and titles used by community members. In some interviews, participants preferred to begin by explaining their lineage, community roles, or experiences with traditional healing before directly answering the interview questions. Allowing space for these contextual introductions not only showed respect but also provided deeper insights into the ethical frameworks guiding their beliefs.

One of the most significant turning points in the fieldwork came after the first round of interviews. When I began analysing the data, it became evident that many of the respondents did not directly address the research questions, particularly those relating to specific Zulu cultural practices that mirror aspects of human germline enhancement. Some participants openly stated during the interviews that they were uncertain about the specialised nature of certain practices. Therefore, several respondents suggested that I consult well-known traditional healers in the Mbonomuhle community who possessed deeper knowledge of such practices. Acting on this guidance, I scheduled a second round of one-on-one interviews, which proved far more productive in addressing the aims of the study.

The insights gained during these subsequent interviews were unexpected and significant. I found specific practices to be very interesting. For example, the use of oils extracted from

animals, such as the black mamba and tortoise, to promote longevity, practices that, conceptually, parallel germline enhancement's pursuit of extended life expectancy. I also learned about the cultural practices involving gender selection, such as mixing an infant's umbilical cord with *umuthi* and burying it at the maternal home, asking for the ancestors to influence the gender of the next child. The same practice is performed when parents desire twins. Although I had heard about similar traditions before, I had often assumed that their descriptions were exaggerated. Hearing consistent accounts from respected traditional healers and community elders, and learning about their perceived success, broadened my appreciation for the sophistication and cultural logic underpinning these practices.

Another unexpected finding was the level of support, particularly among rural respondents, for germline enhancement when directed at preventing disease. I initially assumed that rural participants would be more sceptical because of the emerging nature of the technology. Instead, many viewed it as a potential means of strengthening community health, provided that it aligned with ancestral values, such as seeking ancestral guidance, and avoided altering natural heredity for nonessential reasons. Their openness challenged my assumptions about how traditional communities engage with biomedical innovation.

Insights from urban respondents further complicated these expectations. Although this group was purposively selected for their cosmopolitan and modern perspectives, several participants demonstrated a deep familiarity with cultural and spiritual beliefs that I had anticipated would be more pronounced in rural settings. For example, some urban participants described the belief that ancestors protect a child while still in the womb, shaping family understanding of pregnancy and early life. Others spoke about the continued use of *isihlambezo* during pregnancy, not only for general well-being but specifically to enhance the unborn child's disease resistance. I had previously assumed that such practices were largely rural, discovering their prevalence in urban areas broadened my understanding of how cultural knowledge persists across different contexts. These insights highlight that urbanisation does not necessarily diminish the relevance of traditional practices and enrich the comparative analysis by revealing meaningful continuities between the two groups.

There were moments in the analysis phase where organizing the data into themes proved challenging, especially because many of the responses overlapped across cultural, ethical, and ontological components. Referring back to the interview schedule and the aims of the study

helped me maintain clarity and coherence. Despite these challenges, the thematic structure ultimately reflected the complexity of the participants' worldviews.

Overall, the fieldwork deepened my understanding of the ethical, cultural, and spiritual frameworks through which Zulu people interpret new biotechnologies. It also revealed the importance of humility, cultural sensitivity, and methodological flexibility in qualitative research. The reflections gained through these interviews strengthened the rigor and credibility of the study by allowing me to critically examine how my positionality, decisions, and adaptations shaped the data collection and interpretation process.

5.8 Conclusion

This chapter presented the primary data obtained from the one-on-one interviews. The findings were organised into five themes: 1. Applications of germline enhancement, 2. Safety and efficacy concerns, 3. The impact of parental genetic choices on future generations, 4. Socio-cultural and religious implications, and 5. The parallels between Zulu cultural practices and human germline enhancement. For each theme, the perspectives of the two respondent groups (rural and urban) were discussed in separate sub-sections. Under the first theme, rural respondents generally supported germline enhancement when used to prevent disease, and some perceived it as a means to strengthen community health. However, they expressed caution toward applications related to aesthetics or cognitive enhancement, noting that such uses might conflict with traditional values and disrupt natural traits inherited through ancestry. In contrast, urban respondents were more receptive to a broader range of applications, including those extending beyond disease resistance. Their views tended to emphasize scientific and technological advancement while still acknowledging the need for ethical oversight.

Under the second theme, rural respondents expressed high levels of caution regarding the potential adverse effects of germline technologies, including long-term off-target impacts that might be difficult to reverse. The safety issues raised were closely tied to spiritual beliefs, with many feeling that any interference with natural genetics could result in spiritual consequences, such as a disruption in ancestral protection and blessing. The urban respondents expressed similar safety concerns, but they were more open to trusting scientific advancements, provided that rigorous testing and ethical standards were upheld. They believed that societal acceptance of germline technologies would depend heavily on clear, transparent communication regarding

their safety. Some felt that robust regulations and ongoing research could eventually reassure the public about the technology's efficiency and reliability.

For the third theme, the rural participants expressed concerns that parental decisions around germline enhancement could restrict the autonomy and individuality of future generations, shaping children to meet parental expectations rather than fostering their unique identities and talents. Most felt that altering genetics for future generations exceeded parental authority and bordered on interference with the spiritual realm. Urban participants shared similar concerns, noting that an emphasis on creating flawless children could reduce natural diversity and lead to unintended social hierarchies that favour enhanced traits over natural ones. However, they believed that, with proper guidelines, parental choices aimed at improving health could ultimately benefit future generations.

Regarding the fourth theme, rural respondents highlighted that germline enhancement could have profound socio-cultural and religious impacts, potentially threatening Zulu values, beliefs, and ancestral practices. Their main concern was that such technology might diminish reliance on traditional spiritual practices and alter the sanctity of life as viewed within their cultural framework. Urban respondents acknowledged these implications but were more open to adapting cultural practices to accommodate certain advancements. However, they noted the potential for societal tension if genetic modification technology were not approached with cultural sensitivity.

On the last theme, the rural respondents identified limited parallels between Zulu cultural practices and the concept of germline enhancement. They viewed practices such as *ukugcaba* for strength and the use of *isihlambezo* as aligned with natural health maintenance rather than enhancement. They believed that while there are some similarities in health objectives, germline enhancement does not fully align with Zulu cultural practices, as it disrupts the natural order upheld by tradition. The urban respondents acknowledged that cultural practices involving preventive health reflect some objectives of germline enhancement but believed that altering fundamental traits could conflict with Zulu ideals of inherited identity and ancestral legacy.

The next chapter discusses and interprets the findings in relation to the literature review and theoretical framework, laying the foundation for establishing an African ethical perspective on human genetic enhancement.

CHAPTER SIX
DISCUSSION AND ANALYSIS OF FINDINGS

6.0 Introduction

The previous chapter presented the study's findings from one-on-one interviews with the rural and urban respondents, highlighting the similarities and differences in their ethical and cultural perspectives on human germline enhancement technologies. These findings were organized around key themes emerging from the respondents' insights and broader ethical debates commonly associated with germline enhancement. The current chapter offers a comprehensive discussion and analysis of the findings in relation to existing literature and the theoretical frameworks guiding this research. By applying the ethical framework of Principlism and the theory of African Communitarian Ethics introduced in Chapter Three, the chapter explores the primary implications of the collected data and assesses whether the findings support or challenge established theories and literature on human germline enhancement.

This chapter will apply Principlism to critically evaluate the ethical concerns and perspectives expressed by the participants, using its four guiding principles: autonomy, beneficence, non-maleficence, and justice. These principles will provide a structured means to assess whether the participants' views align with established ethical standards in healthcare and biomedical innovation. In addition, African Communitarian Ethics will be employed as a descriptive tool for interpreting the participants' moral attitudes and ethical considerations surrounding germline enhancement in the Zulu cultural context. By combining these two ethical frameworks, this chapter aims to provide a comprehensive and context-sensitive analysis of the findings, highlighting both their biomedical implications and their relationship, whether aligned or in conflict, with Zulu moral philosophy.

6.1 An Ethical Analysis of Human Germline Enhancement Through Principlism

As discussed in Chapter Three, principlism provides a systematic approach to addressing ethical challenges in healthcare. Since human germline enhancement is still largely in the experimental phase (Visscher et al., 2025: 638), principlism's flexibility and focus on case-by-case evaluation through each principle make it particularly useful for analysing the potential risks, benefits, and justice considerations in a context where long-term effects remain uncertain. Human germline enhancement raises ethical questions beyond cultural specificity, including

concerns about consent, potential harm, fairness, and the appropriate limits of human intervention in biology. Therefore, principlism offers a clear set of ethical criteria to evaluate these issues across various contexts, including the context of the Zulu people of South Africa.

This section of the analysis focuses on a balanced evaluation of individual and parental rights, broader societal impacts, and the long-term consequences of such technologies. It explores key concerns identified in the findings, including the lack of autonomous decision-making, potential misuse, off-target effects, and long-term harms. Additional concerns include the risk of physical deformities that could lead to psychological distress, the emergence of genetic privileges that may exacerbate social inequalities, and threats to individuality, genetic diversity, and fundamental Zulu cultural traditions. Finally, the analysis discusses the concerns regarding social stratification and marginalization that may arise from germline enhancement. Since principlism is a framework that encourages decision-making based on weighing risks and benefits, this analysis will also briefly explore the benefits that the participants mentioned regarding communal well-being and potential societal advancement.

6.1.1 Lack of Autonomous Decision-Making

The findings indicate that all the rural respondents and six urban respondents had no prior knowledge of germline enhancement[15]. The remaining four urban respondents reported some familiarity with concepts related to germline enhancement, citing sources such as articles, videos, and even science-fiction movies that covered topics like cloning and the use of IVF for twins. This lack of knowledge suggests that their ability to make informed and autonomous decisions is compromised. Without adequate understanding, individuals cannot fully grasp the potential risks, benefits, or ethical implications of these technologies, which undermines the validity of their consent.

The relative novelty of germline enhancement is a significant factor contributing to the lack of knowledge among the participants. This presents a considerable challenge to respecting autonomy. According to Beauchamp and Childress (2001: 58), respect for autonomy involves respecting an individual's capacity to make informed and voluntary choices regarding their body and life (see page 59). This perspective aligns with Archard's (2008: 5) argument that, to

[15] See pages 96 and 97.

uphold autonomy in the biomedical field, there is an ethical responsibility to provide robust scientific evidence about all aspects of the innovation in question (see page 81). The findings reveal that the principle of autonomy is closely linked to the safety and efficacy concerns raised, including potential misuse, off-target effects, and long-term consequences of germline enhancement, since the reliability and risk assessment of these technologies directly impact individuals' ability to make informed ethical choices. These safety concerns are further examined under the subsequent principles.

6.1.2 Potential Misuse, Off-targets, and Long-Term Harm

Concerns about potential misuse emerged as a significant issue during the interviews. Four participants[16] highlighted that enhancements that go beyond therapeutic purposes could exacerbate harmful stereotypes. For example, Rural Respondent 1 expressed concerns that people might pursue enhancements excessively to stand out in society. She stated: *enhancements could be used not just for medical purposes but to create physical or intellectual advantages that could deepen societal inequalities…because people might pursue extreme modifications in a bid to stand out.* Similarly, three urban respondents[17] expressed concerns that non-therapeutic applications of the technology might cater to superficial desires, leading to the commodification of natural human traits. As stated by Beauchamp and Childress (1994: 260), evaluating the misuse of germline enhancement against the principle of beneficence requires examining how such actions align or conflict with the moral duty to advance good and prevent harm (see page 83). According to the findings, germline enhancement has the potential to be misused, presenting serious risks that may lead to widespread harm and undermine its intended goal of improving human health and well-being. When germline enhancement is permitted for non-therapeutic reasons, it violates the principle of beneficence because it prioritizes individual desires, such as increased intelligence or aesthetic preferences, over the collective well-being of society.

Five respondents specifically mentioned issues related to off-target effects, while seven expressed concerns about the long-term consequences of germline enhancement[18]. Some of the

[16] The four respondents consist of one rural and three urban respondents. See pages 101-102.
[17] Urban Respondents 2,3, and 6. See page 102.
[18] Three rural and two urban respondents, while the remaining seven consist of five rural and two urban respondents. See pages 101-103.

identified off-target issues included the risk of causing unintended and irreversible genetic alterations that could result in disfigurement, doubts about the feasibility of attaining absolute precision, and the challenge of fully understanding human genetics. The long-term consequences raised concerns about the possibility of transferring these changes to subsequent generations, the emergence of unforeseen health problems, and the societal impact of radically altering human traits. These issues demonstrate the participants' apprehension regarding the long-term implications of germline enhancements, their potential to permanently alter future generations, and the delicate balance between human biology and society.

The possibility of unintended harm or disfigurement directly contradicts the principle of beneficence, as such outcomes fail to reduce suffering and instead introduce new challenges. Additionally, when attempted enhancements do not deliver desired traits or ensure precise outcomes, trust in the technology diminishes, and the purpose of promoting well-being is compromised. This lack of effectiveness violates the principle of beneficence by exposing individuals to risks without any tangible benefit. In this context, the risk of harm outweighs the potential benefits. Kenneth Iserson (1999: 43) argues that in biomedical ethics, beneficence requires physicians to take actions that ensure a reasonable certainty of positive outcomes while prioritizing the minimization of harm (see page 79). Since this assurance is lacking in the current case of germline enhancement, proceeding with such procedures would violate this principle.

When considering the long-term consequences of making permanent genetic alterations, it is crucial to recognize that doing so without a complete understanding of their impacts could inadvertently harm future generations. Since beneficence emphasizes the prevention of harm, it is important to exercise extreme caution when implementing these modifications to avoid unintended consequences. Furthermore, Iserson (1999: 43) also argues that physicians must carefully weigh the potential benefits to the patient against the risks involved. Therefore, if there is the possibility of unforeseen health problems, the principle of beneficence calls for a thorough assessment to ensure that interventions do not create more harm than they prevent.

The potential risks associated with germline enhancement highlight the need for cautious deliberation before implementing such technologies in clinical practice. However, the principle of beneficence also necessitates an evaluation of the potential benefits. If developed responsibly and applied ethically, these technologies could address critical medical challenges, such as eliminating hereditary diseases, alleviating suffering, and exploring new healthcare

opportunities. This perspective is supported by the work of David DeGrazia (2005), Christian Coenen et al. (2009), and Thomas Douglas (2008) in Chapter Two of this study (see page 81). Thus, most participants began by acknowledging these potential benefits and their implications for broader society before mentioning the above concerns. Twelve respondents expressed a strong interest in the application of disease resistance, emphasizing its practical and life-saving advantages, which could potentially reduce reliance on healthcare infrastructure and also reduce medical expenses. Additionally, seven respondents highlighted the value of cognitive enhancement, believing it could improve the nation's prospects of achieving first-world status, enhance financial stability, and boost problem-solving and decision-making skills[19]. Ultimately, they argued that this could lead to innovations that benefit society and improve the overall quality of life.

From a beneficence standpoint, germline enhancement can be seen as ethically beneficial as it aims to promote the well-being of individuals and society. However, an ethical question arises: does enhancement beyond therapeutic uses, such as increased intelligence, enhanced physical ability, or extended life expectancy, truly benefit individuals and society? Or could it potentially shift societal values and harm social cohesion? The goal of creating a healthier, more capable human population aligns with the principle of beneficence, as it seeks to promote the greatest good for future individuals. Nevertheless, as noted by Iserson (1999: 43), after weighing the potential benefits against the risks, the challenge provided by these imperatives lies in determining when it is acceptable to pursue certain benefits despite the associated risks, and when the dangers involved justify forgoing those benefits (see page 83).

6.1.3 Risk of Physical Deformities and Psychological Distress

While beneficence focuses on assessing and prioritizing treatments that maximize benefits, non-maleficence functions as a fundamental safeguard that prohibits actions causing pain, suffering, incapacitation, or the deprivation of life's natural benefits (Beauchamp and Childress, 1994: 260). When considering the potential misuse of the technology, off-target effects, and long-term consequences through the lens of non-maleficence, these concerns highlight the current ethical and practical limitations of the technology. This is especially important, given the significant risk of widespread and irreversible harm.

[19] The twelve respondents consist of two rural and ten urban respondents, while the seven respondents consist of two rural and five urban respondents. See pages 96-99.

As aforementioned, the misuse of germline enhancement technologies for non-essential or superficial purposes reduces human traits to commodities. Additionally, off-target effects can lead to physical deformities, causing psychological distress for the parents along with the affected individual, and exacerbation of social inequalities. Unforeseen genetic complications could have irreversible consequences for future generations, directly conflicting with the principle of non-maleficence by exposing individuals to unnecessary harm and long-term uncertainty. Non-maleficence emphasizes the importance of avoiding harm over potential speculative benefits, particularly when there is a risk of significant and irreversible harm. Therefore, until germline enhancement technology is reliable enough to ensure minimal risks, its pursuit remains ethically problematic according to this principle.

6.1.4 Encourages Genetic Privilege and Widens Social Inequalities

Four respondents[20] expressed concerns that if germline enhancements were utilized for physical or intellectual advantages, they might only be accessible to privileged groups. For instance, Urban Respondent 3 pointed out that*…if wealthier families have access to enhancements, it could lead to inequality, with those unable to afford these modifications facing discrimination.* This exclusivity poses a risk of reinforcing systemic social disparities, further marginalizing individuals who cannot afford or access these technologies. Evaluating these concerns through the principle of justice involves analysing the fairness, equity, and distribution of risks and benefits across society and future generations. Beauchamp and Childress (1994: 330) emphasize the importance of implementing reasonable, non-exploitative, and well-considered procedures to ensure fairness (see page 86). This principle requires that the costs and benefits of advancements in biotechnologies are equitably shared among all stakeholders. Additionally, it aims to prevent the exploitation of vulnerable populations and ensure that no group bears an undue burden or is unjustly excluded from potential benefits. The unequal distribution of enhancements, combined with the entrenchment of societal stereotypes, would violate the principle of justice by unfairly favouring certain individuals while undermining equity and the collective well-being of society.

[20] Two rural and two urban respondents. See pages 115 and 117.

Furthermore, future generations and other vulnerable people who may not fully understand or consent to the risks involved in germline enhancement can be disproportionately affected by unintended alterations. This uneven distribution of harm violates the principle of justice, especially since those most affected often cannot advocate for themselves. The fact that results cannot be guaranteed, combined with the potential for harm, raises significant concerns for those who invest their resources and trust in this technology, particularly when they face irreversible consequences. Moreover, the uncertainty surrounding the accuracy of these technologies undermines fairness, as off-target effects can result in lifelong suffering for some individuals, particularly those without access to reparative measures or healthcare systems that can treat such issues. Finally, unforeseen health problems can also disproportionately affect less affluent populations, who may lack access to advanced medical care or effective mitigation strategies. This situation deepens existing health inequities and further violates the principle of justice, which demands equitable access to health protections.

6.1.5 Threats to Individuality, Genetic Diversity, and Cultural Practices

Three respondents[21] raised concerns that germline enhancement would restrict the individuality and autonomy of future generations, thereby undermining personal agency. They argued that pre-selecting genetic traits might foster a deterministic view of a child's identity, in which children are shaped to meet their parents' aspirations or societal expectations, rather than being allowed to develop their unique talents and capabilities. Such practices could hinder a child's natural growth, self-discovery, and personal development. For example, Rural Respondent 7 stated, *Genetic modifications undermine the value of everyone having a say in their own lives and developing their unique gifts and talents. So, directly altering someone's genetics based on what you, as the parent, believe is important ultimately diminishes this intrinsic value*. While parental autonomy may justify some applications of germline enhancement, the lack of consent from future generations presents a significant ethical challenge. This concern aligns with Iserson's (1999: 43) argument of the two ethical convictions encompassed by the principle of autonomy (see page 79). These convictions emphasize the importance of recognizing and valuing an individual's autonomy by respecting their choices and not interfering with their actions unless they pose a risk of harm to others. Additionally, they highlight the ethical obligation to protect individuals with diminished autonomy, and the level of that protection

[21] Two rural respondents (5 and 7) and Urban Respondent 5. See pages 101 and 109.

should be determined by the potential risk of harm and how likely they are to benefit from that action (Iserson, 1999).

Beauchamp and Childress (1979: 58) further stress that moral decision-making inherently assumes that rational agents are capable of making informed, voluntary choices, as well as acting with intent. This highlights the importance of allowing individuals to make deliberate and thoughtful decisions that reflect their autonomy (see page 80). The tension arises because, as the ultimate recipient of these decisions, the child has no say in their genetic modifications. Moreover, as Cavaliere et al. (2019: 80) point out, this ethical dilemma often polarizes opinions, particularly between transhumanists, who advocate for advancing human capabilities, and bioconservatives, who caution against altering natural processes (see page 125). This debate highlights the difficulty of balancing parental reproductive rights with the autonomy of unborn individuals. The findings reinforce this polarization, emphasizing the conflict between respecting parental decision-making and safeguarding children's future autonomy and individuality. Striking this balance is crucial to ensuring that germline enhancement technologies are applied ethically and responsibly.

Another issue raised by four urban respondents regarding the potential long-term effects of germline enhancement was the loss of genetic diversity and homogenization of traits[22]. These participants argued that genetic diversity is not only crucial to humanity's biological adaptability and resilience but also fundamental to the cultural and personal uniqueness that defines human identity. The reduction of this diversity raises ethical questions about the value of human life and the boundaries of parental control. According to these participants, there is no guarantee that a child will grow up to embody or utilize the traits chosen by their parents. This misalignment between parental aspirations and a child's self-determination highlights the ethical tension between guiding a child's development and imposing control over their genetic makeup. From the perspective of autonomy, the respondents, echoing the views of bioconservatives, advocate for a balance that respects natural processes and protects the agency of future generations (Cavaliere et al., 2019: 80). According to Ishii and Beriain (2019: 371), the homogenization of traits through germline enhancement presents a dual peril: it not only

[22] See page 108.

reduces the genetic richness of humanity but also infringes on the autonomy of those who will bear the consequences of decisions made without their consent (see page 56).

Regarding the two issues mentioned above, David Archard (2008: 5), as discussed in Chapter Three, distinguishes between two types of genetic enhancements, namely directed and all-purpose. The key difference lies in their specific objectives and the scope of modifications (see page 81). Directed enhancement focuses on specific traits or abilities that parents or society deem desirable while all-purpose enhancement pertains to traits or capabilities that can benefit an individual in various aspects of life, which in turn, increases an individual's autonomy (Archard, 2008: 5). A response from Rural Respondent 5 reflects a similar sentiment, arguing that selecting specific traits can be detrimental because it imposes limitations on the child's autonomy. She stated that *choosing specific traits for a child can be harmful. It's like turning the child into a robot to fit someone's agenda…*. Therefore, Archard posits that once the type of enhancement is clearly defined, be it directed or all-purpose, it becomes relatively straightforward to determine whether it infringes upon human autonomy.

The final issue, raised by two rural participants, highlighted significant concerns that parents engaging in germline enhancement could undermine fundamental beliefs about family and cultural traditions within the Zulu community. This concern was further emphasized by five other rural respondents under theme 5[23]. The central concern is that such actions may defy deeply held Zulu values and beliefs regarding the vital role of ancestors in guiding and protecting future generations. This disruption could metaphorically "kill" the bond with their ancestors, threatening the spiritual and cultural ties that are vital to Zulu identity. Genetic traits such as the shape of a child's eyes, ears, or nose play an essential role in the cultural practice of *ukubikwa kwesisu*[24]. Weakening the cultural processes that affirm identity and belonging. Further cultural and religious issues will be discussed under African communitarian ethics.

While autonomy, as outlined by Cavaliere et al. (2019: 80), supports the belief that parents should determine what is best for their children (see page 28), it is crucial to recognize that embracing germline enhancement technologies could jeopardize cultural identities and the unique traits that define families and communities, particularly within the African context.

[23] See pages 106 and 120.
[24] See page 107.

Such choices may unintentionally weaken the natural connection between future generations and their ancestors, threatening their sense of belonging and cultural heritage. In this context, autonomy must balance individual choice with the preservation of culture and respect for ancestry. It is important to ensure that personal freedoms do not undermine deeply rooted traditional practices and identities. These concerns highlight the need to respect the broader social and cultural frameworks that shape individual and collective identities, ensuring that genetic choices align with the values of the community.

6.1.6 Determinism, Genetic Homogenization, and the Potential Disruption to Cultural Beliefs

The first issue raised by the participants regarding the potential impacts of parental choices was the concern that germline enhancement could foster a deterministic view of a child's identity. One significant harm that may result from this is psychological distress, as children might feel compelled to align with aspirations imposed upon them. Beauchamp and Childress (1994) highlighted that non-maleficence acts as a threshold in bioethics, ruling out any intervention that causes more harm than good. Applying this principle to germline enhancement suggests that interventions should focus on improving health and well-being without incorporating traits linked to external expectations, such as non-essential physical or cognitive enhancements. By prioritizing eliminating genetic diseases and addressing health-related issues, the technology can minimize potential harm, reduce the psychological burden on children, and protect their individuality. This ensures that technological advancements serve the best interests of future generations, upholding their right to self-determination.

The second issue the participants raised was the potential loss of genetic diversity due to parents pre-selecting similar traits for their children, which could lead to the homogenization of traits. Genetic diversity is vital for humanity's adaptability, resilience, and cultural uniqueness. Given the severity of this potential harm, the principle of non-maleficence would again caution against interventions that lack significant health-related benefits. On the other hand, targeted genetic enhancements, such as increasing resistance to specific genetic diseases, could strengthen resilience without necessarily diminishing diversity. Therefore, non-maleficence emphasizes the importance of applying germline enhancements with caution. The focus should be on preserving both biological and cultural diversity for the benefit of future generations.

The final concern raised was that when parents pre-select genetic traits for their children, these choices could unintentionally disrupt cultural practices and traditions that put emphasis on ancestral ties, spiritual connections, and communal identity. Such disruptions could lead to cultural, social, and spiritual harm, particularly in communities where these values are integral to well-being, such as the Zulu community. Applying the principle of non-maleficence to this issue suggests that germline enhancements should be sensitive to cultural and spiritual values that shape familial and community life. Interventions that risk severing connections or eroding cultural identity should be avoided. Instead, germline enhancement should prioritize the preservation of health and well-being. This approach ensures that parental choices do not impose harm by disregarding deeply rooted traditions, and it highlights the ethical imperative of designing technologies that align with cultural values, fostering both individual and communal well-being.

6.1.7 Potential Communal Well-being and Societal Advancement

The findings reveal the complex ethical landscape of germline enhancement, highlighting the potential negative impacts of parental genetic choices. However, as previously stated, the principle of beneficence not only supports the pursuit of actions that maximize benefits and minimize harm but also requires a careful evaluation of potential harms versus benefits before any action can be deemed ethically justified (Beauchamp and Childress, 1994: 260). Notably, several participants expressed a positive outlook on the potential benefits of parental genetic choices.

Five participants[25] expressed the belief that actively equipping future generations with advantageous genetic traits could better prepare them for upcoming challenges and opportunities, potentially resulting in enhanced quality of life and societal benefits. They suggested that this practice could be viewed as an extension of parental responsibilities, similar to decisions made in areas such as education and healthcare. However, they emphasized the importance of focusing such genetic enhancements on meaningful outcomes such as health and cognitive abilities, rather than superficial or frivolous traits. The participants further highlighted that society already relies heavily on technological solutions. Rural Respondent 10 compared germline enhancement to widely accepted health interventions, such as vaccines, highlighting its perceived inevitability and the importance of embracing innovations to improve

[25] One rural respondent and four urban respondents. See page 108.

human well-being. This perspective frames germline enhancement as a natural progression in the ongoing integration of technology to improve quality of life.

From the perspective of beneficence, germline enhancement has the potential to significantly promote well-being by reducing suffering, preventing genetic diseases, and increasing opportunities for success. However, these potential benefits must be carefully weighed against the risks, such as unintended consequences and societal inequities. When the enhancements are focused on meaningful outcomes, this aligns with the principle of beneficence by aiming to improve quality of life, promote future generations' longevity, and minimize the risk of misusing technology. As posited by Beauchamp and Childress (1994), the concepts of specific and general beneficence are differentiated based on the relationships and moral obligations involved in assessing the potential benefits of an action (see page 69). They define specific beneficence as obligations directed toward individuals with whom we share close relationships, whereas general beneficence refers to broader, universal obligations to benefit society as a whole. For instance, equipping future generations with advantageous genetic traits to promote collective well-being, coupled with the view that germline enhancement is a technological solution to alleviating human suffering, aligns with general beneficence, as it supports actions aimed at improving societal well-being.

Meanwhile, participants who view germline enhancement as an extension of parental responsibilities support the concept of specific beneficence, emphasizing actions that prioritize the best possible benefits for their children. This further aligns with Julian Savulescu's (2001: 1) concept of procreative beneficence, which argues that during the preimplantation stage, parents have a moral obligation to select the child expected to have the best life (see page 50). This approach shifts the focus from merely preventing diseases to enhancing traits that could contribute to a "good life", such as intelligence, increased life expectancy, and overall health.

When evaluated through the principle of beneficence, the pre-selection of genetic traits raises significant ethical concerns. This principle supports germline enhancement as a way to improve health or alleviate suffering. However, designing children to meet parental or societal aspirations poses risks of psychological harm. Such deterministic approaches may pressure children to conform to predefined expectations, hindering their ability to explore their individuality and develop freely. Beneficence prioritizes well-being by fostering an environment that encourages self-discovery and personal growth rather than imposing

predetermined traits. By prioritizing the holistic development of children, the principle of beneficence promotes actions that nurture their autonomy and emotional well-being.

Furthermore, when considering the potential loss of genetic diversity and the resulting homogenization of traits through the lens of beneficence, it becomes clear that preserving genetic diversity is crucial for both individual and collective well-being. This perspective aligns with Beauchamp and Childress' (2019: 10) explanation of beneficence as a principle that promotes the well-being of both individual patients and society as a whole (see page 83). In contrast, a decline in diversity can increase vulnerability to unforeseen challenges, such as emerging diseases, and weaken societal resilience. Therefore, the principle of beneficence advocates for cautious approaches that promote health and well-being while safeguarding natural diversity. This ensures humanity's ability to adapt and thrive in an unpredictable future.

Interpreting the participants' perspectives through the principle of beneficence highlights the need to balance parental duties in ensuring their children thrive in specific environments and professions, with considerations of how genetic enhancements might affect their children's individuality and connection to cultural values. Additionally, considering societal well-being is crucial for a thorough ethical evaluation of both the immediate and long-term impacts of germline enhancement technologies.

6.1.8 Social Stratification and Marginalization

The majority of the rural and urban respondents acknowledged that while germline enhancement presents numerous opportunities to improve humanity's quality of life, it also raises significant concerns about fairness, accessibility, and the potential for exacerbating social inequalities. Four respondents[26] specifically cautioned that allowing parents to select their children's genetic traits could deepen existing socioeconomic disparities and create new forms of social stratification where genetically enhanced individuals might be perceived as superior, leading to divisions based on genetic traits. For example, Urban Respondent 4 stated, *If widespread adoption of this technology occurs, it could undermine human dignity by creating a society where those who can afford enhancements may be seen as superior while others may be "downgraded"...They might even feel or be seen as inferior.* According to Beauchamp and Childress (1994: 330), the focus on the fair allocation of resources, benefits, and burdens

[26] Two rural and two urban respondents. See pages 115 and 117.

among members of society (see page 86). Applying this principle to germline enhancement technologies emphasizes the importance of ensuring equitable access to prevent these advancements from widening social and economic divides.

The issue of unenhanced individuals being viewed as inferior or different and potentially facing bullying, discrimination, or marginalization raises significant justice concerns because this risks creating a two-tiered system where an individual's worth is judged based on their genetic makeup. As Andoh (2017: 43) cautions, unequal access to germline enhancement technologies risks fostering genetic classism and eugenics (see page 59). Evaluating this issue through the lens of justice highlights the need to protect the dignity and rights of all individuals, ensuring that societal values do not promote exclusion or stigmatization based on genetic characteristics.

In effect, the findings indicate that evaluating human germline enhancement through the lens of principlism faces significant ethical challenges. These include the lack of autonomous decision-making by the enhanced individuals, the potential misuse of the technology, off-target effects, and the unknown long-term harm to these individuals. The risk of physical deformities and psychological distress that could result from these deformities may affect both the parents and the enhanced individuals. Additionally, the participants expressed concerns that germline enhancement could lead to genetic privilege, further exacerbating social inequalities and marginalization.

Furthermore, the findings suggest that germline enhancement could potentially threaten the individuality of those who are enhanced, due to genetic determinism. It may also pose risks to genetic diversity and cultural traditions central to the Zulu people's identity. However, germline enhancement could also offer opportunities for societal advancement, which could improve communal well-being. While the potential benefits, such as eradicating diseases and promoting societal progress, are compelling reasons for further research, the associated risks, particularly those related to unforeseen long-term consequences, highlight the need for cautious and regulated implementation.

The findings are consistent with existing literature, addressing well-established concerns related to autonomy, beneficence, non-maleficence, and justice. Additionally, they expand the discussion by introducing cultural considerations pertinent to African communities, adding an important layer of ethical complexity that is often underrepresented in broader debates but is

essential for the ethical application of such technologies in diverse sociocultural contexts. In its current form, the findings suggest that germline enhancement does not meet the ethical standards established by principlism. The risks inherent in this technology, especially those that could lead to significant societal and personal harm, outweigh its potential benefits. This highlights the necessity for rigorous safeguards before considering its widespread application.

6.2 An Ethical Analysis of Human Germline Enhancement Through the Lens of African Communitarian Ethics

The previous section outlined a structured bioethical evaluation of the implications of human germline enhancement technologies. It analysed the study's findings through the four foundational principles of principlism. This analysis identified areas where germline enhancement aligns with ethical standards while highlighting potential conflicts that need to be addressed to achieve moral acceptability. The section below presents a critical ethical analysis of the findings, using the perspective of African Communitarian Ethics.

In this chapter, the study uses African Communitarian Ethics as a descriptive tool for understanding how traditional Zulu worldviews and moral values inform perspectives on human germline enhancement. This ethical theory is particularly relevant for explaining the ethical boundaries and culturally acceptable uses of germline enhancement technologies within the Zulu community. Furthermore, it offers insight into how they may respond to the potential social changes presented by germline enhancement. Through the lens of African Communitarian Ethics, the participants raised several concerns. These include perceived threats to personhood and human dignity, potential disruption of ancestral connections, challenges to the spiritual duality of the Zulu people, conflicts with Christian understandings of life and creation, and threats to cultural and religious obligations. Finally, the chapter discusses the participants' Afrofuturistic views.

6.2.1 Threats to Personhood and Human Dignity

Six participants expressed concerns about the connection between human germline enhancement and the African communitarian concept of personhood[27]. They fear that these interventions could undermine human dignity by reducing individuals to mere products of

[27] See pages 111-115.

design, rather than beings shaped by ancestral heritage and communal relationships. Rural Respondent 5 specifically noted that a child's genetic makeup might be perceived not as a natural gift from ancestors, but as a "human-modified creation". This perspective resonates with the argument made by Isa and Safian-Shuri (2018: 118), who cautioned that genetic enhancement could undermine the dignity of enhanced individuals, suggesting that manipulating the human genome for desired traits may reduce procreation to mere manufacturing (see page 60). As a result, the moral status and rights of enhanced humans may be violated as they could be perceived not as fully human, but as desired products. This concern intersects with Menkiti's (1984: 171) conception of personhood, which he argues is not an automatic status conferred at birth but a moral achievement gradually earned through participation in communal life (see page 92). This view directly opposes the logic behind germline enhancement, which assumes personhood can be improved or perfected through genetic modification. According to the participants, designing a person in advance treats them as a finished "product" rather than beings who develop their dignity through communal relationships and ethical behaviour.

Furthermore, Akpa-Inyang and Chima (2021: 3) define personhood as being rooted in relationality and solidarity (see page 92). This definition highlights that individuals exist in relation to others, especially family, community, ancestors, and future generations. Their idea of solidarity emphasizes an active moral commitment to care for the well-being of others, particularly the vulnerable. In this context, the vulnerable include future people, the unborn, and those who are genetically unaltered. Consequently, germline enhancement could indeed violate human dignity and personhood if it prioritizes genetic "perfection" over the deep moral value attached to the shared experience of being nurtured within a community.

Another concern pertaining to personhood is related to the controversy surrounding the practice of discarding human embryos during the experimental and selection phases of germline enhancement, raised by Urban Respondent 6[28]. He argued that *each embryo represents a potential human life, and disposing of them undermines the sanctity of life.* This issue is particularly significant within the African communitarian understanding of personhood, as it raises ethical questions about when life begins and how personhood is defined. In contrast to

[28] See page 115.

the Western perspective, which associates personhood with cognitive capabilities, autonomy, and individual rights, the argument is often made that embryos lack rationality and independence, and therefore may not be regarded as full persons. In African communitarian ethics, as articulated by Mbiti (1990: 108) and Menkiti (1984: 171), the focus is on actions that contribute to the well-being of the community rather than serving individual self-interests, even when these actions are framed as parental choices (see page 96).

This view aligns with the belief, expressed by two participants, that a child's spirit resides in the spiritual realm from the moment of conception[29]. This perspective suggests that embryos, though not yet full persons, possess moral and spiritual significance as potential members of the community, inherently connected to both the ancestral and divine realms. Thus, discarding embryos based on genetic desirability could challenge the African traditional sanctity of life and disrupt the spiritual dimension of personhood, which extends beyond biological existence (Eze, 2008: 387). It reinforces the idea that every stage of human development holds intrinsic value, not only for its biological attributes but also for its role within the moral and spiritual order of the community. Therefore, when embryos are discarded because they do not meet enhancement goals, they are treated as "defective material" rather than as future members of the human community whose value cannot be reduced to genetic quality. This ultimately violates the communal value of human life, which is fundamentally what African personhood represents. Akpa-Inyang and Chima (2021) also highlight that the aspect of solidarity in personhood is a moral consideration that extends beyond individual rights to protecting the well-being of future generations (see page 92). Consequently, an embryo is viewed not only as a potential child for the parents, but also as a potential member of the community and part of the ancestry. Discarding them shows disregard for the ethical significance of potential life within the communal and intergenerational context.

6.2.2 Potential Disruption of Ancestral Connections

One of the key ongoing concerns raised by the participants was the potential for germline enhancement to disrupt fundamental beliefs about family and culture within the Zulu community, particularly regarding the revered role of ancestors in guiding and protecting future generations. In theme 1 concerning the 'Applications of human germline enhancement', Rural

[29] Rural Respondents 6 and 7 (Page 124).

Respondent 9 expressed concerns about potential disruption of ancestral connections, stating:[30]*It is taboo to mess with the genetic makeup of a person. Doing this would disrupt the deep connection we share with our ancestors...certain illnesses are believed to serve as a way for our ancestors to draw our attention to issues that need to be addressed in our homesteads.* In theme 3, Urban Respondent 6 also stated that:[31]*Using such technologies could disrupt the natural connection that future generations would have with their ancestors, weakening their sense of belonging and cultural identity.* Additionally, five rural respondents under theme 4 expressed that this potential disruption in spiritual connections could negatively affect the future generations' transition into the afterlife[32].

In the final theme, which explored the 'parallels between Zulu cultural practices and human germline enhancement', five rural respondents reiterated these concerns[33]. Here, two respondents similarly noted that: A*ncestors take great pride in passing down specific physical traits, be it the nose, ears, or complexion; this also goes for spiritual traits like ancestral gifts. These characteristics are regarded as blessings that contribute to the child's future prosperity.* In essence, a majority of the participants argued that germline modifications might disrupt the spiritual and intergenerational connections that are central to ancestral veneration. As Mbiti (1990: 141) states, "the individual does not and cannot exist alone. He owes his existence to other people, including those of past generations and his contemporaries". This highlights a widely held traditional African belief that ancestors continue to guide and influence the living, emphasizing the interconnectedness of individuals, an idea that lies at the core of Ubuntu, as outlined in Chapter Three (see page 93).

Mbiti (1990: 141) further explains that in the African worldview, ancestral veneration is not considered superstition; rather, it is an acknowledgement of deep, unbroken relationships across generations (see page 93). From this perspective, germline enhancement could produce biological discontinuity that prevents spiritual recognition by one's ancestors by introducing technological manipulation into the genetic flow. Ultimately, if an individual's biological and spiritual essence is altered to the extent that it diverges from their ancestral line, the connection

[30] See page 97.
[31] See page 109.
[32] See page 112.
[33] See page 122.

necessary for ancestral veneration and spiritual kinship could be weakened or severed. This situation would violate the principle of Ubuntu, which emphasizes continuity and mutual recognition between the ancestors and the living.

As mentioned above, some participants argued that germline enhancement could disrupt the natural connection between future generations and their ancestors, thereby weakening their sense of belonging and cultural identity. Mbiti (1990) and Eze (2008: 386) emphasize that the relationship between an individual and their community is both interactive and mutually influential; identity is not formed in isolation but is continuously shaped and defined through dynamic social relations (see pages 81 and 94). This community extends beyond the living to include ancestors. Eze highlights that the essence of Ubuntu lies in the belief that humans are fundamentally interconnected, and that identity, dignity, and moral worth emerge from these relationships rather than from individual autonomy (Eze, 2008: 387). Thus, when identity is shaped by technological intervention instead of being inherited through lineage and cultivated by community, it risks shifting personhood away from Ubuntu's relational foundation toward a more individualistic understanding of "design". Ancestral lineage, in this context, is more than just genetic inheritance; it shapes the moral and cultural foundation that forms identity.

Similarly, Wiredu (2008: 335) describes African communitarian ethics as rooted in a kinship-based social structure that shapes moral obligations and personal identity (see page 95). In this perspective, kinship extends beyond biological ties to encompass belonging, identity, and intergenerational moral responsibility. Consequently, Ubuntu frames identity as a communal construct that connects the living, ancestors, and future generations. In this context, germline enhancement signifies a departure from an inherited, community-shaped identity to one that is engineered through human intervention. This shift challenges the communal foundations upon which many African identities are built. Thus, germline enhancement poses a risk of undermining the moral and cultural integrity of future generations.

6.2.3 Challenges to the Spiritual Duality of the Zulu People

Two rural respondents expressed concerns that reflect the spiritual duality inherent in Zulu ontology, where traditional ancestral beliefs and Christian doctrines coexist in a delicate

balance[34]. Rural Respondent 3 specifically stated that: *Life is a gift from uMvelinqangi and one's ancestors…Such changes could result in a loss of cultural identity and diminish our moral clarity regarding the meaning of human life.* This perception highlights that for those who believe that there is a Supreme Creator who exerts power over their lives, as well as ancestors that, to some degree, influence their lives, altering genetics could be seen as a disruption of the natural spiritual order, particularly the sanctity associated with conception. This interference is seen as a threat to the sacredness of both ancestral reverence and the Christian belief in divine creation. Consequently, it threatens the spiritual duality central to Zulu identity and distorts the moral understanding of human life.

Similarly, Rural Respondent 8 echoed this concern, affirming that *uMvelinqangi creates life with purpose, and even if challenges arise with conception, we can consult with our ancestors and ask them to intercede on our behalf in asking uMvelinqangi for His favour because we believe they are closer to Him.* She viewed any attempt to override fertility outcomes through technological means as an act of spiritual disrespect, violating both traditional ancestral values and Christian teachings. These concerns affirm the observations of Scroope (2019: 1) and Hexham (1981: 273), who argue that within Zulu spirituality, there exists a delicate balance between ancestral and Christian worldviews (see page 75).

Furthermore, three urban respondents also alluded to this concern, recognizing the potential disruption germline enhancement poses to the spiritual duality embedded in Zulu ontology[35]. Although each respondent articulated their views from slightly different perspectives, they all expressed a deep-rooted belief that altering the genetics of life threatens to violate both divine and ancestral authority. Urban Respondent 1 stresses that life is governed by uMvelinqangi and facilitated through ancestral intervention. She argues that when humans begin to select traits, they *enter a domain that is not ours to control.* This concern suggests that germline enhancement is not just a technological intervention but also an act of spiritual disobedience, which could lead to the loss of divine and spiritual protection. As a result, *life could end at any time… if it's not blessed in the spiritual realm.*

[34] See page 113.
[35] See page 116.

Urban Respondent 7 expands on this position by cautioning that *any action that disrupts this sacred balance…could lead to a spiritual imbalance, distancing us from God's purpose and cutting ties to our ancestral roots.* Lastly, Urban Respondent 9 highlights the social and spiritual consequences of germline enhancement, warning that it may prioritize parental desires over divine or ancestral intentions. Together, these respondents reveal a shared concern that because human life is governed by dual spirituality, germline enhancement is perceived not merely as scientific development but as a violation of sacred boundaries. This threatens the integrity of the Zulu spiritual duality that has historically mediated moral understanding and ontological legitimacy. When understood within the broader context of contemporary Zulu life, as noted by Nwoye (2017: 52) and Scroope (2019: 2), many Zulu beliefs and ethical systems have evolved alongside urbanization and scientific advancements (see page 75). However, the foundational principles of relationality, spiritual interconnectedness, and spiritual veneration remain deeply embedded in cultural and social life. The responses from both rural and urban participants confirm that, despite exposure to modern ideologies and technologies, the spiritual duality that governs life remains intact and influential.

6.2.4 Conflicts with Christian Understandings of Life and Creation

Three rural respondents expressed concern that human germline enhancement constitutes a direct violation of Christian beliefs regarding divine creation, human purpose, and the sanctity of life[36]. They expressed a deep-rooted belief that uNkulunkulu is the sole creator and determiner of human life. Rural Respondent 1 questions whether a child *not entirely created by Him* can truly receive divine blessings and protection. She cites the popular Bible verse from Genesis: *uNkulunkulu wathi asenze umuntu ngomfanekiso wethu*, arguing that choosing specific traits undermines divine authority and implies that human judgment is greater than God's will. This perspective aligns with the classic Christian critique of "playing God," as outlined by many scholars, including Isa and Safian-Shuri (2018), Warmflash (2019), Liao (2019), and Shozi (2020). This critique reflects a profound discomfort with the moral authority assumed through germline enhancement technologies (see pages 57 and 58). Isa and Safian-Shuri (2018: 117) argue that altering God's creation is immoral because it transgresses divine law, suggesting that humans lack the authority to modify what God has created with perfect wisdom. Moreover, they posit that any attempt to imitate or assume God's creative power is

[36] See page 113.

not only a moral violation but also a potential source of harm to humanity and the Earth. This aligns with the respondent's question of whether a genetically enhanced child can be blessed. She further says that…*By doing so, we would definitely be assuming the role of God; the very act implies that we believe He wouldn't have granted those features otherwise.*

Rural Respondent 4 deepens this critique by cautioning that altering God's design could invite divine disapproval, as captured in the isiZulu idiom, *siyobe sizidonsela amanzi ngomsele*. She believes that germline enhancement removes *the element of surprise that comes from life as we know it*, meaning that it would disrupt the divine mystery inherent in natural birth, an aspect understood to be part of God's purposeful design. This perspective aligns with Liao's (2019: 99) argument that "designing" children with specific traits could erode established views on natural human development, a concern that reflects the religious beliefs of the Zulu people. Her viewpoint reveals not only a fear of *divine retribution or imbalance,* illustrating the moral seriousness with which such technological interference is regarded in this context, but also states that *some may even question the existence of a Creator,* thereby trivializing God's role in the origin and purpose of life.

Rural Respondent 10 acknowledges the inevitability of technological progress but expresses concern that germline enhancement technologies *introduce the unsettling possibility of creating actual human robots,* thereby reducing human identity to engineered design. He argues that *future generations could end up resembling machines rather than leaving procreation to God's design. A human being is a creation of God, and everything is perfect just the way He intended it to be.* This perspective indicates that germline enhancement not only undermines the idea of God's intentional creation but also risks a moral and spiritual dehumanization of future generations. These concerns resonate with Nwoye's (2017: 52) assertion that while Zulu belief systems have adapted to modernity, core spiritual values such as divine authority remain central to the Zulu moral thought (see page 95).

In addition, six urban respondents collectively expressed a shared religious concern that the risks associated with germline enhancement would distort God's purpose for humanity[37]. Similar to the rural respondents, Urban Respondents 2 and 5 highlighted the technology's

[37] See page 115.

implications for Christian teachings, stating that *every person is born with inherent dignity* simply because they are made in God's image. Urban Respondent 2 specifically says that germline enhancement *would not be taken lightly within religious groups,* particularly when motivated by non-therapeutic goals such as *aesthetic or intellectual improvements.* Urban Respondent 5 further stated that if germline enhancement is done for these reasons, *we risk undermining the religious moral frameworks taught in church, like humility, equality, and acceptance of natural flaws.* These concerns resonate with the views expressed by Scroope (2019: 2), which suggest that even though many Zulu people live in urban cities and are exposed to modern science and technology, their Christian beliefs significantly influence their understanding of right and wrong, creation, and the natural order (see page 95). Consequently, they oppose germline enhancement for non-medical reasons, as their faith teaches them that all humans are created in God's image and that life should only be altered beyond when necessary for healing.

Furthermore, Urban Respondents 4 argues that germline enhancement *goes against God's intended purpose for our offspring* and *would turn reproduction into a controlled and artificial process,* thereby undermining the sacredness of conception and challenging God's sovereignty. Lastly, contrary to Urban Respondents 2 and 5, Urban Respondent 8 states that *okholweni kuyohlezi kunezinqinamba*, meaning that within the Christian worldview, natural imperfections and illnesses *are all part of God's plan, providing opportunities for spiritual growth and allowing for divine intervention.* Therefore, bypassing this part of one's spiritual journey could disrupt the significance of prayer and the deepening of faith. These concerns align with Nwoye's (2017) and Scroope's (2019) insights, which suggest that one of the fundamental aspects influencing the ethical life of the Zulu people is the relationship between the living and the divine. Choices around reproduction and health are not just scientific or personal choices; they are deeply spiritual. Thus, when Urban Respondent 8 says that using germline enhancement to eliminate natural imperfections could undermine the importance of faith, it highlights that these challenges, though not ideal, hold spiritual value rather than being issues to be fixed through science.

6.2.5 Threats to Cultural and Religious Obligations

Five rural respondents expressed concerns that germline enhancement presents a potential threat to the preservation of traditional and religious values among the Zulu people[38]. Rural Respondent 2 noted that *Germline enhancement could change the way we perceive culture and traditions as long-standing beliefs, values, and practices passed down through generations, which are elements that provide a sense of belonging and distinguish us from the rest of the world.* Rural Respondents 5 and 9 specifically raised concerns that traditional practices, such as *Ukubikwa kwesisu* and *Imbeleko,*[39] could be compromised. They argued that modifying a child's genetic makeup to meet parental preferences could undermine the belief that an individual's traits are expressions of ancestral heritage and divine will, rather than merely a product of human intervention.

These concerns align with the communitarian views of Mbiti (1990), Gyekye (2004), and Wiredu (2008), which emphasize that communal values, traditions, and customs are not merely inherited; they are moral goods that must be preserved and passed down to future generations (see page 95). Gyekye (2004: 13) argues that it is the moral obligation of each generation to ensure cultural continuity, particularly regarding how communities understand concepts like personhood, kinship, and moral development. Wiredu (2008: 335) highlights the African belief that communal life and continuity rely on shared understandings of humanity and ethical traditions. If germline enhancement alters the communal perception of what it means to be human, it threatens the ethical foundation of communal rites and intergenerational relationships.

Moreover, Mbiti (1990: 108) asserts that, within the African worldview, individuals are deeply connected to their ancestors, who are always present and actively guiding and protecting their descendants. Disrupting established practices, which are essential rites that affirm this spiritual connection, through germline enhancement affects not only the moral and spiritual fabric of the entire community but also the legacy of past and future generations. Eze (2008: 393) further emphasizes that cultural integrity relies on preserving core values while engaging with modernity in ways that do not dilute one's identity (see page 95). Thus, concerns about the potential transformation of long-standing cultural beliefs, values, and practices reflect an apprehension that germline enhancement may exceed the limits of responsible adaptation.

[38] See page 111.
[39] For detailed information about the practices, see pages 107 and 112.

Instead of supporting cultural evolution, it risks catalyzing a gradual erosion of spiritual and communal identity. Similarly, the religious concerns mentioned highlight that germline enhancement could undermine the sovereignty of God and His divine intention for creation. When humans assume the authority to design their offspring, especially for non-therapeutic reasons, it introduces the perception that a child is no longer a sacred gift from God but a product of human engineering. This shift challenges the belief in the sanctity of life, leading to what most of the participants view as an act of "playing God".

6.2.6 Afrofuturistic Perspectives on Germline Enhancement

When asked which of the germline enhancement applications they considered valuable, a total of sixteen respondents indicated that disease resistance was the primary justification for genetic enhancement, with most citing that germline enhancement could lead to reduced healthcare dependency and lower medical expenses[40]. From Fayemi's (2018: 70) perspective on personhood, genetic interventions that prevent hereditary diseases can be viewed as tools that enhance personhood rather than diminish it, as they improve the individuals' capacity to live fulfilling lives (see page 86). The participants' preference for only the essential applications of germline enhancement echoes Andoh's (2017: 32) observation that Africa remains significantly behind in biomedical advancements, particularly in discussions and research related to germline enhancement (see page 63). This gap contributes to the widespread scepticism many Africans have toward emerging biotechnologies.

Notably, the preference for applications related to disease resistance indicates that it is not that there is resistance to biomedical innovation; rather, it reflects a desire for health-related progress that is consistent with cultural values. This aligns with Fayemi's (2018: 71) conceptualization of Afrofuturism (see page 95). Urban Respondent 10's reason behind finding the disease-resistance application beneficial was that it could be interpreted as God's way of granting humanity the wisdom to improve the quality of life and alleviate suffering[41]. This response reflects how African communities often perceive medical interventions from a spiritual and moral lens, linking health advancements to ancestral communication and divine purpose. This perspective aligns with Nwoye's (2017: 47) view that this belief is particularly true for the Zulu people and is an integral part of their ontological beliefs (see page 75).

[40] See page 96 and 99.
[41] See page 116.

Furthermore, a total of nine participants from both rural and urban groups expressed a forward-looking perspective on cognitive enhancement and extended life expectancy[42]. Two rural respondents specifically mentioned that these enhancements could eventually lead to financial stability for families who engage in them. Rural Respondent 10 linked the enhancement of life expectancy to alleviating the emotional burden of losing a child[43]. This viewpoint resonates with Fayemi's argument that transhumanist interventions can help actualize personhood, particularly when they enhance one's capacity to appreciate life and contribute meaningfully to society (see page 95). Additionally, it is consistent with Thaldar et al.'s (2020: 5) assertion that technological advancements in genetics ought to be assessed based on their potential to promote human flourishing. Therefore, instead of viewing cognitive enhancement as a purely individualistic pursuit of intelligence, an Afrofuturistic perspective frames it as a tool for uplifting families and communities. This approach reinforces key principles of African communitarian ethics by ensuring that individuals can contribute to communal progress and intergenerational stability, provided that these enhancements are accessible and equitably distributed.

Five of these respondents associated cognitive enhancement with broader national development, stating that it could propel Africa toward first-world status by improving its economic state and fostering innovation[44]. They emphasized that these technologies could help address economic inequalities and advance human potential. This view aligns with Andoh (2017: 33), who argues that Africa should not fall behind in technological advancements due to rigid ethical conservatism. Rural Respondent 10 pointed out that the younger generation's trust in technology could encourage broader acceptance of germline enhancement, provided that safety and ethical concerns are adequately addressed[45]. This viewpoint further supports Andoh's assertion that African societies need to engage in deeper ethical discussions about emerging technologies instead of dismissing them out of traditionalist fears.

[42] See pages 96 and 98.
[43] See page 96.
[44] See page 99.
[45] See page 107.

An Afrofuturistic perspective recognizes that younger generations are key drivers of technological change. However, as Fayemi (2018: 70) and Thaldar (2022: 9) caution, technology must remain ethically grounded in African communal values to prevent alienation and social fragmentation. Urban Respondent 10 also argued that enabling individuals to lead healthier and longer lives, free from cognitive or physical limitations, could enhance human dignity and empower people to take control of their genetic inheritance[46]. This further aligns with Fayemi's assertion that personhood is dynamic and shaped by socio-cultural and technological changes, rather than being a fixed biological state. It also echoes Fayemi's claim that African states have a duty to adopt technologies that promote personhood and enhance human well-being (see page 95).

Urban Respondent 7 compared germline enhancement to IVF, arguing that human control over reproduction is not a new concept. She maintained that as long as enhancements focus on health rather than non-essential traits, they are likely to be accepted[47]. This perspective aligns with Thaldar and Shozi's (2020: 35) assertion that resistance to genetic modifications often stems from misconceptions and a lack of information. They noted that technologies like IVF were once controversial but are now widely accepted. Therefore, viewing germline enhancement as an extension of existing reproductive technologies resonates with Afrofuturism's pragmatic approach, which does not outright reject genetic modification but emphasizes ethical considerations to ensure that new technologies benefit society as a whole, preventing their misuse as tools of social inequality.

Lastly, Rural Respondent 9 suggested that parents who believe in their ancestors should consult them before initiating the enhancement process. This would allow them to communicate their reasons for enhancing their child and reassure their ancestors that the prospective child will still be their descendant[48]. The aim of doing this would be to avoid spiritual disconnections and imbalances while emphasizing the importance of ancestral guidance. This view challenges the dominance of Western bioethical principles and supports the philosophy of Afrofuturism, which integrates science with spirituality instead of separating the two. Ancestral consultation reflects a deep-rooted African tradition in which significant life decisions, especially those

[46] See page 117.
[47] See page 109.
[48] See page 112.

concerning human life, are made through communication with ancestors and communal wisdom. This suggestion aligns with Fayemi's (2018: 7) and Andoh's (2011: 74) views that Afrofuturism seeks to merge the speculative, future-oriented outlook of technology with the deeply relational and ancestor-conscious ethics of African communitarianism (see page 95).

In effect, when analysing the concerns through the lens of African communitarian ethics, the findings were grouped into three key perspectives. First, some respondents emphasized the implications of human germline enhancement on traditional ancestral belief systems. Second, others highlighted its impact on dual spirituality, particularly the coexistence of Christian faith and ancestral veneration. Third, the findings included concerns that were specifically rooted in firmly held Christian beliefs. Under the first perspective, the findings indicated that germline enhancement may compromise the perceived dignity of enhanced individuals, reducing procreation to a form of manufacturing. A significant concern is the potential disruption of ancestral connection, as this technology could interfere with fundamental beliefs surrounding spiritual ties between the living and their ancestors. It is believed that ancestors play a role in guiding and protecting the living. Therefore, germline enhancement might negatively affect future generations by hindering their recognition by their ancestors.

The findings from the second perspective highlight the concern that germline enhancement could undermine the sacredness of conception and procreation, as viewed through the lens of ancestral veneration and divine creation. This could distort the moral understanding of human life, leading to the perception of germline enhancement as an act of disobedience against divine authority. Such a view may result in a loss of divine and spiritual protection. The findings also show that the technology poses a challenge regarding the collective moral obligation to preserve traditional and religious values. Participants expressed concerns that traditional practices, such as *Ukubikwa kwesisu* and *Imbeleko*, where ancestral veneration plays a key role, might be compromised. These practices represent the belief that traits are expressions of ancestral heritage and divine will, which should not be perceived as products of human intervention. Instead, they are viewed as legacies shared across past and future generations.

Furthermore, the findings revealed that some participants held Afrofuturistic views, particularly viewing disease resistance as the main justification for germline enhancement. Some expressed optimism about cognitive enhancement, stating that it could lead to financial stability, not only for individual families but also for South Africa as a whole by fostering innovation and advancing human potential. Additionally, several participants viewed germline

enhancement as an opportunity for individuals to take control of their genetic makeup, particularly leading to healthier and longer lives. Lastly, the findings under the third perspective indicated discomfort among participants regarding the moral authority that germline enhancement technologies seem to assume. Many felt that such advancements challenge God's sovereignty over humanity, equating it to "playing God". One of the reasons for this discomfort is rooted in Christian teachings, which suggest that natural imperfections hold spiritual significance. Such imperfections are seen as means to deepen one's faith in God's purpose for life, rather than issues to be resolved through scientific intervention.

6.3 Conclusion

This chapter presented a thorough analysis of the study's findings by applying the ethical frameworks of principlism and African communitarian ethics to critically evaluate and interpret the perspectives and ethical concerns raised by the rural and urban respondents on human germline enhancement. Key concerns identified under principlism include a lack of autonomous decision-making, as sixteen participants indicated they had no prior knowledge of germline enhancement. The relative novelty of the technology was recognized as a significant factor contributing to this lack of awareness. The evaluation of this issue through the lens of principlism highlighted that it poses a substantial challenge to the principle of autonomy. Additionally, concerns about the potential misuse of germline enhancement, along with its off-target effects and long-term harms, were prevalent. These issues were found to lead to further concerns, such as the risk of physical and psychological distress.

Other concerns include the potential harm that germline enhancement poses to the individuality and autonomy of future generations, which could undermine their agency. The findings revealed that pre-selecting genetic traits may encourage a deterministic view of a child's identity, where children are enhanced according to their parents' aspirations or societal expectations, rather than being allowed to develop their unique talents and capabilities. Furthermore, significant concerns about how germline enhancement might conflict with fundamental beliefs within the Zulu community regarding family and cultural practices were also raised. The central concern is that participating in germline enhancement could disregard deeply held Zulu values and beliefs about the vital role of ancestors in guiding and protecting future generations. This disruption could metaphorically "kill" the bond with their ancestors, posing a threat to the spiritual and cultural ties that are crucial to Zulu identity.

From the ethical framework of principlism, the principles of beneficence and non-maleficence effectively highlight the potential harms associated with germline enhancement. These principles evaluate the harms against the potential benefits presented by this technology. Participants noted that these benefits could include improved communal well-being, as germline enhancement may help eradicate genetic diseases. Additionally, enhancing cognitive abilities could equip future generations with advantageous traits, better preparing them for challenges and opportunities, ultimately leading to an improved quality of life and societal advancements. The findings also suggest that engaging in germline enhancement could be viewed as an extension of parental responsibilities, much like the decisions parents make regarding education and healthcare.

Lastly, the analysis discussed concerns about the emergence of genetic privileges, which could pose a threat to the genetic diversity of humanity. This situation may lead to social stratification and marginalization, creating challenges for both those who are enhanced and those who are unenhanced, either due to the inability to afford it or because it conflicts with their parents' cultural beliefs. These issues pose significant challenges to the principle of justice and indicate that germline enhancement has the potential to exacerbate social inequalities if it is not ethically and effectively integrated into communities.

The chapter also analysed the participants' concerns through the lens of African communitarian ethics, offering cultural and moral insights into their perspectives on human germline enhancement. Key concerns identified include the potential threats to personhood and human dignity as understood within the African context, since the technology risks reducing individuals to mere products of design rather than recognizing them as beings shaped by ancestral heritage and communal relationships. A thorough analysis of the disruption of ancestral connections, as noted under principlism was discussed, where the participants explained that germline enhancement could produce biological discontinuity that prevents spiritual recognition by one's ancestors. Thus, disrupting the intergenerational connections that are central to ancestral veneration.

The analysis further highlighted the implications that germline enhancement presents for the dual spiritual beliefs of the Zulu people. These include potential disruption to the natural spiritual order, particularly regarding the sanctity of conception and the respect owed to both ancestral traditions and Christian beliefs in divine creation. Some considered it an act of

spiritual disrespect, arguing that it violates traditional ancestral values as well as Christian teachings. Other participants expressed strong Christian beliefs, suggesting that germline enhancement undermines divine authority by implying that human judgment takes precedence over God's will. This could disrupt the divine mystery inherent in natural birth, which they view as part of God's purposeful design. Additionally, the findings indicated that engaging in germline enhancement could lead to a gradual erosion of spiritual and communal identity, compromising their moral obligation to uphold traditional and religious values as understood within Zulu culture. Lastly, the analysis discussed the participants' Afrofuturistic perspectives on germline enhancement, where many participants believed that it could reduce dependency on healthcare and lower medical expenses, reflecting a desire for health-related advancements that align with cultural values and benefit society as a whole. Ultimately, the chapter emphasizes the importance of adopting a culturally sensitive and ethically sound approach when integrating germline enhancement technologies into non-Western communities. This will be the focus of the next chapter, where the study proposes an African-centered ethical framework for addressing the challenges and potential benefits of human germline enhancement.

CHAPTER SEVEN
TOWARDS A HOLISTIC ETHICAL PARADIGM FOR HUMAN GERMLINE ENHANCEMENT FROM AN AFRICAN COMMUNITARIAN PERSPECTIVE

7.0 Introduction

The preceding chapter analysed the respondents' key ethical and cultural perspectives on germline enhancement through the biomedical framework of principlism and the theory of African communitarian ethics. The chapter explained how the findings align with biomedical principles, such as the principle of beneficence, which supports the participants' views that human germline enhancement could alleviate human suffering by eradicating hereditary diseases and improving societal well-being. It also highlighted areas of contention, where participants expressed concern that the technology could unintentionally disrupt cultural practices and traditions that emphasize ancestral ties, spiritual connections, and communal identity. These disruptions could lead to cultural, social, and spiritual harm, particularly in traditional communities where these values are integral to well-being, such as the Zulu community. This harm challenges the biomedical principle of non-maleficence.

This chapter aims to address the key concerns raised in the previous chapter by proposing a framework for the ethical incorporation of African communitarian values into the evaluation of human germline enhancement technology. This approach is informed by the main findings of the study, the literature reviewed, and the guiding theoretical framework. It comprises two interrelated but distinct approaches: the first approach advocates for integrating African communitarian values into the existing biomedical ethical evaluation of human germline enhancement. It seeks to enrich current biomedical frameworks, which are commonly based on Western liberal ethics, by incorporating African communitarian perspectives. These perspectives include moral obligations toward the community and future generations, the concept of human dignity (as articulated by Metz), and elements of Afrofuturism. This integration aims to ensure that biomedical evaluations of germline enhancement are more inclusive, sensitive to context, and ethically relevant for African settings.

The second approach presents an independent African bioethical model that is grounded in culturally specific worldviews, with a particular focus on the ontological and moral perspectives of the Zulu people in South Africa. It reconceptualizes the ethical evaluation of germline enhancement technologies through three interrelated ethical strands: the ethic of

ancestral continuity, the ethic of spiritual balance, and the ethic of Christian stewardship. These strands reflect African moral and spiritual traditions that guide how biotechnologies ought to be assessed. Using the Zulu worldview as a case study, this framework demonstrates how bioethics can be grounded in African values and perspectives, providing culturally relevant responses to global scientific developments rather than simply applying externally imposed ethical models.

Both approaches are essential because, on the one hand, incorporating African communitarian values into traditional bioethics can promote inclusivity and contextual relevance in global biomedical discussions. On the other hand, a culturally rooted ethical approach provides African communities with the tools to evaluate emerging technologies, such as human germline enhancement, through their own ontological and moral views. Together, these methods support a more informed and ethically consistent engagement with germline enhancement technologies in Africa. The following section presents an argument illustrating how African cultural frameworks can meaningfully shape how these technologies are understood and adopted. It examines how specific African communitarian values can be applied not only to guide the responsible adoption of germline enhancement in African settings but also to address key ethical concerns that emerged from the study's findings.

7.1 The Argument for Integrating African Communitarian Values into the Biomedical Ethical Evaluation of Human Germline Enhancement

As shown in Chapter Five, there are parallels between Zulu cultural practices and human germline enhancement. The study found that certain practices within the Zulu community resemble germline enhancement. For example, specific herbal mixtures are ingested, used in baths, or introduced into the bloodstream through small incisions by traditional healers to enhance health, strength, and disease resistance. Rural Respondent 6 noted that oils extracted from certain animals, when applied through small incisions, are believed to extend a person's lifespan. This mirrors the concept of enhanced life expectancy. Other practices mentioned include *ukuqiniswa*, the use of *amabhande* to strengthen physical and spiritual resilience, and *isihlambezo*, which is used during pregnancy to promote maternal and child health (see pages 123, 124, and 121). Additionally, some respondents referred to herbal mixtures and rituals, such as *imbiza* and *ukugcaba*, believed to increase memory and concentration, and are commonly used by students during exam times (see page 127). Rural Respondents 6 and 9 also discussed cultural practices related to gender selection, which, to some degree, align with the

concept of “designer babies”. These examples demonstrate that the notion of enhancement is not foreign to African thought or practice. Therefore, African communities are well-positioned to contribute ethical and culturally informed perspectives to effectively engage with issues related to emerging technologies, such as germline enhancement.

The discussion in the previous chapter highlighted several key findings regarding human germline enhancement. In addition to concerns about the lack of autonomous decision-making, potential misuse of the technology, off-target effects, and the emergence of genetic privileges leading to social stratification and marginalization, the findings suggest that germline enhancement could disrupt fundamental familial and cultural beliefs within the Zulu community. This disruption may threaten their spiritual ties, practices, and identity as Zulu people. While traditional practices emphasize holistic enhancement, modern biotechnology presents ethical challenges that require culturally responsive frameworks. Therefore, the current biomedical evaluation of emerging biotechnologies, often guided by principlism, needs to be adaptable to the cultural contexts in which it is applied. This point has been emphasized in critiques of the framework, particularly by Tom Walker (2009), Daniel Callahan (2003), and Francis Akpa-Inyang and Sylvester Chima (2021) in Chapter Three of the study. This highlights the need to incorporate African values and philosophical perspectives into the ethical assessment of technologies, such as human germline enhancement, to better reflect the African context. The following section offers several suggestions for addressing the main concerns identified through evaluating germline enhancement through principlism. These suggestions aim to integrate African values into the bioethical discussion, providing culturally appropriate and ethically sound approaches for managing the complexities of germline enhancement in African societies.

7.1.1 Addressing the Limitations of Autonomous Decision-Making in Human Germline Enhancement

As discussed in Chapters Two and Five, germline enhancement introduces unknown biological, social, and spiritual changes that affect not only individuals but also future generations and, ultimately, the essence of communal life. As Archard (2008: 5) states, there is an ethical duty to provide solid scientific evidence on all aspects of the innovation. To ensure the public fully understands the promises, risks, and complexities of the technology, a top-down approach to sharing knowledge is necessary. This means scientists and ethicists should inform the public

about both the scientific and moral aspects of the technology through bioethics literacy campaigns.

According to Beauchamp and Childress (2001: 58), the principle of autonomy upholds the rights to make informed, independent decisions about one's body and future. However, in the African context, this principle alone is insufficient to address the complexities of ethical decision-making**.** Gyekye (2004: 13) argues that African moral obligations towards the community and future generations necessitate a balance between personal autonomy and communal harmony, leading to the concept known as relational personhood. This suggests that African communities should resist the uncritical adoption of bioethical frameworks. Instead, they must recognize that decisions made today will have long-term impacts on the community, its cultural heritage, and moral values (Gyekye, 2004: 13). Therefore, it is essential for educational initiatives to promote public ethical deliberation, which includes religious and cultural experts, such as theologians and various community leaders. Such discussions should occur early in the research stages, ensuring that local research ethics committees are prepared to evaluate germline enhancement research in a manner that reflects both scientific rigor and cultural realities. This can be achieved by incorporating experts in African philosophy and traditional medicine into the evaluation process.

This approach addresses both the emerging scientific advances and the rich moral traditions embedded in African communities. It addresses the concern that limited knowledge of germline enhancement restricts individuals' ability to make informed and autonomous decisions about their engagement with these technologies. Furthermore, it offers a reinterpretation of the principle of autonomy, addressing arguments made by Callahan (2003: 288) that the current biomedical evaluation of biotechnologies often relies on the principle of individual autonomy, which overlooks the deeper moral reasoning and deliberation required for addressing the complex ethical dilemmas these technologies present. Additionally, it highlights that the emphasis on individual autonomy overlooks the moral authority of cultural influences in shaping ethical decision-making (Akpa-Inyang & Chima, 2021: 4). By reframing autonomy through the lens of relational personhood, African bioethics offers a more culturally agreed way for evaluating germline enhancement technologies.

7.1.2 Responding to Physical, Psychological, and Safety Concerns

The literature and findings revealed serious physical, psychological, and generational risks associated with germline enhancement. These ranged from unintended and irreversible genetic changes that could cause physical disfigurements to the inability to ensure absolute precision. The long-term outcomes included the possibility of unforeseen health problems, psychological distress, and the risk of passing these issues to future generations. The study assessed these concerns using the biomedical principles of beneficence and non-maleficence to evaluate the risk-benefit ratio and serve as safeguards against potential harm.

Scholars such as Thaldar et al. (2022: 16), Brokowski and Adli (2020: 89), and Pang and Ho (2016: 59) caution about the safety and effectiveness of germline enhancement technologies, making this a highly controversial and heavily regulated area of bioethics worldwide. Metz's two conceptions of human dignity: vitality and community, based on African moral thought, offer culturally relevant ethical frameworks to address these concerns, going beyond standard biomedical principles. According to Metz's idea of vitality, humans have a unique vital force that can be either enhanced or diminished by experiences such as health, happiness, suffering, or injustice (Metz, 2012: 24). He explains that this view is influenced by both indigenous African metaphysics and Christian thought, which considers life itself sacred because it comes from God. The risk of irreversible harm, including physical, psychological, and unintended effects, could greatly reduce a person's ability to live a thriving life. It might threaten their bodily integrity and health while also hindering their rational and moral development. Therefore, based on this African value, the evaluation of these technologies should conclude that clinical trials should not move forward unless safety is assured, and only modifications that can be reversed should be allowed.

Metz's second conception defines community through two interconnected aspects: identity and solidarity. Identity involves recognizing oneself as part of a group, while solidarity means acting cooperatively and compassionately to promote others' well-being (Metz, 2012: 26). Violations of this, such as exclusion, exploitation, or harm, are seen as a denial of dignity. The risk of physical and psychological harm can hinder an individual's ability to thrive as a moral and social being, leading to alienation that undermines the communal foundation of dignity in African ethics. As a preventive step, evaluating germline enhancement should reflect the African value of solidarity, which stresses actively fostering compassion for future generations. This relational view of non-maleficence serves as a culturally rooted obligation to protect future individuals from harm.

Measures for responding to such concerns must therefore focus on strengthening social inclusion and ensuring that future individuals can fully participate in communal life without the risk of imposed disadvantages. According to African ethics, this approach preserves dignity, unlike conventional biomedical principles, such as beneficence and non-maleficence, which focus primarily on individual welfare and rely on prospective parental consent, integrating African communitarian values into these discussions requires an approach that reflects Metz's framework. Therefore, decisions regarding germline enhancement must be made through inclusive community engagement and guided by African conceptions of human dignity, where vitality, solidarity, and ancestral continuity take precedence. Technologies that fail to meet these ethical standards should remain subject to stringent regulation or exclusion from use in African contexts.

7.1.3 Mitigating Determinism, Preserving Genetic Diversity, and Preventing Homogenization

One major concern is that germline enhancement might promote a deterministic view of a child's identity. This could lead to children being shaped primarily to fulfil their parents' aspirations or societal expectations, rather than allowing them to develop their unique talents and capabilities. As a result, this could undermine the individuality and autonomy of future generations. Additionally, there is a related issue concerning the potential loss of genetic diversity. If parents begin to pre-select similar traits for their children, it could lead to a homogenization of genetic characteristics. The study applied the principles of autonomy and non-maleficence to evaluate these potential harms in line with global biomedical standards.

To effectively address the long-term communal harms and intergenerational risks of determinism, threats to genetic diversity, and homogenization, the African communitarian ethic of moral obligations toward the community and future generations offers a more context-sensitive and pluralistic approach for evaluating these complex ethical challenges. As posited by Walker (2009: 130) and Akpa-Inyang and Chima (2021: 4), principlism alone poses a challenge in identifying one's moral responsibilities as a member of a specific culture, arguing for adjustments based on the cultural context in which it is used. For example, the principle of autonomy emphasizes the individual's right to self-determination, often isolated from social and historical context, and non-maleficence mainly concerns immediate or direct harm to individuals.

In addressing the concern of determinism, African communitarian ethics offers a compelling framework by emphasizing that personhood and identity are shaped and realized through social relationships within the community, rather than being individually isolated (Gyekye, 2004; Wiredu, 2008). Moral decisions, such as the choice to engage in germline enhancement, which carries profound and irreversible ethical consequences, must therefore be evaluated not solely in terms of individual autonomy but in relation to their broader communal impact. This includes obligations to ancestors and future generations. The communitarian notion of moral obligation toward future persons affirms the importance of respecting their moral agency by ensuring that genetic preselection does not constrain their identity or predetermine their life path. This view resists the reduction of future individuals to genetically engineered traits and instead upholds their capacity to develop personhood within a relational moral context.

To preserve genetic diversity and prevent homogenization, African communitarian ethics reframes these issues as collective and intergenerational harms, extending beyond the individualistic scope of biomedical principles as non-maleficence. This African ethical framework emphasizes that current generations have a moral duty not only to protect biological resilience but also to safeguard the richness of human experience and cultural diversity across time. In contrast, the global bioethical principle of non-maleficence, which obligates researchers and practitioners to "do no harm", typically addresses these concerns at an individual risk level, such as potential biological, psychological, or societal harm that may result from reduced genetic variability, increased susceptibility to diseases, or diminished adaptive capacity (Ishii & Beriain, 2019: 371). Although non-maleficence is a valuable ethical principle, its focus on clinical and measurable outcomes often overlooks broader issues, like cultural erosion, where many Africans believe that physical and character traits reflect the presence and legacy of ancestors. As a result, it does not fully engage with the relational responsibilities emphasized in African communitarian thought, especially the duty to preserve human diversity as a moral and cultural inheritance for future generations.

To integrate African communitarian values into the biomedical ethical evaluation of germline enhancement technologies, it is necessary to adopt culturally informed ethical guidelines. This includes the establishment of community-driven bioethical frameworks that align with principles such as Ubuntu, which emphasize moral agency and interdependence as an ontological truth that highlights the interconnectedness of individuals, "...including those of past generations and his contemporaries" (Mbiti, 1990: 141). Within this perspective, children

are not viewed as mere extensions of parental desire but as moral beings in development, whose growth must be nurtured rather than controlled. An ethic of humility and stewardship should guide parental decision-making regarding germline enhancement. This reflects the African moral obligation to protect the well-being of future generations rather than attempting to control their genetic makeup. Additionally, the legal recognition of a future child's "right to an open future" should be enshrined in the regulation of these technologies. This is crucial to prevent germline interventions that impose rigid expectations or predetermined life paths on children.

The principle of procreative non-maleficence, proposed by Thaldar and Shozi (2020), discussed in Chapter Three, which asserts that reproductive choices should avoid causing harm to the prospective child could be revised to not only focus on avoiding foreseeable harm to the individual child, but also safeguard the cultural, genetic, and moral diversity essential to the well-being of the community and future generations. Establishing ethics councils that include cultural custodians and bioethicists would help review proposed enhancement practices. These councils would apply intergenerational wisdom to ensure that interventions align with long-term community well-being, thereby embedding moral continuity into modern decision-making.

Moreover, there is a need for the constitutional recognition of genetic pluralism as a protected social and cultural good. This could involve advocating for constitutional clauses or national bioethics that explicitly recognize genetic diversity in the same vein as linguistic, cultural, or heritage rights. Such legal recognition would position genetic homogenization not merely as a technical or medical concern, but as a potential violation of collective and intergenerational rights. It would affirm the responsibility to safeguard genetic and cultural diversity for future generations, aligning with early African communitarian thinkers like John Mbiti (1990: 108), who stressed the importance of preserving traditions, religious beliefs, and customs to maintain spiritual and cultural continuity. Ultimately, this communitarian approach extends beyond the individualism of the Western principles of autonomy and non-maleficence by situating human beings within a framework of interdependence, emphasizing relational identity, collective well-being, and long-term moral responsibility, offering a more holistic and culturally grounded framework for evaluating the ethical implications of human germline enhancement.

7.1.4 Preventing Inequalities Arising from Genetic Privilege and Social Stratification

Germline enhancement may entrench genetic privilege, risking inequality and exclusion. To address this, justice must be re-envisioned through an African communitarian lens. This could lead to social advantages, inequality, and the marginalization of those who remain unenhanced. The study assessed these potential issues using the biomedical principle of justice to protect the dignity and rights of future generations. To best prevent inequalities caused by genetic privilege and social stratification within an African communitarian ethical framework, the principle of moral responsibilities toward the community and future generations stands out as the most solid and appropriate foundation.

This ethic provides an ethical basis for resisting the emergence of genetic hierarchies by grounding justice in intergenerational duty and community continuity. It calls on current generations to protect the well-being, fairness, and cohesion of future generations, ensuring that technological progress does not endanger the social fabric. In contrast, Western theorists such as Beauchamp and Childress (1994), Francis Fukuyama (2002), and Manitza Kotzé (2014) approach justice through the lens of individual rights, fairness, and distributive equity, mainly focusing on who gains access to germline enhancements and whether future autonomy is preserved. While grounded in fairness, rights-based approaches may miss the relational nature of justice in African contexts.

African communitarian ethics go beyond individual benefits by asserting that enhancement technologies must serve the well-being of the entire community rather than privileging select individuals or elites. Drawing from the works of Kwasi Wiredu (2002), Kwame Gyekye (2004), and Thaddeus Metz (2012), African conceptions of justice emphasize relationality, communal harmony, and shared moral responsibility. From this perspective, any technology, such as germline enhancement, that threatens cultural identity, weakens communal bonds, undermines ancestral continuity, or fosters exclusion and inequality, is considered unethical and inherently unjust.

In response to these ethical concerns, there is a pressing need for African countries to establish legally mandated national communal bioethics councils composed of community leaders, traditional elders, youth representatives, ethicists, and scientists. These councils would promote consensus-based ethical deliberation, ensuring that decisions on germline enhancement reflect shared communal values, prevent elite dominance, and uphold collective

moral accountability, in line with Wiredu's emphasis on inclusive consensus. Furthermore, the creation of a dedicated ethical trait review board is necessary to evaluate the communal necessity and justice implications of proposed genetic enhancements. Comprised of bioethicists, geneticists, community representatives, public health officials, and legal scholars, this board would assess not only the immediate effects of such technologies but also their intergenerational social and cultural impacts. By scrutinizing enhancements that may promote social hierarchies, erode cultural and genetic diversity, such a board would serve as a proactive mechanism for ethical oversight. In this way, ethical governance aligns not only with scientific progress but with cultural continuity and collective dignity.

7.1.5 Mitigating Threats to Cultural Continuity

Addressing the potential threats and disruptions to cultural beliefs and practices posed by human germline enhancement requires an African ethic rooted in communal and ancestral values. Unlike the current Western biomedical approach, which is primarily structured around parental and individual autonomy, an African communitarian approach emphasizes obligations to communal harmony, ancestral continuity, and the well-being of future generations. In Chapter Six, the study employed the principles of autonomy and non-maleficence to evaluate these concerns. On the basis of autonomy, it was acknowledged that parents may have the right to make reproductive decisions using germline enhancement to prevent genetic diseases or to enhance certain traits in their future children. The principle also recognizes the importance of the future child's self-determination.

While the principle of non-maleficence emphasizes the avoidance of physical or psychological harm, it is insufficient for addressing the broader sociocultural impacts of germline enhancement. Specifically, it overlooks cultural, spiritual, and communal harms, such as the disruption of ancestral belief systems and the erosion of intergenerational bonds. In contrast, African moral obligations toward the community and future generations offer a more appropriate ethical foundation for engaging with such technologies. To close this ethical gap, culturally grounded bioethical frameworks must be institutionalized through legal and policy domains. African states should incorporate these communal values into their constitutional and health policies, including legal recognition of communal moral standing and protection of spiritual practices related to birth and ancestry. This approach reflects Michael Eze's (2008: 393) argument that maintaining cultural integrity requires preserving core cultural values while managing change in a way that prevents cultural dilution and allows for meaningful adaptation

to technological progress. Consequently, African worldviews are accorded equal weight alongside global bioethical standards. Accordingly, bioethical policies must safeguard spiritual beliefs and ancestral worldview as essential aspects of respecting cultural integrity.

Building on Gyekye's advocacy for balancing individual rights with communal obligations, cultural impact assessments offer a practical tool for ethical regulation. Incorporated into germline policy frameworks, these assessments should emerge from community-driven dialogue that reflects spiritual traditions, moral responsibilities, and the lived realities of African societies. They would evaluate potential disruptions to ancestral beliefs, compatibility with local cultural customs and kinship systems, and impacts on intergenerational inheritance and lineage-based identities. This method provides a strong foundation for critically assessing and guiding the ethical use of human germline enhancement in African contexts, where cultural practices and beliefs are central to moral identity, spiritual continuity, and communal belonging. It also helps ensure that technological interventions respect deeply rooted communal values and responsibilities over time. This approach ensures that germline enhancement technologies in Africa evolve in harmony with the moral values that define communal life.

7.1.6 Balancing the Potential Benefits and Harms of Human Germline Enhancement

In addition to the abovementioned concerns and potential harms, the previous chapter also analysed the prospective benefits of human germline enhancement, particularly its implications for communal well-being and broader societal advancement. These benefits include the potential eradication of hereditary diseases, thereby promoting longevity and enhancing the overall quality of life for future generations. Furthermore, the possibility of enhancing cognitive abilities could better equip future individuals to face upcoming challenges and seize opportunities more effectively. These potential benefits were critically assessed through the principle of beneficence, which emphasizes that biotechnological innovations must be evaluated based on the benefits they offer and the harms they may cause.

As discussed in Chapter Three, Afrofuturism reimagines futures through African cultural, religious, and communal values, oriented towards collective well-being (Fayemi, 2018: 71). It enables a critical yet constructive engagement with emerging biotechnologies, such as germline enhancement, while preserving cultural identity, promoting justice, and ensuring intergenerational cohesion. In light of the potential physical and psychological harms,

Afrofuturism's emphasis on holistic well-being, which includes the physical, psychological, spiritual, and communal aspects, renders any intervention that disrupts these foundational relationships ethically problematic. This was echoed by six rural respondents, who emphasized the central role of traditional healers and herbal medicine in promoting holistic healing and balance across the mental, physical, and spiritual realms. For example, Rural Respondent 9, when asked about cultural practices that could improve life expectancy, stated that the work of *izinyanga* and *izangoma* is aimed at promoting mental, spiritual, and physical balance, which is a key to extending life.

In addressing the risks of determinism and genetic homogenization, Afrofuturism upholds plurality and diversity as essential for human flourishing. It opposes technological innovations that impose fixed or idealized standards of beauty or intelligence. Consequently, Afrofuturism advocates for a ban on editing traits based on aesthetic social ideals, such as skin colour, eye colour, or height. Additionally, psychosocial impact evaluations should be conducted before any germline interventions to identify potential harms, such as identity confusion, alienation, or psychological distress. Such evaluations must account not only for individual psychology but for cultural interpretation of identity and lineage. This approach also calls for the integration of culturally grounded counselling services for the parents and individuals born through germline enhancement technologies, fostering a sense of belonging and enabling them to interpret their identities in ways that are affirming and culturally resonant.

In evaluating and guiding the potential benefits of germline enhancement, Afrofuturism envisions such biotechnology as a potential instrument for liberation, provided it is applied with cultural intelligence, collective justice, and intergenerational solidarity. Fayemi's interpretation of Afrofuturism suggests that transhumanist interventions, including enhancing human cognition or freeing future individuals from biological constraints, may not necessarily yield negative consequences, as is often presumed (Fayemi, 2018: 72). He argues that embracing science and technology might actualize African personhood by enhancing the capacity to appreciate life in all its facets (spiritually, communally, and intellectually). However, Afrofuturism insists that such interventions be guided not by individualistic or market-driven imperatives, but by communal values and responsibilities. Therefore, there is a need to prioritize germline enhancements that address collective health challenges through public health-based selection criteria, aimed at alleviating diseases that impose a collective burden on African communities. Therapeutic applications, such as disease resistance, should

be distributed equitably to advance communal well-being rather than reinforce structural inequalities.

With regard to cognitive enhancement, Afrofuturism supports such interventions only to the extent that they contribute to communal empowerment. Enhancements should strengthen collective capabilities and not undermine traditional knowledge systems by fostering elitism or individualism. Therefore, cognitive enhancements ought to be limited to public-interest goals, such as advancing health, education, and sustainable development, rather than serving private ambitions or socially constructed ideals of superiority. As Urban Respondent 8 explained, *focusing on disease resistance is the most beneficial path forward; that way, future generations will live longer and healthier lives.* This perspective was echoed by Urban Respondent 10, who stated that *if done right and all the safety issues are addressed, parents can empower their kids and place them in a better position to succeed in certain environments or professions, as well as improve their overall health and quality of life.*

Ultimately, Afrofuturism advocates for a vision of liberation rooted in cultural pride, relational identity, and communal dignity, qualities regarded as essential markers of a good life, beyond mere biological enhancement. As Urban Respondent 10 further noted, *by granting people the opportunity to live healthier and longer lives, not limited by their cognitive or physical flaws, germline enhancement could actually enhance human dignity and empower people to take charge of their genetic legacy.* Accordingly, human germline enhancement must be directed toward improving quality of life in relational terms, encompassing mental well-being, cultural belonging, spiritual meaning, and communal participation. Such an approach ensures that biotechnologies serve as a force for uplifting historically marginalized communities, rather than deepening existing inequalities. In this way, Afrofuturism provides an ethical framework for navigating enhancement technologies, grounded in the values of justice, dignity, and collective flourishing essential to African futures.

7.2 Towards a Culturally and Spiritually Grounded Bioethics

In the previous chapter, the study's concerns were also analysed through the lens of African communitarian ethics. Three key perspectives emerged from this analysis. First, some respondents emphasized the impact of human germline enhancement on ancestral belief systems. Second, others discussed its effects on dual spirituality, a phenomenon prevalent in many African countries. Third, there were concerns rooted in Christian beliefs. The following

section provides guidance on navigating germline enhancements ethically, drawing on the study's findings and theoretical framework, which is grounded in African values such as intergenerational harmony, spiritual interconnectedness, and communal responsibility. It will explore ethical decision-making frameworks that align germline enhancement with cultural preservation and spiritual integrity, while addressing the concerns raised by the participants.

7.2.1 An Ethic of Ancestral Continuity

Among those surveyed, ethical concerns about spiritual and cultural coherence emerged most strongly in relation to ancestral belief systems. One major concern is that germline enhancement may undermine the dignity of the enhanced individuals by reducing procreation to a process of technological manipulation, rather than a sacred, lineage-based act of continuity. Rural Respondent 6 highlighted this concern with the Zulu proverb: *Umuntu akazalwa yedwa, uzalwa nomlando wakhe,* which means that an individual is always connected to their lineage, history, and broader community. Urban Respondent 6, among others, supported this viewpoint, stating that: *Using such technologies could disrupt the natural connection that future generations would have with their ancestors, weakening their sense of belonging and cultural identity.* In many African traditions, birth is viewed not only as a biological event but also as a spiritual transmission of identity and ancestral essence. Any interference in this process risks disrupting the deeply held beliefs that the living are spiritually connected to their ancestors, who serve vital roles as protectors and guides.

An ethic of ancestral continuity, rooted in the African value of intergenerational harmony, affirms the sacred and ongoing connection between individuals and their ancestors. It requires that germline enhancement be evaluated not only for its technical feasibility but also for its ability to preserve lineage integrity and maintain ancestral recognition. Some participants with Afrofuturistic perspectives did not outright reject genetic innovation; rather, they emphasized that germline enhancement should be undertaken in a way that strengthens ancestral ties rather than weakening them. Those who strongly believe in ancestral veneration may advocate for consulting traditional healers to seek guidance from ancestors before any germline intervention is carried out. For instance, Rural Respondent 9 pointed out that *perhaps the least parents can do if they truly believe in their ancestors is to consult them before initiating the process and heed the guidance they receive from them.* This illustrates that for many, consulting traditional healers is not symbolic; it is an act of relational discernment, aligning ancestral guidance with genetic decisions. To support this, intergenerational bioethics committees should be established

at the community level. These committees should include scientists, bioethicists, community leaders and elders, traditional healers, and youth representatives. They can discuss whether a proposed enhancement aligns with or conflicts with ancestral values, ensuring that decisions are relational instead of individualistic.

By grounding the decision-making process regarding germline enhancement in an ethic of ancestral continuity, African societies can maintain the integrity of their spiritual and familial lineages while navigating modern science in a way that honors both innovation and ancestral belonging. This approach aligns with Fayemi's argument that Africans have a moral duty to improve the human condition through technologies that not only advance personhood but also improve humanity (Fayemi, 2018: 73). Additionally, Thaldar (2022: 9) emphasized that the pursuit of technological advancement must resonate with Africa's moral vision of community, dignity, relational existence, and intergenerational responsibility instead of embracing value-neutral or Western-dominated ethical standards. In doing so, African societies chart a course where biotechnology is not a source of discord but a continuation of ancestral wisdom and communal integrity. This ethic of ancestral continuity affirms that germline enhancement must harmonize not only with empirical science but also with the spiritual narratives and familial bonds that sustain African lived experiences. The following perspectives further explore how dual spiritual commitments and faith-based ethics influence communal responses to germline innovation.

7.2.2 An Ethic of Spiritual Balance

Germline enhancement may redefine moral boundaries by reshaping human nature in ways society is unprepared for or unable to justify responsibly. The findings indicated a belief that genetically altered individuals might not be acknowledged by their ancestors, nor fully accepted within Christian frameworks that value natural, God-given life. This shift then challenges the spiritual foundations of personhood and may be perceived as an act of disobedience against divine authority, potentially resulting in a loss of divine and ancestral protection. Rural Respondent 3 articulated this spiritual duality, stating: Life is a gift from uMvelinqangi and one's ancestors…I believe altering genetics in this way would disrupt our understanding of the natural order and the spiritual sanctity that begins at conception. Urban Respondent 1 reinforced this viewpoint by saying, *We have various natural methods such as praying to uMvelinqangi, the Creator, and communicating with our ancestors to ensure we*

receive the blessings we need…if it's [enhancement] *not blessed in the spiritual realm, life could end at any time because you're not protected.*

An ethic of spiritual balance, rooted in the African value of spiritual interconnectedness, recognizes the complex and deeply lived reality of dual spirituality within African communities, as noted by Scroope (2019: 1) and Hexham (1981: 273) in Chapter Two, dual spirituality reflects the entangling of ancestral veneration and Christian belief, a moral landscape where spiritual coherence is paramount. This ethic advocates for germline enhancement to be assessed through a framework of integration and dialogue, ensuring that both ancestral and Christian spirituality remain active in guiding and shaping ethical futures. The findings, including Afrofuturistic perspectives, showed that some participants expressed cautious optimism toward the technology, provided it aligns with their spiritual worldviews. The ethic addresses participants' concerns by promoting inclusive moral reflection that meaningfully involves traditionally grounded Christians in discussions of the spiritual implications of germline enhancement. Their perspectives are essential for determining whether such biotechnologies support or undermine spiritual well-being. This approach aligns with Andoh's (2017: 43) assertion that the main contemporary challenge is fostering collaboration among researchers, society, and government to engage in dialogue about the values promoted by advancements in genome editing technologies. This involves discussing the values we uphold and seek to advance within the community.

In addition to the intergenerational bioethics committees mentioned earlier, it is essential to incorporate views from traditionally grounded Christians into bioethical decision-making processes. Their insights are particularly valuable in assessing whether a procedure upholds or disrupts spiritual continuity from this perspective. For example, bioethics committees must assess whether proposed procedures disrupt ancestral ties or conflict with foundational Christian principles. It is vital to provide training for those who identify as experts in this field, equipping them to understand the potential implications of germline enhancement. This preparation will enable them to offer informed, sensitive guidance to their communities.

Furthermore, they can also establish community education and dialogue spaces or workshops where people can explore questions about germline enhancement in light of their spiritual identities. These platforms can foster collective understanding, dispel misunderstandings, and affirm shared values like care, dignity, and harmony within the communities involved. By

emphasizing spiritual coherence and moral dialogue, this ethic ensures that biotechnology evolves in harmony with Africa's sacred traditions and communal futures.

7.2.3 An Ethic of Christian Stewardship

The third perspective revealed participants' concerns about the moral authority that germline enhancement seems to possess. A prevailing concern is that such interventions challenge God's sovereignty over humanity, often framed as "playing God." This discomfort reflects a belief common in African Christian communities that life is sacred and created by God with purpose and wisdom. Some participants, like Urban Respondent 4, argued that *altering human genetics would remove the sacredness of conception and birth, turning reproduction into a controlled, artificial process,* which *…goes against God's intended purpose for our offspring.* Others expressed that a child born through germline enhancement might not be regarded as fully created by God, potentially lacking divine blessings or protection.

Additionally, some participants, such as Urban Respondent 5, expressed concerns that germline enhancement could undermine *religious moral frameworks taught in church, such as humility, equality, and acceptance of natural flaws,* suggesting that humans do not have the right to change what God has made. This is especially significant since aspects, such as illness or disability are often perceived as part of God's plan for spiritual growth and divine healing. From this perspective, attempting to eliminate such imperfections could interfere with a deeper spiritual purpose. Conversely, religious participants with Afrofuturistic views, like Urban Respondent 10, suggested that germline enhancement could be embraced as God's way of granting wisdom to improve the quality of life and reduce human suffering. Overall, these participants identified disease resistance as the primary justification for germline enhancement.

An ethic of Christian stewardship affirms that humans are caretakers, not owners of life. This entails the responsible use of knowledge, power, and technology not for personal or commercial gain, but in service of God's purposes, the vulnerable, and the flourishing of all creation. Rooted in the African value of shared responsibility for life, well-being, and the future, this ethic emphasizes that human agency must operate within moral limits set by divine wisdom. It views ethical innovation as part of humanity's God-given duty to care for creation wisely and justly. Therefore, the intergenerational bioethics committees should also include theologians whose role would be to bridge the gap between faith and emerging biomedical technologies, such as human germline enhancement. These theologians can offer insights rooted in Christian ethics and scripture, helping communities interpret germline enhancement

in ways that are aligned with their values. Their presence would help ensure that moral reflections on germline enhancement remain within core theological teachings, particularly those concerning creation, suffering, and the sanctity of life, while also contributing meaningfully to the decision-making processes.

Furthermore, the committees should develop faith-informed ethical guidelines that clearly distinguish between therapeutic or healing-oriented enhancements and aesthetic or non-essential uses of germline enhancement. As Urban Respondent 10 observed, *while disease resistance aligns with Christian values of healing and compassion, enhancements for appearance risk undermining humility and equality, which are core spiritual teachings.* Therefore, these deliberations include advocating for the ban of enhancements that exacerbate inequality or promote superficial ideals of perfection. Such a framework provides a theologically grounded basis for navigating the complex ethical implications of germline enhancement. It acknowledges theological concerns regarding divine authority and creation while affirming humanity's responsibility to care, heal, and innovate in ways that uphold human dignity and promote the well-being of future generations. This approach, although it originates from different philosophical and theological foundations, aligns with Metz's (2012: 26) African conception of human dignity, which emphasizes that human life is relational, morally accountable, and centred on caring for others. Both perspectives affirm that human worth is recognized when individuals are included, cared for, and not exploited.

As shown above, a holistic ethical approach to human germline enhancement technology from an African communitarian perspective must incorporate the ethics of ancestral continuity, spiritual balance, and Christian stewardship. Such an approach recognizes that human life is embedded in a network of relationships, including past, present, and future connections, and that ethical decision-making must support these intergenerational and spiritual links. As Wiredu (2008: 335) emphasizes, African communitarian ethics are based on kinship structures that influence moral obligations and identity, where communal harmony and mutual flourishing are crucial. Gyekye (2004: 16) supports this by describing the common good as the realization of values like dignity and human potential, which arise when individuals align their actions with the interests of the broader community.

From this foundation, the ethic of ancestral continuity requires that biomedical interventions like germline enhancement honour the lineage and spiritual heritage that bind individuals to their forefathers. As Mbiti (1990) asserts, moral duty includes preserving cultural integrity,

which connects people to their ancestors and spiritual responsibilities. In turn, the ethic of spiritual balance calls for careful judgment to ensure that germline enhancement technologies do not disrupt the metaphysical balance between the physical, spiritual, and social aspects of life, a concern deeply embedded in African worldviews. Eze (2008: 393) cautions that cultural integrity must be preserved not through rigid conservatism but through responsible negotiation with change.

In this light, Christian stewardship complements and enhances these African ethical insights. It situates human agency within divine moral limits while affirming the sacred responsibility to innovate wisely, care for creation, and promote justice, especially for the vulnerable and future generations. Together, these ethical components offer a coherent framework that neither blindly rejects germline enhancement nor embraces it uncritically. Instead, they call for context-sensitive, morally grounded, and theologically informed engagement with biotechnology, which protects communal well-being, honours spiritual and ancestral obligations, and guides innovation towards the collective good. This framework does not merely regulate biotechnology; it reimagines its place in African futures, ensuring it uplifts rather than uproots, heals rather than harms.

Table 7.1 An African Ethical Approach to Human Germline Enhancement

Ethical Strand	**Core Value**	**Primary Concern**	**Guiding Principle**	**Response to Human Germline Enhancement**
Ancestral Continuity	Intergenerational harmony	Disruption to ancestral bonds and familial lineage	Preservation of cultural heritage and familial lineage in decision-making.	Establishment of Intergenerational Bioethics Committees (inclusive of community leaders and traditional healers)–to evaluate whether proposed enhancements align with ancestral values. Consultation with traditional healers

Spiritual Balance	Spiritual interconnectedness	Challenges the spiritual foundations of personhood	Aligning technological decisions with spiritual laws, ancestral authority, and cosmic balance.	Establishment of Intergenerational Bioethics Committees (inclusive of traditionally grounded Christians)–to assess whether proposed enhancements align with traditional and Christian principles. Community education and dialogue spaces/workshops
Christian Stewardship	Divine stewardship	Challenge God's sovereignty over humanity ("Playing God")	Exercise responsible stewardship over life, recognizing divine ownership and moral accountability.	Establishment of Intergenerational Bioethics Committees (inclusive of theologians)–to assess whether proposed enhancements conflict with foundational Christian principles. Develop faith-informed ethical guidelines

The above table illustrates a holistic ethical approach for evaluating human germline enhancement from an African communitarian perspective. The table is organized into three interrelated ethical strands: Ancestral Continuity, Spiritual Balance, and Christian Stewardship. Each strand is grounded in a specific core value, addresses the primary ethical concern gathered from the respondents, offers a guiding principle for moral reasoning, and suggests practical responses to human germline enhancement. The various strands come together to create a complementary and integrated approach that enables African communities to critically evaluate and guide the adoption of germline enhancement in ways that are culturally relevant, spiritually grounded, and ethically coherent. The tabular format clarifies the contribution of each strand

and demonstrates how the different worldviews can work together through dialogue to make collective decisions, reflecting the communal decision-making approach central to African ethics. This ensures that germline enhancement technologies are meaningfully integrated into African ways of life through values that promote communal integrity, spiritual well-being, and intergenerational justice.

To ensure that this framework is practical and applicable, the proposed committees outlined in the table can be integrated into South Africa's existing health research governance system, which is regulated by the National Health Act and overseen by the National Health Research Council (see page 48). In practice, the Intergenerational Bioethics Committees would complement the work of registered Health Research Ethics Committees (HRECs). While HRECs have the legally mandated responsibility to review research protocols for compliance with established ethical and scientific standards, the proposed committees would offer an additional layer of ethical reflection rooted in African communal values. The recommendations from these committees could be formally incorporated into HREC submissions or sought as advisory opinions in cases involving human germline enhancement. This approach effectively turns the framework outlined in the table into a practical governance mechanism that aligns with existing regulatory requirements while also broadening ethical deliberation to include intergenerational and culturally embedded concerns. This integration positions the proposed framework as a normative and institutional extension of current bioethical governance in South Africa, rather than serving as an alternative.

7.3 Researcher Positionality on Human Germline Enhancement in the African Context

As a researcher, I take a contextual and critically balanced stance on human germline enhancement. On one hand, the findings align with key biomedical ethical principles, particularly beneficence, as germline enhancement has the potential to reduce human suffering by eradicating hereditary diseases and improving overall societal well-being. In the African context, where access to healthcare is often uneven and genetic conditions can impose significant burdens on families and communities, such interventions could make a meaningful contribution to human flourishing.

However, this potential must be weighed against serious ethical concerns arising from African ontological perspectives. Participants pointed out that human germline enhancement could disrupt deeply rooted cultural frameworks that prioritize ancestral continuity, spiritual

interconnectedness, and communal identity. In communities such as the Zulu, where personhood is relational and extends beyond the individual to include the living, the living dead, and future generations, genetic modification poses important questions about the integrity of lineage and the meaning of being authentically African. Additionally, the findings indicate a lack of uniformity in these viewpoints. For instance, some religious perspectives hold that human beings are created in the image of God and are, thus, inherently complete. From this standpoint, germline enhancement could be seen as an unjustified alteration of divine creation, thereby introducing further ethical tension.

Therefore, I argue that human germline enhancement should neither be uncritically accepted nor entirely rejected in the African context. Instead, a qualified acceptance guided by ethical considerations is warranted, driven by the potential benefits of this technology. Importantly, this acceptance must be structured to avoid reproducing or deepening existing inequalities within African societies. In this sense, the ethical permissibility of germline enhancement depends on its context-sensitive adaptation, ensuring the innovation is pursued responsibly and inclusively. The central challenge is to articulate a pathway that advances biomedical progress while remaining attuned to the social, cultural, and ontological dimensions of what it means to be African, as reflected in the holistic ethical paradigm proposed in this chapter.

7.4 Conclusion

This chapter has proposed a culturally rooted ethical framework for engaging with bio-enhancement, particularly germline technologies, through an African communitarian lens. By incorporating philosophical and indigenous African ethical perspectives, the chapter proposed a dual approach to ensure that emerging technologies resonate with African values of communal well-being, intergenerational responsibility, and moral integrity. The first approach advocates for integrating African communitarian values into existing biomedical ethical frameworks. These values encompass communal obligations, concerns for future generations, and conceptions of human dignity as articulated by Metz, specifically the components of vitality and community. Additionally, this approach incorporates Afrofuturism as a forward-looking, culturally rooted perspective that envisions technological progress in harmony with African identities and aspirations.

Within the first approach, the framework addressed a range of ethical challenges by grounding bio-enhancement within African communitarian ethics. Autonomy and moral decision-making

were reinterpreted to reflect the influence of cultural norms and collective moral authority. Rather than relying solely on individual choice, the approach emphasized the need for bioethics literacy campaigns led by scientists and ethicists to ensure the public is adequately informed about the scientific and moral implications of enhancement technologies. Physical, psychological, and safety risks were evaluated through Metz's dignity-based ethics, which prioritize bodily integrity and the capacity for moral development. The framework concluded that germline interventions should proceed only when safety is assured, with a strong preference for reversible modifications. Ethical approval was deemed valid only when based on community-level consensus aligned with African conceptions of dignity.

Concerns regarding determinism, genetic diversity, and homogenization were reframed through a communitarian lens that treats these risks as potential forms of collective and intergenerational harm. To address this, the chapter recommended the formation of ethics councils composed of cultural custodians and bioethicists, mandated to evaluate enhancement proposals using culturally grounded and pluralistic standards. Legal protections for genetic diversity, similar to those already in place for language, culture, and heritage, were also proposed. The framework further addressed the inequalities stemming from genetic privilege and social stratification by grounding justice in intergenerational responsibility and community continuity. It emphasized the ethical obligation to resist the emergence of genetic hierarchies through a commitment to the well-being of both present and future generations. To institutionalize this commitment, the framework proposed the establishment of legally mandated national communal bioethics councils. These councils would facilitate consensus-based ethical deliberation, ensuring that decisions about germline enhancement reflect shared communal values, prevent elite dominance, and uphold collective moral accountability.

Furthermore, the approach aimed to safeguard cultural continuity by promoting the integration of communal bioethics into national constitutions and health policies. It acknowledged that ethical governance must be culturally rooted to remain relevant and legitimate within African contexts. Finally, the framework turned to Afrofuturism as a primary ethical perspective for balancing the potential benefits and harms of germline enhancement. Instead of seeing the future as solely a technological space, Afrofuturism envisions it as strongly connected to African culture, spirituality, and communal traditions. It presents a vision of the future grounded in justice, dignity, and collective well-being. These values are vital for guiding bio-enhancement technologies in ways that align ethically and culturally with African societies.

The second approach developed an independent African bioethical model rooted in the ontological and spiritual worldviews of the Zulu people in South Africa. This framework is based on three interconnected ethical principles. First, the ethic of ancestral continuity emphasizes moral obligation to both past and future generations. It highlights the importance of preserving moral lineage and cultural heritage. Second, the ethic of spiritual balance promotes harmony between the physical and spiritual realms, guiding ethical engagement with emerging technologies. Third, the ethic of Christian stewardship calls for the responsible care of life and nature as divinely entrusted creations. This aligns bio-enhancement with theological values such as humility, service, and moral accountability.

Together, these principles offer a culturally embedded ethical lens for evaluating human germline enhancement. When combined with the first approach, they form a comprehensive and culturally grounded ethical paradigm for navigating the promises and perils of germline enhancement technologies in Africa. These approaches move beyond reactive or externally imposed bioethics by offering proactive, context-sensitive frameworks that prioritize communal integrity, justice, and the collective good. Together, these frameworks do not merely reflect ethical positions; they define a moral path for African futures, ensuring that human enhancement is also a cultural preservation, spiritual integrity, and communal flourishing. This was followed by a tabular representation of how the proposed ethical approach operates, offering a summary of its core ethical strands, values, guiding principles, and responses to human germline enhancement. The following chapter presents the study's final conclusions, demonstrating how the objectives of the study were achieved and how the research questions posed at the outset have been addressed.

CHAPTER EIGHT
SUMMARY AND CONCLUSION

8.0 Introduction

This chapter presents a summary and comprehensive conclusion of the study's findings. It is divided into three sections: the first provides a brief overview of each chapter; the second presents the study's conclusions, demonstrating how each of the four research sub-objectives from Chapter One has been fulfilled; and the third outlines how the study achieved its main objective by emphasizing the significance and implications of the proposed ethical paradigm.

8.1 Summary of the Study

The study aimed to critically examine how the Zulu ontological understanding of the sanctity of life shapes ethico- cultural responses to human germline enhancement. Chapter One introduced the study by outlining its background and motivation, particularly the increasing relevance of germline enhancement technologies and their potential impact on African societies. It identified the research problem, highlighted the significance of the study, and presented the main and supporting research questions.

Chapter Two reviewed relevant literature, focusing on global debates surrounding human germline enhancement, including arguments for and against the technology. It then discussed African perspectives on the technology, narrowing the study's focus to the ontological and ethical beliefs of the Zulu people of South Africa. In doing so, the chapter highlighted the research gap: the limited culturally specific evaluations of the ethical implications of human germline enhancement.

In Chapter Three, the study outlined the theoretical framework, which combined principlism and African Communitarian Ethics. Here, the study demonstrated how principlism can be used to evaluate the risks and benefits associated with human germline enhancement, while African Communitarian Ethics situates moral decision-making within collective values and intergenerational responsibility. The latter enabled the study to describe the culturally grounded insights of its participants and also prescribe ways to assess human germline enhancement within African contexts. Additionally, the chapter examined the strengths and limitations of both frameworks, showing their value and constraints in addressing the ethical challenges posed by germline enhancement. Chapter Four detailed the study's methodology, including the

research design, study area, sampling methods, and the strategy of inquiry applied in analysing the data.

Chapter Five presented the study's empirical findings gathered from the one-on-one interviews. These findings were organized into themes that reflected both the literature review and the participants' responses. Each theme covered the perspectives of rural and urban respondents separately, allowing for an accurate representation of both viewpoints and highlighting the similarities and differences between the two. This ensured that both traditional and modern voices were included in the study's inquiry. Below is a list of the themes discussed in this chapter:

1. Applications of Human Germline Enhancement
2. Safety and Efficacy Concerns of Human Germline Enhancement Technologies
3. The Impact of Parental Genetic Choices on Future Generations
4. Socio-Cultural and Religious Implications of Human Germline Enhancement
5. Parallels Between Zulu Cultural Practices and Human Germline Enhancement

Chapter Six discussed and analysed the findings in relation to the reviewed literature and the study's theoretical framework. The analysis was also organized into themes that aligned with each ethical framework. Under Principlism, concerns included limited autonomous decision-making, the potential for misuse, off-target effects, long-term harms, and the risk of physical deformities that could cause psychological distress. Participants also raised fears about genetic privileges that could exacerbate social inequalities, lead to social stratification and marginalization, and threaten individuality, genetic diversity, and core Zulu cultural traditions. The analysis also explored the potential benefits of the technology, such as improved communal well-being and societal advancement. Through the lens of African Communitarian Ethics, the participants raised the following concerns: threats to personhood and human dignity, potential disruption of ancestral connections, challenges to the spiritual duality of the Zulu people, conflicts with Christian understandings of life and creation, and threats to cultural and religious obligations. The chapter concluded by reflecting on the participants' Afrofuturistic perspectives.

Chapter Seven presents the study's main contribution: the development of a holistic ethical paradigm for human germline enhancement from an African communitarian perspective.

Drawing on participants' insights, the chapter integrates two complementary approaches. The first embeds African communitarian values within biomedical evaluation, ensuring that ethical assessments of germline enhancement remain inclusive, culturally grounded, and aligned with African social realities. The second advances an independent African bioethical model based on culturally specific worldviews, with particular emphasis on Zulu ontological and moral perspectives. Together, these approaches demonstrate how African ethical traditions can work alongside scientific innovation to offer a coherent framework for guiding the responsible use of germline enhancement in African contexts.

8.2 Conclusions

The study's sub-objectives were as follows:

1. To determine the nature of human germline enhancement.
2. To explore the key ethical issues associated with human germline enhancement.
3. To examine the ethico-cultural challenges that human germline enhancement poses to the Zulu ontology.
4. To assess how insights from Zulu ontology on the sanctity of life, together with Principlism, and African Communitarian Ethics, can guide the development of a culturally grounded bioethical framework for human germline enhancement in Africa.

8.2.1 The nature of human germline enhancement

The study established that human germline enhancement involves the intentional modification of reproductive cells in ways that can affect not only an individual's traits, but also those of their descendants (Hersch, 2020: 3). Unlike somatic gene therapy, which alters non-reproductive cells and affects only the treated individual, germline enhancement is heritable and permanent, making it a far more significant intervention. Furthermore, its implications extend beyond merely correcting genetic diseases; it also has the potential to enhance desirable traits, such as increased life expectancy, improved cognitive ability, and physical enhancement (Buchanan, 2011). This dual-purpose places germline enhancement in a grey area between therapy and augmentation, blurring the lines between medical treatment and human enhancement.

The study further revealed that the transformative breakthrough in germline enhancement emerged in 2012 with the development of CRISPR, which is a technology that enables precise

and efficient modifications to DNA within a relatively short period (weeks), making it one of the most significant advancements in modern molecular biology (Aliouche, 2019: 1). This has enabled scientists to explore applications ranging from disease prevention to more speculative forms of human enhancement. However, studies have shown that one significant drawback of this technology is that it occasionally produces unintended alterations (off-targets) to the genome (Alexiou et al., 2020: 63). While some of these changes may be minor, they are particularly concerning because such changes would be passed down to future generations. Moreover, even in cases where no immediate errors are detected, there remains the possibility of delayed or unforeseen consequences arising over time. This reinforces the need for careful oversight and ongoing monitoring of this particular research (Alexiou et al., 2020: 64). These risks highlight the tension between the transformative potential of germline enhancement and the ethical responsibility to protect future generations.

8.2.2 The key ethical issues associated with human germline enhancement

The study discussed that human germline enhancement has generated considerable public debate and a wide range of ethical concerns, including the safety and efficiency of the technology, the question of consent from future generations, and the socio-cultural and religious implications associated with germline enhancement, highlighting the embryonic research phase. Pang and Ho (2016: 59) caution that despite technological advances in germline enhancement, significant safety uncertainties persist, preventing its clinical use. They argue, however, that ongoing research is essential to assess long-term effects and may gradually reduce error rates to safer levels. Among the most pressing issues are off-target effects, whose unpredictable occurrence could produce unintended consequences for the human genome and pose risks to future generations (Khan, 2019: 326). Therefore, ensuring precise genome modification and prioritizing patient safety are central to the ethical acceptance of germline enhancement. Many researchers argue that clinical applications of germline editing remain a distant prospect because its irreversible nature would require entirely new clinical guidelines or substantial revisions to existing somatic therapy protocols to safeguard against potential harm (Shinwari et al., 2018: 105).

In addition to safety and efficacy concerns, the study revealed that altering the human genome also raises profound ethical questions about decision-making and consent. As Shinwari et al. (2018: 106) highlight, these questions can be framed around the “three W’s”: who decides, what modifications are made, and for whom? Such concerns intersect with broader debates

about parental authority and the rights of future generations. Should parents have full autonomy to determine their children's genetic traits, or would such choices unjustly impose decisions on individuals who cannot yet consent? Andoh, Ishii, and Beriain, further argue that if prospective parents do not fully understand the potential risks and unintended consequences, adverse outcomes could arise, which would affect the enhanced individuals, such as the straining of parent-child relationships, and the fostering of prejudice against those with unintended traits, thereby compromising the welfare of future generations (Andoh, 2011: 73; Ishii & Beriain, 2019: 371).

Furthermore, some scholars, such as Shozi, Alonso, and Savulescu, argue for government-imposed limits on parental freedom to address the above concerns. They posit that the act of selecting traits for one's child is itself ethically problematic, as it creates a "collision" between the prospective parent's interest in shaping the child and the child's future sense of self (Shozi: 2020: 63). This tension gives rise to the "non-identity" problem, wherein the child may struggle to identify with traits imposed by parental choice, which cannot be undone (Alonso and Savulescu, 2021: 569). Pang and Ho (2016: 61) also caution that such practices could be perceived as dehumanizing, potentially contributing to the rejection of germline enhancement.

Another critical ethical concern highlighted in the study discussed is that germline enhancement fundamentally revolves around the unresolved moral status of the human embryo. As emphasized by Brokowski and Adli (2019: 92), the controversy surrounding embryonic research is not solely about technological possibilities but rather about the unresolved question of when an embryo acquires personhood. While scientists may broadly accept the technical boundary of 14 days for embryo research, there remains no consensus regarding the point at which embryos should be accorded moral status. Therefore, Brokowski and Adli (2019: 92) warn that ignoring such fundamental issues risks enabling practices that are considered deeply unethical by many.

Religious perspectives further complicate this debate with major world religions (Christianity, Judaism, Hinduism, Buddhism, and Islam), diverging in their ethical evaluations of genetic technologies, also offering no universal consensus (Warmflash, 2019: 1). Beyond religious objections, scholars such as Andoh (2017), Shinwari et al. (2018), and McMahon (2020) caution technologically advanced nations could exploit germline technologies to engineer "superior" population, intensifying global inequalities and fueling a new era of consumer

eugenics. This trajectory risks reducing human identity to a product of design, undermining fundamental values of liberty, equality, and uniqueness (Player & Matsuura, 2020: 3). Recognizing these challenges, leading scientists and ethicists, including developers of these technologies, have called for a temporary moratorium on germline enhancement, stressing the need for robust governance frameworks before these technologies are integrated into society (Cavaliere et al., 2019: 80).

8.2.3 The ethical and cultural challenges that human germline enhancement poses to the Zulu ontology

To address this sub-objective, the study relied on primary data gathered from Zulu respondents, together with the insights from the literature reviewed in Chapter Two. The findings indicate that human germline enhancement poses several ethical and cultural challenges to Zulu ontology. These challenges include: threats to personhood and human dignity, potential disruption of ancestral connections, challenges to the spiritual duality of the Zulu people, conflicts with Christian understandings of life and creation, and threats to cultural and religious obligations.

From a Zulu perspective, germline enhancement threatens personhood and human dignity by reducing individuals to products of design rather than sacred beings whose dignity emerges through community, ancestry, and ethical conduct. This echoes Menkiti's (1984: 171) communitarian view that personhood is a moral achievement developed over time within a community. Zulu ontology views life as a sacred process of becoming, grounded in ancestral relationships and moral behaviour. By pre-determining traits genetically, germline enhancement shifts dignity from a communal and spiritual attainment to a biologically manufactured product, thereby undermining the sanctity of life. Isa and Safian-Shuri (2018: 118) similarly warn that such enhancement risks turning procreation into a manufacturing process, diminishing the moral status of enhanced individuals, and threatening their recognition as full persons.

A further concern relates to the discarding of human embryos during germline enhancement, which challenges the Zulu view of personhood by raising questions about when life begins and how dignity is recognised (Mbiti, 1990: 108; Menkiti, 1984: 171). Unlike Western perspectives that emphasise autonomy and rationality, the Zulu view understands moral worth in terms of contribution to community well-being, and life is sacred even in its potential form. Embryos

are therefore seen as possessing moral and spiritual value through their connection to the ancestral and divine realms. Discarding embryos based on genetic desirability disrupts this spiritual dimension of personhood and undermines the Zulu belief that every stage of human development carries intrinsic worth (Eze, 2008: 387).

Within the Zulu view, germline enhancement raises ethical concerns by potentially disrupting ancestral connections, which are central to guiding and protecting future generations. Ancestors are believed to pass down both physical and spiritual traits, regarded as blessings that contribute to a child's future well-being (Mbiti, 1990: 141). Technological intervention in the genome may interfere with these spiritual and intergenerational connections, threatening the sacred continuity of ancestral veneration. Identity and personhood are formed relationally through community and ancestral lineage (Eze, 2008: 386); predetermining traits through germline enhancement risks shifting personhood toward individualistic "design", undermining the moral, spiritual, and communal foundations of Zulu identity.

The findings also highlight concerns regarding the challenges that human germline enhancement might pose to the Zulu spiritual duality of life, where life is considered a sacred gift from uMvelinqangi and one's ancestors. Altering genetics is perceived as a disruption of this natural spiritual order, particularly regarding the sanctity of conception. Technological interventions that override fertility outcomes may be interpreted as acts of spiritual disrespect, privileging parental desires over divine or ancestral intentions. This dual threat undermines both ancestral reverence and Christian beliefs in divine creation, eroding cultural identity and moral clarity concerning the meaning of human life (Scroope, 2019: 1; Hexham, 1981: 273). Despite exposure to modern ideologies and technologies, the foundational principles of relationality, spiritual interconnectedness, and reverence for the sacred remain deeply embedded in Zulu cultural and social life, affirming the enduring influence of this dual spiritual framework (Nwoye, 2017: 52; Scroope, 2019: 2).

Human germline enhancement is seen as a direct challenge to Christian beliefs regarding divine creation and human purpose. In Zulu ontology, life is also understood as a gift from uNkulunkulu alone as the sole determiner of human existence. Selecting or designing traits is perceived as undermining divine authority, implying that human judgment can override God's will. This aligns with the classic Christian critique of "playing God", as highlighted by Isa and Safian-Shuri (2018), Warmflash (2019), Liao (2019), and Shozi (2020), reflecting discomfort

with the moral authority assumed through germline enhancement. Within the Zulu worldview, such interventions are viewed not only as a challenge to God's intentional creation but also as a potential source of moral and spiritual dehumanization of future generations.

Finally, the findings indicate that germline enhancement poses a threat to the preservation of traditional and religious values. Practices such as *Ukubikwa kwesisu* and *Imbeleko* could be compromised because individual characteristics are believed to be expressions of ancestral heritage and divine will, rather than products of human design. This perspective is supported by Mbiti (1990), Gyekye (2004), and Wiredu (2008), who emphasize that communal values and ethical traditions are moral goods that sustain intergenerational continuity. Wiredu (2008: 335) points out that communal life depends on shared understandings of humanity. Additionally, from a religious perspective, assuming the authority to design offspring undermines God's sovereignty and sanctity of life, transforming children from sacred gifts into mere products of human engineering.

8.2.4 How Principlism and African Communitarian Ethics guided the development of a culturally grounded bioethical framework for human germline enhancement in Africa

Through the adopted ethical framework, the study conducted a comprehensive analysis of the findings, with the main concerns articulated under each guiding theory. This approach allowed for a systematic evaluation of these concerns and facilitated the development of a culturally sensitive bioethical framework for assessing human germline enhancement. This framework constitutes the first component of a two-part holistic paradigm proposed by the study. The second component, which directly relates to the study's primary objective, will be presented in the following section.

Through Principlism, the key concerns that emerged were limited autonomous decision-making, potential misuse of the technology, unforeseen off-target and long-term effects. Additionally, there were risks of physical deformities and psychological distress, issues of genetic privilege, and widening of social inequalities. Other notable concerns included determinism and the disruption of cultural practices and beliefs. Principlism provided a structured means of mapping these concerns onto globally recognized biomedical principles, thereby serving as an effective evaluative tool. The principle of beneficence, in particular, was used in the study to highlight potential benefits the participants noted, such as equipping future

generations with advantageous traits that may enhance resilience to disease, improve cognitive capacities, and promote overall quality of life. These perceived benefits were interpreted as contributing to communal well-being and societal advancement, a theme that intersected with Afrofuturistic perspectives within African Communitarian Ethics.

African Communitarian Ethics, applied both descriptively and prescriptively, provided the cultural values necessary to contextualize these findings within African settings. This framework emphasized moral obligations toward the community and future generations, as well as the intrinsic value of human dignity, as articulated by Metz. It also incorporated the forward-looking Afrofuturistic elements. By incorporating these values, the study ensured that the ethical evaluation of germline enhancement extended beyond abstract biomedical principles to include considerations rooted in African worldviews. Overall, Principlism and African Communitarian Ethics functioned as complementary in the development of a culturally sensitive bioethical framework, capable of addressing both the challenges and potential benefits of human germline enhancement in Africa.

8.3 How the Zulu ontological understanding of the sanctity of life shapes ethical and cultural responses to human germline enhancement

To achieve the main objective, the second part of the proposed holistic paradigm presents an independent African bioethical model based on culturally specific worldviews. By focusing on Zulu moral and spiritual perspectives, it reconceptualizes the evaluation of germline enhancement technologies through three interrelated ethical strands: ancestral continuity, spiritual balance, and Christian stewardship. This approach demonstrates how bioethics can be grounded in African values and traditions, offering context-sensitive responses to global technologies rather than relying on externally imposed ethical models.

The ethic of ancestral continuity emphasizes the importance of intergenerational harmony and cautions that human germline enhancement could sever ancestral bonds and disrupt familial lineage. Guided by the principle of preserving cultural heritage, this strand calls for the establishment of Intergenerational Bioethics Committees that include traditional healers and community leaders to evaluate whether proposed enhancements align with ancestral authority. Additionally, the ethic of spiritual balance upholds spiritual interconnectedness, insisting that technological decisions must respect spiritual order and preserve harmony. Here, the committees would include traditionally grounded Christians and be complemented by

community dialogue workshops, providing platforms to evaluate whether interventions align with a dual spirituality that integrates both traditional and Christian principles. Finally, the ethic of Christian stewardship emphasizes divine custodianship, viewing life as a sacred trust belonging to God. To guard against "playing God", this strand requires committees involving theologians and the development of faith-informed ethical guidelines to ensure innovations reflect moral accountability and justice.

Together, these strands show how the Zulu understanding of life's sanctity shapes responses to human germline enhancement. Grounded in ancestral legitimacy, spiritual harmony, and divine stewardship, the framework evaluates biotechnology beyond biomedical terms, ensuring it upholds African cultural and spiritual values. In this way, the Zulu perspective positions bioethics as a guide for innovation that promotes healing and communal flourishing rather than individual gain.

8.4 Contributions, limitations, and future research

This study makes several key contributions to the ethical evaluation of human germline enhancement in African contexts. It develops a two-tier ethical paradigm that integrates normative tools of principlism with the conceptual foundations of African communitarian ethics, offering a culturally grounded framework for bioethical decision-making. The study introduces three moral strands: ancestral continuity, spiritual balance, and Christian stewardship, which serve as culturally informed criteria for evaluating emerging biotechnologies. Furthermore, it proposes the establishment of Intergenerational Bioethics Committees and Cultural Impact Assessments to formalize community participation in bioethical governance. The research also promotes the concept of genetic pluralism as a moral and cultural right that is comparable to linguistic and heritage rights. Additionally, it shows how Afrofuturism can align technological advancement with African moral perspectives.

Despite these contributions, the study has several limitations. Its focus on Zulu participants means that the findings may not fully represent all African societies. The qualitative nature of the data, while insightful, reflects subjective perceptions that may evolve over time. Moreover, the development of the normative framework was constrained by the absence of empirical evidence on the long-term outcomes of human germline enhancement, as the technology remains emergent and has not progressed into any approved clinical phase where such data could be produced.

Future research should therefore explore how the proposed framework functions across diverse African communities through comparative studies. Empirical investigations into the effectiveness of community-based bioethics committees in genomic decision-making would also be valuable. Further research is needed to examine legal and policy frameworks that recognise the cultural and ethical considerations of genetic decision-making. Developing educational tools to improve the understanding of cultural ethics in African healthcare settings is equally important. Longitudinal studies could help illuminate the broader social and spiritual implications of germline enhancement in African contexts.

This study contributes to the ongoing effort to decolonize bioethics by placing African moral thought at the centre of deliberations on emerging technologies. It affirms that ethical innovation must protect both human dignity and cultural integrity. By situating human germline enhancement within the spiritual and communal worldview of the Zulu people, this research offers a pathway toward a more inclusive, holistic, and future-oriented bioethics for Africa.

8.5 Conclusion

The chapter summarized the study's main findings and demonstrated how the research objectives were successfully addressed. First, the chapter established that human germline enhancement entails the intentional modification of reproductive cells in ways that affect both prospective individuals and their descendants. While this technology offers the potential for disease prevention and human enhancement, it also carries significant risks, including unintended genetic alterations and long-term uncertainties, which necessitate strict oversight. Second, the study highlights the ethical issues surrounding human germline enhancement, particularly concerns about safety, consent for future generations, and the broader socio-cultural and religious implications. These concerns have led many scientists and ethicists to call for a moratorium until appropriate governance structures are established. Third, the chapter showed that germline enhancement poses profound challenges to Zulu ontology, threatening concepts such as personhood, ancestral bonds, spiritual duality, Christian beliefs, and cultural obligations.

The chapter demonstrated how the study utilized Principlism and African Communitarian Ethics to guide the development of a culturally sensitive bioethical framework for human germline enhancement. This illustrated the first part of the proposed holistic paradigm, which argues for the integration of African communitarian values into the biomedical ethical

evaluation of germline enhancement. The second part addresses the main objective: examining how the Zulu ontological understanding of the sanctity of life shapes ethical and cultural responses to germline enhancement. It does so through the ethical strands of ancestral continuity, spiritual balance, and Christian stewardship, which provide concrete guidance on evaluating germline interventions. Together, these strands translate Zulu moral and spiritual values into practical criteria for assessing the ethical appropriateness of germline enhancement technologies.

Finally, the chapter concluded by highlighting the study's contribution to the ethics surrounding emerging biotechnologies. It affirmed that ethical innovation must safeguard both human dignity and cultural integrity, while providing a holistic, inclusive, and future-oriented framework for human germline enhancement within African contexts. It also acknowledged the study's limitations and pointed to future research directions, including comparative studies, empirical evaluation of bioethics committees, and the development of legal and educational pathways to support culturally sensitive governance of germline technologies.

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APPENDICES

APPENDIX 1: Interview Guide (English)

Research Title:

Human Germline Enhancement Technology and the Zulu Ontology on the Sanctity of Life: An Ethico-Cultural Inquiry

Summary of Human Germline Enhancement:

Human germline enhancement refers to the practice of modifying the genetic makeup of an individual's reproductive cells, such as sperm or eggs, to produce changes that can be passed down to future generations. This process involves genetic engineering techniques that aim to enhance certain desirable traits, such as intelligence, physical appearance, life expectancy, or disease resistance. It is a controversial and ethically complex practice that raises important questions about the limits of science and the long-term consequences of altering human genetics.

Potential risks include:

- Unintended genetic effects: where changes may occur in the wrong areas of the genome.
- Irreversible changes: alterations are made in such a way that they are passed on to future generations and cannot be easily reversed.

Meaning of the Sanctity of Life:

The sanctity of life refers to the belief that human life is inherently valuable, deserving of respect and protection, and connected to moral or spiritual significance.

Interview Questions

A. Knowledge of Human Germline Enhancement

1. Before this research, did you have any knowledge of human germline enhancement? Please explain how you came about that information.
2. Based on the summary above, what benefits of human germline enhancement do you find interesting and why?
3. What advantages do you believe may be beneficial to the Zulu community and why?
4. How do you believe human germline enhancement would impact the Zulu community, including any potential risks you think might arise?
5. What types of genetic enhancements do you believe are morally permissible and why?
6. What do you perceive as the potential consequences of allowing parents to select traits for their children?
7. Research in human germline enhancement often requires discarding some embryos to modify them. Do you consider this equivalent to ending a human life? Please elaborate.

B. Impact on Cultural and Religious Beliefs:

1. What are the Zulu traditional beliefs regarding the sanctity of life from conception?
2. Why is it important to preserve the sanctity of life within the Zulu culture?
3. How might human germline enhancement affect African communitarianism?
4. Are there any Zulu traditional customs or practices that resemble human germline enhancement? Please elaborate.
5. Are there cultural practices or beliefs that may influence your participation in human germline enhancement? Please elaborate.
6. Could your religious beliefs affect your participation in human germline enhancement? Please elaborate.
7. Do you think participating in human germline enhancement may be seen as taking on the role of God/uMvelinqangi? Please comment.

***** Thank you for your participation*****

APPENDIX 2: Interview Guide (IsiZulu)

Isihloko Socwaningo:

Ubuchwepheshe Bokuthuthukisa Izigaxa Zofuzo Emntwaneni (Human Germline Enhancement) kanye Nezinkolelo ZamaZulu Ngobungcwele Bokuphila: Ucwaningo Lwezokuziphatha Nezamasiko

Isifingqo Sokuthi Kuyini Ukuthuthukisa Izigaxa Zofuzo

Ukuthuthukiswa kwezinto zofuzo zomuntu kubhekisela emkhubeni wokuguqula ufuzo lwesidoda noma lweqanda lomuntu ngendlela eyenza izinguquko zidluliselwe ezizukulwaneni ezizayo. Le nqubo isebenzisa amasu okushintsha izakhi zofuzo ukuze kuthuthukiswe izici ezithile ezifiselekayo, njengokuhlakanipha, ukubukeka komzimba, isikhathi sokuphila, noma ukumelana nezifo. Kuyinto ephikisanayo futhi eyinkimbinkimbi ngokwezomthetho neyokuziphatha, ephakamisa imibuzo ebalulekile mayelana nemikhawulo yesayensi nemiphumela yesikhathi eside yokuguqula izakhi zofuzo zomuntu.

Izingozi ezingaba khona:

- **Imiphumela yofuzo engahlosiwe (off-target effects):** lapho izinguquko zofuzo zingase zenzeke ezingxenyeni ezingafanele ze-genome.
- **Izinguquko ezingahlehliswa:** izinguquko zenziwa ngendlela yokuthi zidluliselwe ezizukulwaneni ezizayo futhi azikwazi ukuhlehliswa kalula.

Incazelo yobungcwele bokuphila:

Ubungcwele bokuphila bubhekisela enkolelweni yokuthi ukuphila komuntu kunenani elikhulu, kufanele kuhlonishwe futhi kuvikelwe, futhi buhlobene nokubaluleka kokuziphatha, okungokomoya, kanye nesibopho ezizukulwaneni ezizayo.

Imibuzo

A. <u>Ulwazi Ngokuthuthukisa Izigaxa Zofuzo</u>

1. Ngaphambi kwalolu cwaningo, wake wezwa noma wazi ngani ngokuthuthukiswa kwezinto zofuzo zomuntu? Ngicela uchaze ukuthi ulwazi lwakho lufike kanjani kuwe.
2. Ngokusekelwe kulesi sifinyezo esingenhla, yiziphi izinzuzo zokuthuthukiswa kwezinto zofuzo zomuntu ezikuthakazelisayo, futhi kungani?
3. Yiziphi izinzuzo ocabanga ukuthi zingasiza umphakathi wamaZulu, futhi kungani?
4. Ucabanga ukuthi ukuthuthukiswa kwezinto zofuzo zomuntu kungaba namuphi umthelela emphakathini wamaZulu, kuhlanganise nezingozi ezingase zivele ocabangayo?

5. Yiziphi izinhlobo zokuthuthukiswa kwezinto zofuzo ozibona zingenziwa ngokuziphatha, futhi kungani?
6. Ucabangani ngemiphumela engase ivele uma abazali bevunyelwa ukukhetha izici zomntwana wabo?
7. Ucwaningo lokuthuthukiswa kwezinto zofuzo luvame ukubandakanya ukulahla ezinye izibungu ukuze ziguqulwe. Ingabe ukulahlwa kwalezi zibungu kubhekwa njengokubulala umuntu? Ngicela uchaze kabanzi.

B. <u>Umthelela Ekukholweni Nasemasikweni</u>

1. Yiziphi izinkolelo zendabuko zabaZulu mayelana nobungcwele bokuphila kusukela ekuqaleni kokukhulelwa?
2. Kungani kubalulekile ukuvikela ubungcwele bokuphila emasikweni amaZulu?
3. Ukuthuthukiswa kwezinto zofuzo zomuntu kungathinta kanjani umqondo wobumbano lomphakathi wase-Afrika (African communitarianism)?
4. Ingabe kukhona amasiko noma imikhuba yendabuko yamaZulu efana nokuthuthukiswa kwezinto zofuzo zomuntu? Ngicela uchaze kabanzi.
5. Ingabe kukhona amasiko noma izinkolelo ezingathinta ukuzibandakanya kwakho ekuthuthukisweni kwezinto zofuzo zomuntu? Ngicela uchaze kabanzi.
6. Ingabe ukholo lwakho lungathinta indlela obheka ngayo noma ukuzibandakanya kwakho ekuthuthukisweni kwezinto zofuzo zomuntu? Ngicela uchaze kabanzi.
7. Ucabanga ukuthi ukuzibandakanya ekuthuthukisweni kwezinto zofuzo zomuntu kungabonakala njengokuthatha indima kaNkulunkulu noma kaMvelinqangi? Ngicela uphawule.

Ngiyabonga kakhulu ngobamba iqhaza kwakho

APPENDIX 3: Letter requesting consent

November 10, 2021

Dear Sir/Madam

My name is Nothando Happy-Girl Shandu. I am a Doctoral candidate at the University of KwaZulu-Natal in South Africa. The title of my research is Human Germline Enhancement Technology and the Zulu Ontology on the Sanctity of Life: An Ethico-Cultural Inquiry. I would like to ask you some questions about the ethical and cultural views on human germline enhancement technologies. This project will be conducted under the supervision of Dr Beatice Okyere-Manu (UKZN).

I am hereby seeking your consent to interview you on the topic outlined above. I have attached a copy of the interview questions to guide our discussion. Please note that additional follow-up questions may arise based on your responses. The interview is expected to take about one hour. I would greatly appreciate your favorable response.
If you would like any further information or have any questions, please do not hesitate to contact me on my number/email below:

Cell phone number: +2[redacted]
Email Address: shandun@ukzn.ac.za/ 214516881@stu.ukzn.ac.za

You can also confirm my credentials with my supervisor as well as my college research office. The details are as follows:

Supervisor:
Dr Beatrice Okyere-Manu
Telephone number: +27 (033) 260 5582
Email: okyere-manu@ukzn.ac.za.

HSSREC Research Office:
Ms Mariette Snyman
Tel: 0312608350/4557/3587
Email: hssrec@ukzn.ac.za

Thank you for your cooperation.

Yours sincerely,
Nothando Happy-Girl Shandu

[redacted]

School of Religion, Philosophy and Classics
Postal Address: Private Bag X01, Scottsville 3209, South Africa
Telephone: +27 (0) 33 260 5540 Facsimile: +27 (0) 33 260 5858 Email:Mchunua@ukzn.ac.za Website:www.ukzn.ac.za

APPENDIX 4: Informed Consent in English

INFORMED CONSENT

Title: Human Germline Enhancement Technology and the Zulu Ontology on the Sanctity of Life: An Ethico-Cultural Inquiry

Name of Researcher: Nothando Happy-Girl Shandu

Email: shandun@ukzn.ac.za/214516881&stu.ukzn.ac.za

For the participant:

- I voluntarily agree to participate in the research described to me by the researcher. The purpose and procedures of the study have been explained, and I understand what my participation involves.
- I am participating of my own free will.
- I understand that the researcher will conduct an interview and may record or take notes during our conversation.
- I acknowledge that the researcher provided information about this study before the interview.
- I have been assured that my identity will remain confidential and anonymous.
- I understand that the information I provide will be used solely for research purposes and handled ethically.
- I understand that I may withdraw from the interview at any time if I feel uncomfortable, and any data collected up to that point will not be used.
- I understand that there are no financial costs or compensation associated with participating in this study.
- I understand that I can contact the researcher via phone or email after the interview if needed.
- I understand that I may keep a copy of this consent form for my records.
- I confirm that I have understood the above information and voluntarily agree to participate in this research.

Can I record the interview? YES / NO

Signature of interviewee..... Date.....

For researcher:

I have explained the content of this consent form to the interviewee and ensured that the interviewee understands the content of this form.

Signature of interviewer..... Date.....

APPENDIX 5: Informed Consent in IsiZulu

Imvumo enolwazi

Isihloko: Ubuchwepheshe Bokuthuthukisa Izigaxa Zofuzo Emntwaneni (Human Germline Enhancement) kanye Nezinkolelo ZamaZulu Ngobungcwele Bokuphila: Ucwaningo Lwezokuziphatha Nezamasiko

Igama lomcwaningi: Nothando Happy-Girl Shandu
Email: Shandun@ukzn.ac.za/214516881@ukzn.ac.za

Kumhlanganyeli:

- Ngiyavuma ukubamba iqhaza ocwaningweni olungenhla umcwaningi angitshele ngalo. Umcwaningi uluchazile ucwaningo futhi ngiyakuqonda engizohlanganyela kukho.
- Ngiyahlanganyela ngoba nginqume ngokukhululekile ukuhlanganyela.
- Ngiyazi ukuth umcwaningi uzoxoxisana nami aphinde aqophe inhlolokhono noma abhale amaphuzu njengoba ngikhuluma.
- Ngiyavuma ukuth ucwaningi ungazisile nalolo cwaningo ngaphambi kweshuji yenhlolokomono enginayo naye.
- Ngaziswe umcwaninig ukuth ubunikazi bami buzohlala bungaziwa.
- Ngiyaqonda ukuth ulwazi engizolunikeza umcwaningi luhloselwe izinjongo zocwaningo futhi luzosetshenziswa ngendlela efanele.
- Ngiyaqonda ukuthi uma ngizizwa ngingakhululeile ukuqhubeka nenhlolokhono ngingayeka noma nini futhi ulwazi oluqoqwe ngesikhathi ngihoxa ngeke lusetshenziwe.
- Ngiyaqonda ukuth ngeke kube nemithelela yemali ekuvumeni ukuxoxisana.
- Ngiyaqonda ukuthi ngingashayela umcwaningi ucingo noma ngimthumelele i-imeyili noma ngasiphi iskhathi mase siqedile ngenhlokomono.
- Ngiyaqonda ukuthi ngingaligcina leli fomu lemvume.
- Ngiyaluqonda ulwazi olungenhla futhi ngiyavuma ukubambai iqhaza kulolucwaningo.

Ngingayiqhopha inhlolokhono yethu? YEBO/CHA

Signature of interviewee (Isignesha yomhlanganyeli) .....
Date.....

For researcher: (Okomcwaningi)

I have explained the content of this consent form to the interviewee and ensured that the interviewee understands the content of this form.

Signature of interviewer (Obuza imibuzo)…… Date.....

APPENDIX 6: Permission Letter (Mbonomuhle Community)

[redacted]

MBONOMUHLE COMMUNITY
ORGANIZATION
Reg: 15675/83508
BOX 706
NGOMA, 3950
CELL: 072 816 6407 / 072 666 1410

APPENDIX 7: Ethical Clearance

UNIVERSITY OF KWAZULU-NATAL
INYUVESI YAKWAZULU-NATALI

09 October 2025

Nothando Happy-Girl Shandu (214516881)
School of Rel Phil & Classics (Prior Restructuring)
Pietermaritzburg Campus

Dear NH Shandu,

Protocol reference number: HSSREC/00004717/2022
Project title: The perception of human genetic enhancement technologies among the Zulu indigenous people in South Africa: An ethico-cultural enquiry
Amended title: Human Germline Enhancement Technology and the Zulu Ontology on the Sanctity of Life: An Ethico-Cultural Inquiry
Degree: PhD

Approval Notification – Amendment Application

This letter serves to notify you that your application and request for an amendment received on 08 October 2025 has now been approved as follows:

- Change in title

Any alterations to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form; Title of the Project, Location of the Study must be reviewed and approved through an amendment /modification prior to its implementation. In case you have further queries, please quote the above reference number.

PLEASE NOTE: Research data should be securely stored in the discipline/department for a period of 5 years.

HSSREC is registered with the South African National Health Research Ethics Council (REC-040414-040).

Best wishes for the successful completion of your research protocol.

Yours faithfully

[redacted]
.....
Doctor Shamila Naidoo (Interim Chair)

/nng