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# How long do I have to be strong? The exploration of endometriosis in Black women: efficacy and implications of aromatase inhibitors as a novel treatment

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Thesis

# HOW LONG DO I HAVE TO BE STRONG? THE EXPLORATION OF ENDOMETRIOSIS IN BLACK WOMEN: EFFICACY AND IMPLICATIONS OF AROMATASE INHIBITORS AS A NOVEL TREATMENT

by

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## DEDICATION

To my Mom, Dad, and Sister Sanaa. Thank you for always believing in me. Without you, none of this would be possible. Isaiah 60:22

To the Strong Black Women who struggle to maintain their fortitude, we see you, we hear you, and change is coming for you. Sincerely, a Strong Black Woman

## ACKNOWLEDGMENTS

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Lastly, I cannot thank my family enough. I would not be me if it weren't for you. You are my biggest support and my truest inspiration. I hope to make you all proud.

**HOW LONG DO I HAVE TO BE STRONG? THE EXPLORATION OF ENDOMETRIOSIS IN BLACK WOMEN: EFFICACY AND IMPLICATIONS OF AROMATASE INHIBITORS AS A NOVEL TREATMENT**

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ABSTRACT

Endometriosis is a complex gynecological ailment that affects millions of women worldwide. However, within the discourse on endometriosis, there exists a notable gap concerning its impact on Black women. The Strong Black woman can be seen as a philosophical notion that encourages Black women to "rise above" their intersectional vulnerabilities. Often intended as an empowering compliment, the strong black superwoman cultural trope has progressively caused many African American women to have internalized mental and physical health problems. Moreover, black women who experience endometriosis experience difficulties in the diagnosis and treatment in said group. This thesis aims to investigate the efficacy and implications of using aromatase inhibitors as a novel form of treatment for endometriosis in Black women. This literature analysis hopes not only to inform those about the disease but hopes to also shed light on the often-ignored experiences of Black women with endometriosis. All while exploring the advantages and disadvantages of using Aromatase Inhibitors to manage.

## PREFACE

While some research efforts explore racial health disparities as a whole, this research aims to examine the impact of such stigmatization on Black women's menstrual health. This thesis aims to create a theoretical guide to find how the "strong black woman" cultural trope relates to the treatment and service black women receive or fail to receive when seeking healthcare but valid forms of treatment for said condition. Through literary review, the purpose of this thesis is to analyze the effectiveness and consequences of using Aromatase Inhibitors (AI) as a novel form of treatment for endometriosis. This analysis will utilize a framework that explicitly considers and recognizes the intersectionality of race, gender, and health as it pertains to black and white women. I look to answer the following questions: *(1) What is endometriosis? (2) What is the efficacy of Aromatase inhibitors as a form of treatment for patients with endometriosis? What are its consequences? (3) Do stereotypes affect Black women when seeking healthcare? (4) How many black women, when compared to their white counterparts, are properly diagnosed with endometriosis? (5) Systemically speaking, do socioeconomic status and race play a role in receiving proper treatment? If so, How? (6) Does aromatase inhibitor therapy have the potential to be curative?* I hope to find the answer to these questions through comprehensive literary and theoretical analysis.

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## LIST OF ABBREVIATIONS

AI……..Aromatase inhibitors

CAM ……. Complementary and Alternative Medicine

CC …….…...…….. Clomiphene citrate

COH ……..……. Controlled ovarian hyperstimulation

ECDs …… Endocrine Disrupting chemicals

ESCs ……..... Endometriosis stromal cells

E2 …….……. Estradiol

ERs …… Estrogen receptors

CPP …….……. Chronic pelvic pain

FSH ……. Follicular stimulating hormone

GnRH-a ……..Gonadotropin-releasing hormone analogs

GnRH ……...Gonadotropin-releasing hormone

GWA ……..... Genome-wide association

GWAS ……..Genome-wide association studies

HT ……...…… Hormone treatment

IUI …….……..... Intrauterine insemination

LFA-1 ……..……..Lymphocyte function-associated antigen

LH …….…….. Luteinizing Hormone

MAPK ……..…… Mitogen-activated protein kinase

PGE2 ……. Prostaglandin E2

QOL …….. Quality of Life

SBW …….. Strong Black Woman

SHPB ……..……..Superior hypogastric plexus block

sICAM -1 ……... Soluble intercellular adhesion molecule -1

SNP ……...Single nucleotide polymorphisms

STAR …….……. Steroidogenic acute regulatory protein

TUGPA ……..…...Transvaginal ultrasound-guided puncture aspiration

# CHAPTER ONE: ENDOMETRIOSIS PATHOGENESIS AND ETIOLOGY

According to Paula Braveman, the term "Health Disparities" can be seen as systematic, plausibly avoidable health differences adversely affecting socially disadvantaged groups (Braveman et al., 2011). The interactions between an individual's social, structural, and political surroundings and their identities determine their life exposures. These exposures, in turn, affect the features of any diseases they may develop and their interactions with the healthcare system. Employing this paradigm that explicitly recognizes social, structural, and political determinants of health, we will examine key factors contributing to illnesses in a prevalent gynecological ailment while also investigating an innovative treatment approach.

## Section One: Intro to endometriosis

Endometriosis, which is a persistent and recurring ailment, poses a significant challenge for healthcare professionals and places a heavy weight on the healthcare system. The ailment can be seen as a "heritable, hormone-dependent gynecological disorder" (Sapkota et al., 2017). Moreover, it can be seen as a persistent inflammatory condition that affects the pelvic organs, such as the ovaries, fallopian tubes, urinary bladder, and intestines, mostly affecting women between the ages of 15 and 49 (*Endometriosis*, n.d.-a). The average incidence of endometriosis ranges from 2% to 10% in the general population, 50% in the infertile population, and 60% in those with chronic pelvic pain (CPP). The disease seldom affects organs outside the pelvis (Bedaiwy et al., 2017). What contributes to the challenging nature of the disease is the long delay in the

diagnosis of endometriosis in various countries. For the sake of this thesis, we will only focus on the prevalence of endometriosis in the US.

The etiology of endometriosis remains a subject of discussion, with no single theory being adequate to explain its development in women. Including dysmenorrhea, dyspareunia, CPP, irregular uterine bleeding, and infertility in the stigmata of endometriosis, 6%-10% of women of reproductive age are affected (Burney & Giudice, 2012a). Recent research shows growing evidence that the histogenesis of endometriosis is related to 3 different factors. Those being, implantation theory, peritoneal metaplasia, and vascular lymphatic metastatic spread (Patel et al., 2017). Sampson's hypothesis on implantation theory infers that during menstruation, endometrial cells are expelled into the peritoneal cavity, thus potentially enabling cell implantation (Lamceva et al., 2023). Other hypotheses challenge this hypothesis by considering different factors where endometriosis-derived cells migrate to distant organs outside of the peritoneal cavity (Samani et al., 2017). Coelomic metaplasia challenges this theory. The celomic theory posits that Müllerian duct embryonic cells remain in ectopic sites and, upon stimulation by estrogens during puberty, proliferate to become endometriosis lesions (Rolla, 2019). Endometrial lesions possess high aromatase activity, thus generating estrogen in the affected area which then supports endometrial lesion survival and growth. As the presence of excess estrogen progresses, it is accompanied by progesterone resistance. This leads to inflammation caused by immune dysregulation. Recurrent endometrial shedding results in persistent peritoneal inflammation exacerbated by progesterone resistance (Patel et al., 2017). Proinflammatory pathways end up blocking the functions

of apoptotic mechanisms and have the potential for cells to adhere to unfamiliar sites. Macrophages, neutrophils, NK cells, dendritic cells, and T cells are involved in developing and forming endometrial lesions. (Fig 1.)

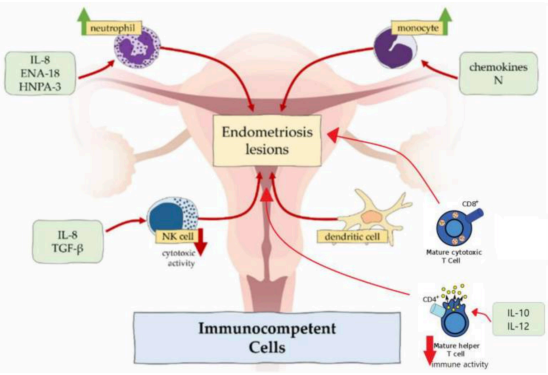


**Figure 1. Immunocompetent cells in endometriosis. (Adapted from: Lamceva et al, 2023)**

*Subsection 1: Pathogenesis*

The pathophysiology of endometriosis is complex and encompasses several variables, including genetic, hormonal, environmental, and sociological factors. As stated before, the most accepted theory can be seen as a retrograde menstruation, indicating that during menstruation, some endometrial cells flow backward through the fallopian tubes and implant on the pelvic organs, leading to ectopic endometrial growth. The considerable personal and societal health issues linked to endometriosis emphasize the need to comprehend its origin and abnormal physiological processes in order to avoid it and create accurate non-surgical diagnostic tests and efficient therapies. Emerging research suggests that genetic predisposition plays a critical role in the initiation and development of endometriosis. Studies have identified several susceptibility loci associated with the condition, including variants in genes related to inflammation,

angiogenesis, and hormone regulation (Sapkota et al., 2017). Reports associating endocrine-disrupting chemicals (EDCs) with endometriosis indicate that endogenous and exogenous estrogens may serve as possible transformative and inductive stimulants in ideas on the pathophysiology of endometriosis (Samani et al., 2017). Hormonal variables primarily influence the pathology of endometriosis, the primary variable being estrogen. (Fig. 2)

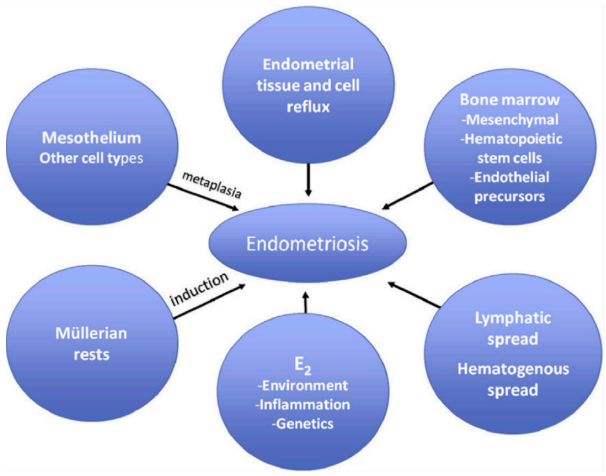


**Figure 2. Theories regarding endometriosis pathogenesis. ( Adapted from: Burney & Giudice, 2012b)**

## Section Two: Early menarche and genetic predisposition

Because of the complexity of the hormone-dependent gynecological disorder, diagnosis of endometriosis is often delayed, with an average lag time of 10 years (Frankel, 2022). This delay is usually attributed to several factors, including the normalization of menstrual pain, the spectrum of symptoms, and the absence of non-invasive diagnostic instruments. (Fig. 3) Identifying risk factors and understanding the genetic predisposition are critical for revealing the biological mechanisms, which then may lead to innovative treatment approaches.

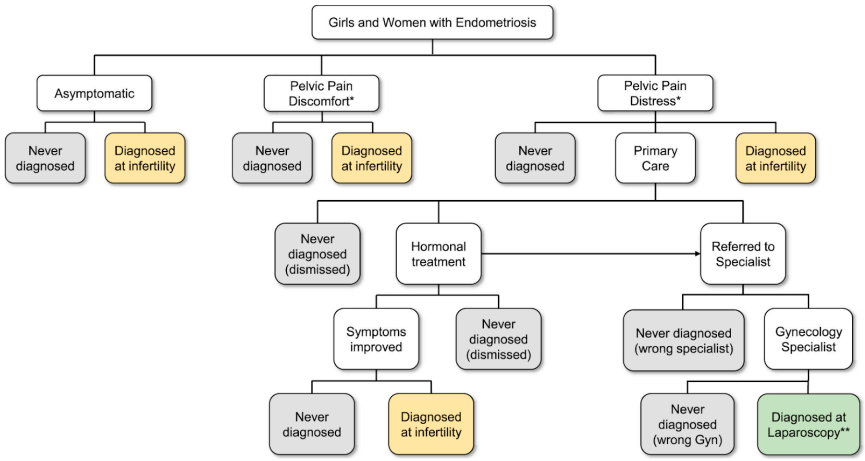


**Figure 3. Pathway through which a person with endometriosis may be diagnosed or mis/undiagnosed. ( Adapted from: Shafrir et al., 2018)**

As we know, endometriosis profoundly affects the physical, psychological, and social health of women (Jurkiewicz-Przondziono et al., 2017). Multiple epidemiological studies have discovered risk variables that may elevate the probability of acquiring endometriosis. Risk factors are often related to increased exposure to estrogen. Prenatal exposure to the synthetic estrogen diethylstilbestrol is associated with an increased incidence of endometriosis in the NHSII cohort and a population-based case-control study conducted in western Washington state (Shafrir et al., 2018). Female adolescents who experience prolonged menstruation throughout their reproductive years can lead to an increased change of retrograde menstruation. This phenomenon can be seen as early menarche.  Puberty begins with the pulsatile production of GnRH by hypothalamic neurons. (Lacroix et al., 2024) After GnRH is secreted, it is released into the median eminence and travels through the hypothalamic hypophyseal portal system to reach the anterior pituitary. GnRH stimulates the gonadotropes in the anterior pituitary to release Follicle Stimulated Hormone (FSH) and Luteinizing Hormone (LH). FSH and LH then subsequently influence the ovaries to promote follicular development and estrogen

synthesis. As estrogen levels rise, it creates a positive feedback loop where estrogen increases the sensitivity of the anterior pituitary to GnRH. This leads to increased LH release, thus triggering ovulation. Menarche occurs after there is a rise in estradiol output. Elevated estradiol levels now impose negative feedback on the gonadotropic axis, resulting in its suppression, which causes cyclical estrogen levels and uterine hemorrhaging. (Lacroix et al., 2024) When female adolescents go through early menarche, there is an increased risk of more frequent and longer-lasting irregularities in menstruation cycles, estrogen, and retrograde menstruation. Uterine bleeding manifests with varied cyclicity until the mechanism of estrogen-induced LH surge matures, resulting in ovulatory cycles. (Lacroix et al., 2024) Over time, prolonged exposure to uterine bleeding can increase the likelihood of developing endometriosis.

The significance of familial clustering of endometriosis cases has prompted extensive research into whether the disorder may have a genetic predisposition. The disorder contains an estimated heritability of about 50%, with ~26% attributed to common genetic variation. (Rahmioglu et al., 2023) It is important to remember that endometriosis is a multifaceted condition influenced by genetic and environmental factors, while its etiology and pathophysiology mainly remain elusive. (Saha et al., 2015) Twin studies, genome-wide association studies (GWAS), and candidate gene studies have been able to identify multiple loci that can be related to an increased risk of endometriosis. Studies on heritability have been able to demonstrate familial accumulation, increased concordance in monozygotic twins, and a 3 to 15 times higher risk in first-degree relatives of women with endometriosis compared with those in the

general population. (Saha et al., 2015) In a Swedish twin-based study, the genetic contribution of 47% to the variation of susceptibility of endometriosis was found. (Saha et al., 2015) Compared to an Australian-based study, it was found that 51% of endometriosis variation is connected to compound genetic effects. (Treloar et al., 1999)

GWAS has identified a surplus of genetic loci associated with endometriosis, identifying 11 independent single nucleotide polymorphisms (SNPs) for endometriosis. (Sapkota et al., 2017) These SNPs include rs10965235 in CDKKN2BAS on chromosome 9p21.3 identified in a Japanese ancestry GWAS study. The SNPs associated with Japanese ancestry encompass rs10965235 in CDKKN2BAS on chromosome 9p21.3, rs1519761 on 2q23.3 identified in a US study of women of European ancestry, seven loci from a European-Ancestry genome-wide association (GWA) study and a meta-analysis of GWA data from European and Japanese ancestries, as well as rs17773813 near KDR on 4q12 and rs519664 in TTC39B from an Icelandic GWA study. (Sapkota et al., 2017) This brings the number of independent SNPs associated with endometriosis at the GWAS level to a total of 12 SNPs. Compared to a study conducted in 2023, the total number of SNPs triples, resulting in 42 identifiable SNPs. (Rahmioglu et al., 2023)

Studies, including GWAS, have linked endometriosis to sex hormone gene polymorphisms like FN1, FSHB, ESR1, CCDC170, LHCGR, and SYNE1., with the FSHB gene encoding the β-subunit of FSH, which forms a heterodimer with an $\alpha$-chain. (Golovchenko et al., 2022) FSH is produced by the anterior pituitary gland and is a critical hormone in the female reproductive system. FSH binds to G-protein coupled receptors to promote granulosa cell growth, estrogen production, and androgen-

converting enzyme aromatase synthesis induction. Golovchenko's study indicates that the rs11031002 and rs11031005 polymorphisms of the FSHB gene, in conjunction with six other loci associated with sex hormone levels, contribute to endometriosis susceptibility in intergenic interactions. (Golovchenko et al., 2022)

**Section Three: Initiation of endometriosis**

The cellular and molecular properties of endometriosis facilitate comprehension of its mechanisms. The majority of endometriosis implants consist primarily of mesenchymal cells with a little epithelial component devoid of the profound invaginations characteristic of ectopic endometrium. (Bulun et al., 2019) Endometriosis stromal cells (ESCs) are indirectly mis programmed, with actions similar to ovarian theca/granulosa cells and tissue macrophages. ESCs synthesize progesterone and estradiol by the production of steroidogenic proteins and enzymes, such as steroidogenic acute regulatory protein (STAR) and aromatase, which convert cholesterol into substantial quantities. (Bulun et al., 2019) The ESC further releases substantial quantities of immune chemicals, including IL-1$\beta$, IL-6, TNF, RANTES, and monocyte chemoattractant protein-1 (MCP-1). (Bulun et al., 2019) Estradiol (E2) is the most biologically active estrogen and the primary steroid during reproductive years. Because of this, estradiol is the main factor in endometrial tissue attachment to the peritoneum and the production of inflammatory cytokines and angiogenesis. Estrogen receptor (ER)$\beta$ mediates the effects of estradiol in endometriosis by promoting lesion viability, altering pelvic tissue structure, and generating inflammatory mediators that activate nociceptors,

resulting in pain. (Fig 4.) The inflammation and chronic estrogen production can be seen as primary drivers of symptoms and disease progression.

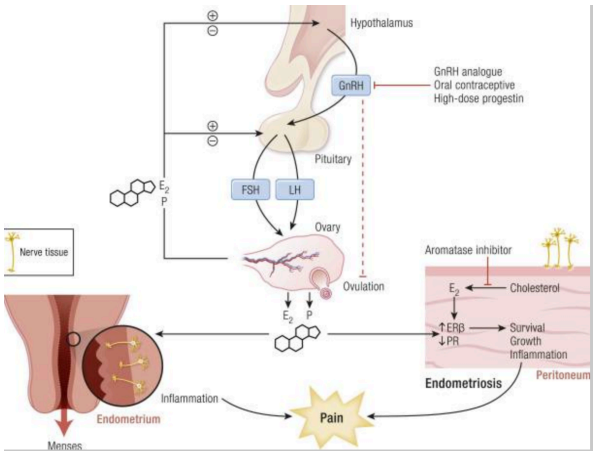


**Figure 4. Schematic of displaying the role of estrogen in endometriosis, emphasizing the processes of menstruation, tissue persistence, inflammation, and pain mechanisms. (Adapted from: Bulun et al., 2019)**

## Section Four: Immune Dysregulation

Immune dysregulation seen in endometriosis plays a primary role in ectopic endometrial tissue's persistence, growth, and inflammation. Peritoneal fluid, mostly generated by ovarian exudation, constitutes a milieu of immune cells, endometrial cells, and erythrocytes that secrete growth factors, angiogenic factors, and cytokines influencing processes inside the abdominal cavity. (Laganà et al., 2019; Rižner, 2015) The menstrual flow induces an inflammatory reaction in the peritoneal cavity, which seeks to eliminate ectopic cells and tissue. (Laganà et al., 2019) Women with endometriosis may endure prolonged menstrual cycles with excessive blood flow, resulting in increased endometrial tissue inside the abdominal cavity, so overloading the cleaning mechanisms of neutrophils, phagocytic leukocytes, and chemotactic leukocytes. (Darrow et al., 1993; Vercellini et al., 1997) In 1997, Vercellini et al. conducted a study

to determine menstrual blood loss in women with and without endometriosis, revealing that women with endometriosis had increased menstrual flow and elevated abnormal menstrual scores. (Table 1.)

**Table 1.** Menstrual Characteristics in 315 Women With and Without Endometriosis

| Characteristics | Endometriosis group ($n$ = 163) | Nonendometriosis group ($n$ = 152) |
|---|---|---|
| Pictorial blood loss assessment chart score | 110 [66.5–156.5] | 84 [56–129]* |
| Flow duration (d) | 4.9 ± 1.4 | 4.6 ± 1.4† |
| Cycle duration (d) | 28.4 ± 4.2 | 29.5 ± 6.5 |
| Dysmenorrhea score | | |
| Visual analogue scale | 52 [17.5–74] | 25 [0–50]‡ |
| Verbal rating scale | 1 [0–2] | 0 [0–1]‡ |
| Serum hemoglobin (g/dL) | 13.0 ± 0.9 | 13.0 ± 0.9 |
| Serum hematocrit (%) | 38.8 ± 2.7 | 38.7 ± 2.5 |
| Serum iron (μg/dL) | 79.9 ± 32.9 | 83.2 ± 35.2 |

Data are presented as median [interquartile range], mean ± standard deviation or $n$ (%).
* $P$ = .007, Mann-Whitney $U$ test.
† $P$ = .03, unpaired Student $t$ test.
‡ $P$ < .001, Mann-Whitney $U$ test.

**Table 1. Adapted from: Vercellini et al.**

Due to women who possess endometriosis having heavier blood flow, the overwhelmed capacity to clean the peritoneum can be a way to explain retrograde menstruation.

Research published in 1991 revealed that NK activity and cytotoxicity against autologous endometrial cells were equally diminished in women with endometriosis, correlating with disease severity. (Oosterlynck et al., 1991) Langana et al. discovered that as endometriosis progresses, NK cells become less effective in killing endometrial cells. Moreover, NK cells exhibit an inverse relationship in terms of higher disease stages associated with lower NK cell cytotoxicity. (2016) In women with endometriosis, the eutopic endometrium releases higher levels of soluble intercellular adhesion molecule-1

(sICAM-1), whereas ectopic endometrial cells exhibit increased expression of sICAM-1. (Laganà et al., 2019) This glycoprotein functions as a counter-receptor for lymphocyte function-associated antigen. (LFA-1). In the case of endometriosis,cICAM-1 antagonizes LFA-1, promoting leukocyte adhesion and migration in endometriosis via its interaction with endometrial cells. (Witkowska & Borawska, 2004) The inflammatory response in endometriosis is exacerbated by elevated COX-2, immune signaling molecules, and cell damage caused by free radicals. The following factors activate mitogen-activated protein kinase (MAPK) pathways. (Laganà et al., 2019) The MAPK refers to cascades of protein kinase reactions that have central roles in signaling cell proliferation response to growth factor stimulation of eukaryotic cells. Dysregulation of the MAPK pathway results in heightened inflammation, immune cell recruitment, growth factor production, pain genesis, hypersensitivity, and antiapoptotic signaling, hence affecting pain hypersensitivity. (Laganà et al., 2019)

## Section Five: Clinical Relevance

The clinical representation of endometriosis is highly variable, ranging from asymptomatic to severe symptoms. The symptoms of endometriosis may fluctuate throughout an individual's life, influenced by therapy, age, or environmental variables, but the mechanisms behind these variations remain inadequately understood. (Horne & Missmer, 2022) Due to the broad spectrum of how endometriosis manifests, the priority in clinical care and treatment differs. For example, a study done in 2018 determined that adolescents with endometriosis experience more pelvic pain, which then affects their

overall quality of life (QOL), while a study done in 2021 focused on how life-affecting fatigue or fertility can affect older women.

Moreover, the long-standing idea that endometriosis and associated symptoms do not arise in young adults and stop with menopause has proven to be incorrect. (Eskenazi & Warner, 1997) In 2012, an online survey revealed that US women aged 18-49 with endometriosis had average weekly productivity losses of 5.3 hours in work and 2.3 hours in home tasks owing to presenteeism, including additional losses of 1.1 and 2.5 hours, respectively. (Horne & Missmer, 2022) The example above proves that there needs to be more communication about endometriosis symptoms between women and healthcare providers to determine optimal treatment. (As-Sanie et al., 2021) Understanding the effects of endometriosis beyond pain and infertility symptoms is crucial for women to achieve a full QOL.

# CHAPTER TWO: ENDOMETRIOSIS IN BLACK WOMEN

Within the discourse of endometriosis, there exists a notable gap concerning its impact on Black women. The Strong Black Woman is a philosophical notion that urges Black women to "rise above" their intersectional vulnerabilities. Often intended as an empowering compliment, the strong black superwoman (SBW) cultural cliche has progressively caused many African American women to develop internalized mental and physical health problems. The idea of whiteness in this context reflects a structural bias that privileges white experiences while marginalizing and devaluing those of Black women. Moreover, the idea of whiteness is often treated as the "default" or "invisible" category, which in turn perpetuates biases thus reinforcing the idea of the SWB. By treating race as a monolithic category, it then obscures the diversity within racial groups and exaggerates the differences between said groups. By reinforcing heterogeneity, social constructionist perspectives on race emphasize the elements that established racial categorization in Western Europe and the United States, such as conquest, slavery, segregation, and inequality. It can then be asserted that comprehending the social context of inequality is essential for elucidating why race serves as a key predictor of health status. (Schulz & Mullings, 2005)

## Section One: Systemic Health Disparities

The notion of systemic racism is deeply embedded in the foundations of critical race theory, which emerged during the 1960s civil rights movement, with Kwame Ture and Charles Hamilton among the first to apply it to the healthcare system. They contended that "racism" entails "prediction of decisions and policies on considerations of

race for the purpose of subordinating a racial group." While acknowledging individual racism, they emphasized institutional or, much rather, systemic racism, which is "less over" and "less identifiable in terms of specific individuals committing the acts. However, it's no less destructive of human life."

Health disparities and health equity are founded on fundamental American social values, pragmatic considerations, and internationally acknowledged concepts of ethics and human rights (Braveman et al., 2011) In the context of African American women, it can be said that health disparities are often found in this group, including maternal mortality and infertility, can stem from stress. According to Rosouli et al., Black women experience higher rates of infertility compared to their white counterparts, with studies indicating rates of 7.2% versus 5.5%% respectively. (Rasouli et al., 2021) As already stated, this ideology is an internalized legacy that dates back to the slave era. From the 1600s, systemic oppression of people of color in American has been upheld through racial narratives, stereotypes, and ideologies that reinforce white dominance. (Feagin & Bennefield, 2014) Moreover, for generations, Black women have often disregarded their health to juggle many expectations and responsibilities. Society's perception and portrayal of black women also contribute to black women's health disparities. Despite many people's positive perceptions and definitions of the strong black woman, there are adverse health effects of such a notion. Black women often encounter significant and enduring health inequities in comparison to white women and women of other ethnicities. (*Department of Health & Human Services*, 2023) Twenty-five percent of Black women have stated that they reside in financial hardship beneath the poverty threshold. As a

result, access to healthcare and healthcare quality contribute to the disproportionate trends seen in this population. Yet, even with Black women of higher socioeconomic status, the disparities persist. (Williams & Collins, 2001; Woods-Giscombé, 2010) Research indicates that, along with financial hardships, noticeable social challenges prevent Black women from making use of healthcare and, ultimately, from experiencing good health. (Institute of Medicine (US) Committee on Understanding and Eliminating Racial and Ethnic Disparities in Health Care, 2003) The intersection of race, gender, and class compounds these disadvantages, reinforcing the systemic exclusion of Black women from equitable healthcare. Kimberlé Crenshaw's concept of intersectionality underscores how these categories are not merely additive but create interdependent systems of oppression (Crenshaw, n.d.). This framework then challenges the reductionist tendency to analyze racism, sexism, or classism in isolation, revealing the necessity of addressing these structural forces simultaneously (Schulz & Mullings, 2005). The overlapping nature of social identities such as racism, classism, and sexism do not exist separately but instead interact with each other, thus leading to interconnected forms of discrimination and disadvantage.

Stereotypes, while inherent, may be detrimental owing to their overgeneralization of groups and the attributes of their members (Devine & Elliot, 1995; Gilbert & Hixon, n.d.; Sidanius & Pratto, 2001). They exhibit resistance to disconfirming evidence, perhaps resulting in prejudice and inequitable treatment. Social and health researchers have shown that discrimination and adverse treatment stemming from negative preconceptions adversely affect individual group members, including mental and physical

health, academic performance, social mobility, and intergenerational health transmission. (David & Collins, 1991; Dominguez et al., 2008; Fordham & Ogbu, 1986; Krieger, 2000; Major & O'Brien, 2005; Settles et al., 2010) The American College of Obstetricians and Gynecologists (ACOG) underscores the critical impact of racial prejudice and injustice on reproductive health inequalities, calling for a renewed commitment to their eradication. Reproductive healthcare access and treatment outcomes for minority women are shaped by social and structural determinants, including limited community care, inadequate insurance coverage, disparities in education and financial literacy, and professional challenges such as microaggressions and racial stereotyping. (*Home | ACOG*, n.d.) The Center for Reproductive Rights characterizes this inequality among racial and ethnic groups racial-ethnic as a human rights concern and expresses that "several U.S. policies may exacerbate these disparities by disproportionately burdening access to health care for women of color." (*Home | ACOG*, n.d.) Solutions aimed at enhancing healthcare availability for women must eliminate societal, educational, and institutional barriers. Thus allowing marginalized women of color to obtain and employ these treatments without the presence of clinician bias or other impediments. (*Home | ACOG*, n.d.)

The superwoman schema feeds off of ancestral resistance. The idea is reinforced by a colonialist, racist, white supremacist culture that employs SWB tropes to commend Black women for their ability to suppress their dynamic emotions and intricate concerns, preventing them from impacting others' lives. She is rendered valueless while concurrently being undermined, her labor exploited, her worth systematically diminished

via excessive effort, and her plight perpetually disseminated on a worldwide scale. (Stewart, 2017) Deriving from the mammy character, the SBW stereotype is a form of colonial bondage, which creates a myth suggesting that Black women are infinitely independent and do not need any help. In 2010, prior to the national implementation of the ACA, approximately 27 million women between the ages 19 and 64; roughly one third of this group, lacked health insurance.

Additionally, financial barriers led to about 45 million women to postpone or forgo medical care. (Sutton et al., 2021) In terms of black women, one in eight Black women (12.0%) ages 19 to 64 lacked health insurance coverage between the years of 2019 and 2021. Compared to their racial counterparts, 10.2% of white, non-Hispanic men and 7.6% of white, non-Hispanic women did not have health insurance nationally. (*Legal Help*, n.d.) This data can further be seen in contraceptive use among women aged 15-49 years, with white women (67%) being more likely to use contraceptives when compared to Black women (59.9%). (*Products - Data Briefs - Homepage*, 2024)

Furthermore, researchers discovered that black women were three times less likely to engage in discussions on contraceptive methods with their healthcare providers and exhibited less comfort in addressing contraceptive topics compared to their white counterparts (Cohn & Harrison, 2022) It is through the use of contraceptive care that one can then be used as an indicator of a woman's access to reproductive healthcare and routine gynecological care. Because there are Black women who are less likely to use contraceptives, one can then use this as a metric to measure reduced access to preventive services that could detect and manage endometriosis early on. Researchers of several

research have assessed at least one socioeconomic factor of health. This study identified three socioeconomic determinants of health for Black women. Those are income, education, and transportation. Researchers of the majority of the research identified a correlation between income and employment with increased sexual risk and diminished sexual and reproductive health. Artiga and Hinton (Artiga & Hinton, n.d.) identified the social determinants of health care as including health insurance coverage, availability of providers, linguistic and cultural competence of providers, and quality of treatment. (Cohn & Harrison, 2022) As previously mentioned, the absence of health insurance for black women results in limited access to health care services. Research indicated that Black women were less inclined to engage in discussions regarding sexual practices and reproductive health with healthcare providers (Thames et al., 2018) and that mistrust towards healthcare providers and a lack of ethnic congruence adversely impacted their intentions to seek assistance for female health issues (Kolar et al., 2015). Physicians treating a higher number of patients of color often did not offer optimal therapies and were significantly influenced by racial perceptions of the health habits of these patients. (Feagin & Bennefield, 2014) This may be associated with the horrors of slavery that conditioned Black females to adopt a "survival response." Black women endured physical and psychological abuses under the dominion of slave owners, stemming from their lack of autonomy, maltreatment, and oppression (Hall, n.d.). These concepts have established a robust foundation among the Black community that can endure in the healthcare sector.

## Section Two: Endometriosis in Black Women

Societal stigmas surrounding menstruation and reproductive health can exacerbate the challenges faced by Black women with endometriosis, leading to a profound impact on their physical, emotional, and social well-being. The societal normality and stigma associated with menstruation disorders hinder illness knowledge among patients, healthcare professionals, and the general public. (As-Sanie et al., 2021) In this context, endometriosis has been formerly thought to affect only white women, thus neglecting diagnostic practices for black women experiencing pelvic discomfort. (Houston, 1984) While Black women encounter sexism, the presence of racism exacerbates their experience beyond the gender differences in healthcare seen by their white counterparts. Therefore, there is a need for a framework (intersectionality) that enables clinical trials, testing, management, therapy, and policy to include the unique experiences of Black women — experiences that are often overshadowed by the myth of the SWB.

Research conducted in the 1970s indicated that more than 20% of black women had laparoscopy because of endometriosis, underscoring the need for heightened awareness and treatment. (Jacoby et al., 2010) Foundational gynecology textbooks, including Williams Gynecology, Blueprints Obstetrics & Gynecology, and Speroff's Clinical Gynecologic Endocrinology and Infertility, perpetuate the belief that endometriosis is less common in Black patients. (Bougie et al., 2022) For example, in the 16th edition of Novak's Gynecology, published in 1961, it reads, "There seems no doubt that endometriosis is much more common in the white private patient than in the dispensary clientele." (Novak et al., 1961) Then, in 2020, when the 16th edition of the

textbook was published, the section states that endometriosis occurs in women across all ethnic and socioeconomic backgrounds. (M.D. Berek, n.d.) Kistner's Gynecology and Women's Health, published in 1999, removed specific commentary addressing endometriosis and race but continued to suggest an ongoing "controversy." (M.D Barbieri et al., n.d.) Moreover, Novak decided to eliminate content that referred entirely to race and endometriosis. Additional instances of racial bias exhibit greater complexity. Blueprints of Gynecology's 2013 editions include clinical illustrations with figure description that reads, "Her ethnicity is Caucasian." which speaks to the idea of endometriosis only occurring in white women (Callahan & Caughey, n.d.). Similar observations are in various gynecology textbooks from the 1960s, with the ideology of "endometriosis only occurring in white women" evolving. However, it is essential to note that much of what was written in said textbooks came from personal opinions without proper citations.

Ethnic and racial disparities were identified through research on surgical complications and treatment. In comparison to other racial groups, white women are more likely to undertake minimally invasive endometriosis diagnosis or treatment procedures, underscoring the necessity of more inclusive surgical approaches. Moreover, researchers were able to conclude that white patients had fewer surgical problems than black patients. Alexander et al. examined the correlation between race, the route of hysterectomy, and postoperative complications in a cohort of 15,136 women undergoing hysterectomy for endometriosis. The research indicated that black women had a greater likelihood of undergoing open hysterectomy and faced more complications compared to

white women, with an odds ratio of 3.36 (50.1% vs 22.9%; odds ratio [OR] 3.36, 95% CI 3.11-3.64). (Alexander et al., 2019) Research indicated that black women were more likely to experience complications compared to white women. (4.1% vs 2.3%; P<.001). Another analysis done by Movilla et al. disclosed that Black women had the most significant incidence of severe consequences undergoing hysterectomy for endometriosis management. Black individuals had the greatest incidence of mild problems at 13.5% and serious complications at 6.6% relative to other ethnic groups. (Movilla et al., 2022) Even after considering patient characteristics and preoperative considerations such as endometriosis lesion location, surgical technique, and concurrent operations, Black patients have an increased likelihood of encountering a major complication relative to other ethnic groups. (odds ratio 1.64;95% confidence interval, 1.10-2.45). (Movilla et al., 2022)

Orlando et al. conducted a retrospective cohort study assessing differences in surgical treatments and postoperative complications related to endometriosis among patients of varying racial and ethnic backgrounds in the United States. (Orlando et al., 2022) 12,194 women were identified in this study, 65% being white, 8.2% Hispanic, 7.3% Black or African American, 6.2% Asian, 1.0% Native Hawaiian or Pacific Islander, 0.6% American Indian or Alaska Native, and 11.5% of unknown race. It was found that elevated complications were experienced by minority groups when compared to their white counterparts. These minority groups can be seen as Native Hawaiian, Hispanic, Black and American Indian. Based on a figure adapted from Keshavarz et al., black women were more likely to undergo abdominal hysterectomy than vaginal. (Fig 5.)

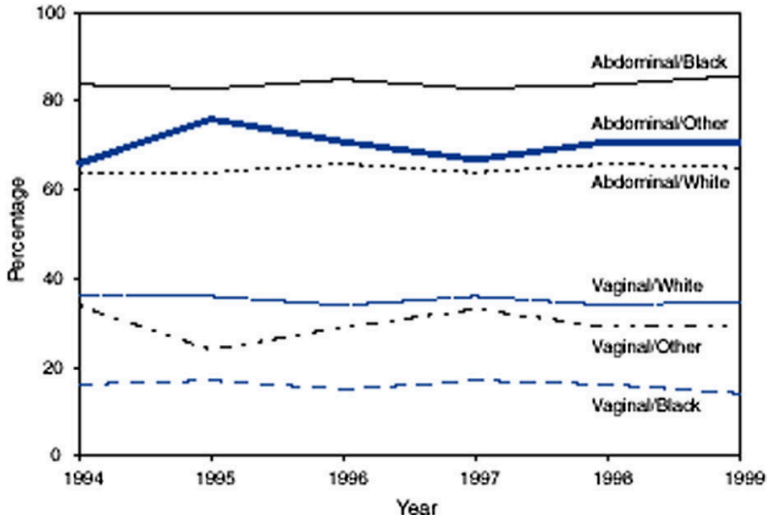


**Figure 5. Hysterectomy approach by race (Adapted from Jacoby et al., 2010)**

As stated before, the severity at which black women experience certain exposures is at a significantly higher rate when compared to their white counter parts. Namely, black women are more likely to inhabit regions with elevated ambient levels of heavy metals, endocrine-disrupting chemicals (ECDs), and air pollution. (Rumph et al., 2022) Researchers identified a correlation between exposure to endocrine-disrupting chemicals (ECD) and the development of endometriosis, indicating that the increased exposure of minority populations to heavy metal compounds may play a role in the variability of disease presentation. (Rumph et al., 2022) Additionally, because early menarche is associated with an increased risk of endometriosis and occurs more frequently among black women, it is possible to assume that the cause of this is due to exposure to environmental factors. (Chumlea et al., 2003)

## Section Three: Intersectionality and Health

Intersectionality has made an essential contribution to feminist ideology. Despite its popularity among feminist researchers, however, intersectionality has been widely contested. Because of this notion's vagueness, feminist researchers dispute the precise meaning of intersectionality and how the term should be used. Nonetheless, intersectionality is essential to feminist theory and can be the backbone of understanding health inequalities. To prove how intersectional feminism is used or seen as a health inequality concept, we must first understand what intersectionality means. Intersectionality can be seen as a paradigm for analyzing how several forms of oppression, including sexism, racism, and classism, may concurrently interact, interconnect, and overlap to create a distinct form of oppression that cannot be adequately explained by examining a single type alone. The focus does not focus on the many identities of a person but rather how social, legal, and political institutions predistortions individuals with various identities to interconnected forms of oppression. Moreover, intersectionality enables feminist theorists to account for differences among women, and while the concept may appear simple, intersectionality denies the prospect of uniformly dismissing women's experiences. There is an increasing demand for innovative methods to conceptualize health inequalities to revitalize existing frameworks for conceptualizing and conveying their attributes, origins, and potential outcomes across educational and legislative sectors (Carter et al., n.d.; *Health Inequalities - Scambler - 2012 - Sociology of Health & Illness - Wiley Online Library*, n.d.; Smith & Schrecker, 2015). Kimberlé Crenshaw, an American advocate, utilized court cases in conjunction with an

examination of women's liberationists and critical race theory to contend that prevailing frameworks for describing and understanding discrimination are insufficient (Holman et al., 2021). Moreover, these frameworks restrict examination of the realities of being "privileged members of the group," specifically African American women. This approach results in a flawed overview of how race and gender intersect, as the foundational concepts of race and sex are based on encounters that reflect only a limited aspect of a more intricate idea (Crenshaw, n.d.). Crenshaw can subsequently detail how various social factors represent the intersectionality of one's self where social constructs and prejudice ideologies overlap (Holman et al., 2021). Gender is often viewed as an analytic category, thus keeping women in a box where their only identity is attached to their gender. Ojanuga speaks to this idea, stating, "Doctors in the early 19th century performed pelvic examinations while looking directly into the eyes of the women…Nudity and exposure of the female body even to the eyes of a doctor was prohibited" (Ojanuga, 1993). Intersectionality dismantles this concept based on the assumption that identity is rich and multifaceted. Lorde expresses, "I cannot afford the luxury of fighting only one form of oppression. I cannot afford to believe that freedom from intolerance is the right of only one particular group" (Savage, n.d.). Moreover, it is impossible to categorize the experiences of women by looking at only one part, that part being her sex and or gender. This allows for theorizing about additional categories, such as race and class, as well as the links between these categories and how these interactions shape people's experiences. Bauer et al. suggest intersectionality prompts an analysis of the significant diversity within assumed groups, such as "women," along with the interaction between individual-

level and societal-level elements that provide varied health outcomes. She outlines five primary advantages of intersectionality for equity, diversity, and inclusion (EDI) in the world of public health: it offers a cohesive framework for researchers focused on the intersections of inequality; it recognizes health disparities as intricate and multifaceted; its emphasis on macro level determinants is more likely to address the root causes of health inequities; it guides the creation of focused and economically efficient interventions and policies; and it enhances the analysis of comprehensive sociodemographic and health data (Bauer et al., 2021; Holman et al., 2021). Kelly et al. argue that:

> "There are three key considerations when using intersectionality in team-based health research context. First, it is important to assess team members' level of comfort with committing to social justice or using an explicitly feminist approach. Some scholars argue that research using intersectionality must openly strive toward social justice, while others argue that when people "use" intersectionality as a framework, it will inadvertently achieve the same ends. Secondly, it is important to consider that intersectionality is the most coherent when applied as a methodology; that is, an approach that informs the composition of the research team, formation of the question, approach to recruitment, and a method used in data collection and analysis. Finally, with the exception of intersectionality measurement work, a common criticism is the difficulty in applying an intersectional framework in a concrete way." (Kelly et al., 2022)

Through the lens of Black female health and its outcomes, we can use these ideologies to understand further how the intersection of race, gender, and class influences Black female health. Moreover, we can look at how overlapping social identities combined with access to care, the quality of treatment, and socioeconomic status create unique experiences of discrimination and disadvantage. Through these ideologies, we can see how the theory of

intersectionality, when applied to healthcare, helps highlight the compounded barriers Black women face.

*Subsection 1: Socio-economic status and race in receiving proper treatment*

Health inequalities were addressed formally under the framework of "health equality." Health equality, while aspirational, presupposes a uniform baseline among diverse groups, overlooking the influence of social, institutional, and political contexts while overemphasizing genetics and risk variables. Conversely, equitable health care studies acknowledge the significant social variables that influence individuals' lives, decisions, and opportunities, hence the disconnect between privileged and disadvantaged groups. (Crear-Perry et al., 2021) The difference in lived experiences leads to health inequities across the life cycle, referring to the biological manifestation of the social circumstances affecting an individual or group. (Krieger, 1994, 2005) Allostatic load can be seen as a fundamental mechanism for embodiment, characterized by the interplay of bodily systems with the cumulative impact of chronic stress and life events over time. (Guidi et al., 2021) The concept of an allostatic load can manifest in the world of health through a process called "weathering," where early deterioration of health is due to cumulative socioeconomic disadvantage. (Katon et al., 2023) Moreover, Black Americans of the same income level as white Americans have 7.5 less wealth. (Doll, 2018) Williams et al. further the discussion of allostatic load by saying:

> "Further evidence of the early health deterioration of African Americans compared to whites comes from analyses of a 10-item measure of allostatic load that was attempting to capture the physiologic burden on multiple biological systems in the NHANES data due to the wear and tear of exposure to stressors

> and other environmental adversity. This study found that blacks had higher scores than whites at all ages, with the racial differences being most marked between 35 and 64 years. Moreover, the racial differences persisted after adjustment for poverty, with nonpoor blacks having higher scores than poor whites. In addition, black women consistently had higher allostatic load scores than black men. These differences could be due to the double jeopardy of racial and gender discrimination that women face, and/or to stressors linked to the central role that black women often play as economic providers to their families." (Williams et al., 2010)

With this in mind, the socioeconomic level may influence the likelihood of endometriosis in women employed in rotating night shifts for more than five years (Parazzini et al., 2017) A study by Rodriguez et al. revealed that Black Women (odds ratio [OR] 0.89, P<.001) had diminished odds of obtaining appropriate care in comparison to white women. Women in high-middle (OR 0.89, P<.001), middle (OR 0.84, P<.001), low-middle (OR 0.80, P<.001), and lowest (OR 0.73, P<.001) neighborhood socioeconomic status categories exhibited diminished odds of receiving adherent treatment compared to those in the highest neighborhood socioeconomic status group. This indicates that women at an elevated risk for endometriosis may have a greater likelihood of experiencing infertility. Previously administered research supported the conclusion that there are racial and ethnic disparities in health care despite making socioeconomic factors and disease characterization independent factors. (Institute of Medicine (US) Committee on Understanding and Eliminating Racial and Ethnic Disparities in Health Care, 2003). This can further reinforce the idea that black women often receive inadequate care when compared to white women who suffer from endometriosis.

Of the articles used in this study, many only focused on the surgical diagnosis and treatment of the patients without considering their socioeconomic background.

(Alexander et al., 2019; Artiga & Hinton, n.d.; As-Sanie et al., 2019; Bougie et al., 2022; Callahan & Caughey, n.d.; Houston, 1984; Jacoby et al., 2010; M.D Barbieri et al., n.d.; M.D. Berek, n.d.; Movilla et al., 2022) Because researchers did not clarify whether financial status influenced health outcomes, the studies fail to give light on whether financial status, whether it be prominent or not, had an influence on components of certain medical results, such as if an individual received proper care due to their financial status or the type of health insurance they may have. The absence of socioeconomic status in these studies must be addressed, emphasizing the necessity for continued research on inequities in endometriosis care.

**Section Four: Diagnosis Rate of Black women with endometriosis**

As stated before, it can be said that health inequities within gynecological care influence the diagnosis and management of endometriosis. (Westwood et al., 2023) It is important to keep in mind that Black women often encounter significant and enduring health inequities in comparison to women of other racial and social groups. Because of the financial hardship Black women tend to face, access to healthcare and the quality of healthcare contribute to the inequitable trends seen in this group. This can then be related to how many Black women are being diagnosed with endometriosis when compared to other groups. Bougie et al. conducted a literary study to systematically review the evidence for the influence of race/ethnicity on the prevalence of endometriosis. From this study, it was determined that Black women, when compared to white women, were less likely to be diagnosed with endometriosis (OR 0.49, 95% CI 0.29-0.83). (Bougie et al.,

2022) Another study conducted in 2021 found that there was a somewhat significant difference between the average time of diagnosis between white and black patients, with the average time being 40.3 ± 56.8 for white women and 43.7 ± 60.9 for black women. (Zhang et al., 2021) It is important to note that in this study of the 198 patients that were included, 184 patients were white while only 14 were black, which then brings into question the size of the data pool and if the data was accurate due to the number of white women compared to black women that participated.

Endometriosis has traditionally been seen as a condition affecting rich, accomplished women with private health insurance who have postponed marriage and childbirth. (Meigs, 1953) Through this statement, it can then be concluded that endometriosis was deemed "rare" in the 'non-private patient and, therefore, by inference, uncommon in black women.' (Chatman, 1976) In 1979, Buttram stated, "Typically, our patients with endometriosis appear to have an intense desire to excel. They are usually well-dressed and have trim figures" (Buttram, 1979). Through this it can then be said that Black women with the disease can become invisible with this rich elitist framing. Stereotypes, while inherent to the human experience, are detrimental since they excessively generalize the traits of groups and their people, exhibiting a strong resistance to contradictory information. In the world of clinical practice and endometriosis, one can then determine that the diagnosis of endometriosis in Black women can be connected to the long-standing legacy of slavery and medical racism. Dr. J Marion Sims is a perfect example of this. The narrative of J.Marion Sims is not only significant in terms of gaining knowledge of the treatment of vesicovaginal fistula, but it also serves as a classic

illustration of the atrocities that were associated with slavery and the mistreatment of human beings, particularly black women, for the sake of medical study. (Ojanuga, 1993) Slaves created the idea of a strong Black woman during the slave era as a survival response to an existence rife with violence, exploitation, and oppression. During slavery, these traits' internalization was a means to personal, familial, and communal survival (Donovan & West, 2015). Such qualities and characteristics have been passed intergenerationally through parents', particularly mothers', Black girls' socialization (Beauboeuf-Lafontant, n.d.)

> "Black females in this country are born into the army of Fierce Angels, and they have no choice in the matter. Membership is required, and the expectations placed on them are completely universal; all black women are supposed to be strong and selfless. Generations of people - Black, White, and just about everybody else- have been raised with the underlying assumption that black women will save them." – Sheri Parks 2010

In the lens of J. Marion Sims, he opted against the use of an anesthetic partly due to his belief that black women have greater pain tolerances. (Ownes, 2017) The legacy of this racist ideology endures to this day. A study conducted in the US revealed that white medical students and physicians continue to hold the belief that black patients have a lower biological sensitivity to pain than white patients. (*Endometriosis*, n.d.-b) Among the literature publications examined, research concentrated on illness prevalence, neglecting to investigate possible diversity in symptom presentation, diagnostic delays, or treatment responses depending on race. The American Journal of Obstetrics and Gynecology determined that Asian women exhibited a higher likelihood, whereas Black women had a lower likelihood of being diagnosed with endometriosis in comparison with

White women from 2006 to 2015. Medina-Perucha et al. found that out of the 2.3 million women studies, 0.7% were diagnosed with endometriosis; of that cohort, 92.3% of them were white and living in a city (73.6%). (Medina-Perucha et al., 2022)

## Section Five: Drug Prescription and Aromatase in Context

Kashyap et al.'s 2023 study analyzed the variations in drug prescription patterns for endometriosis treatment between Black and White patients, both prior to and following diagnosis and contrasted these variations with racial disparities observed in the general population (Kashyap et al., 2023) The study underscores the significance of first-line treatment for endometriosis, a condition frequently subject to diagnostic delays. For the sake of the study, they identified 28 different drug classes and had a total of 16,372 endometrial patients (23.3% Black and 66.0% White). The study revealed significant racial disparities in drug prescriptions for endometriosis management, with 61% of the 28 pharmacological classes examined being prescribed more frequently to white patients than to black patients. Antidepressants (20.7%), anxiolytics (20.4%), antiepileptics (18.7%), and estrogens (10.2%) have notable drug classes that were prescribed at a higher rate to white women than to black women. Because these drug classes deal with mental health, we are then able to relate this to the SBW schema in the sense that under certain conditions, black women are denied expressions of femineity, including vulnerability and emotional distress. This inability to exhibit vulnerability compels the SBW to repress their emotions, resulting in the creation of a "façade to mask their true feelings" of fear, pain, or anger (Green-Goode, 2011; Davis, 1981).

Moreover, four drug classes were prescribed more frequently to black patients compared to white, those being Iron preparations (7.3%), Hormones and related agents (7.1%), and anti-infective/Antiseptics (7.0%). The research emphasizes that postponements in diagnosing endometriosis result in patients receiving first-line therapies before an official diagnosis. Moreover, the results from this study align with the widespread racial inequities in healthcare, whereby Black individuals often encounter obstacles to obtaining complete and adequate treatment alternatives.

Black and white women present differences in how their bodies produce and metabolize certain steroids such as estrogen and androgens. These difference can then affect how they respond to EDCs. (Rumph et al., 2022) Several studies have shown that the luteinization of granulosa cells is dysregulated in endometriosis. (de Abreu et al., 2006; Ono et al., 2014; Toya et al., 2000) Yoshihiro et al. found that women with endometriosis have significantly lower testosterone levels compared to women without the condition. Because of this, higher rates of a protein called BimEL, which triggers cell death, were linked to lower testosterone levels. Moreover, when testosterone levels are low, granulosa cells die at a faster rate. Because aromatase converts testosterone into estrogen, if a woman has low testosterone levels, there is less of this hormone available for aromatase to convert. Thus, leading to low estrogen production. In the context of Black women, Shaw et al. stated that Black women consistently showed higher levels of ovarian aromatase mRNA expression, which is associated with increased estradiol production. Moreover, their follicular fluid had lower androgen to estrogen ratios compared to white women, indicating a hormonal environment with relatively more

estrogen and less androgen. (Shaw et al., 2014) The increase in ovarian aromatase mRNA expression is said to result from a genetic variation in Cytochrome P450 19 (CYP19), the gene that encodes aromatase. (Bulun et al., 1994; Shaw et al., 2014) The notable discrepancies in prescription patterns and health disparities indicate that healthcare professionals must recognize possible biases and endeavor to implement more equal treatment procedures.

# CHAPTER THREE: EFFICACY OF AROMATASE INHIBITORS

## Section One: Overview of Treatment Modalities

The treatment of endometriosis aims to diminish estrogen activity or establish estrogen deficiency. (Pavone & Bulun, 2012) Moreover, existing therapies for endometriosis have inhibitory effects but do not provide a cure. Accessible types of treatment can provide temporary relief from symptoms during treatment. Research indicates that discomfort linked with endometriosis can persist even after undergoing medical therapy such as preventive surgery. The existing therapy options for discomfort linked with endometriosis are preventive. This occurs through the inhibition of the hypothalamic-pituitary-ovarian axis, resulting in decreased ovulatory function. (Bedaiwy et al., 2017) The pituitary gland loses its connection to the hypothalamus, disrupting the normal hormone signaling pathway. Hormone treatment (HT) inhibits embryo implantation by causing endometrial atrophy. Furthermore, this might provide complications for individuals with endometriosis who are attempting to conceive. Hormonal medications are the primary treatment method for people with endometriosis, and they are based on the endocrine pathogenesis of the condition. (Fig 6.) Estrogen reliance and progesterone resistance are critical elements that facilitate endometrial cell implantation, diminish apoptosis, and elevate oxidative stress, inflammation, and neuroangiogenesis. (Vannuccini et al., 2022)

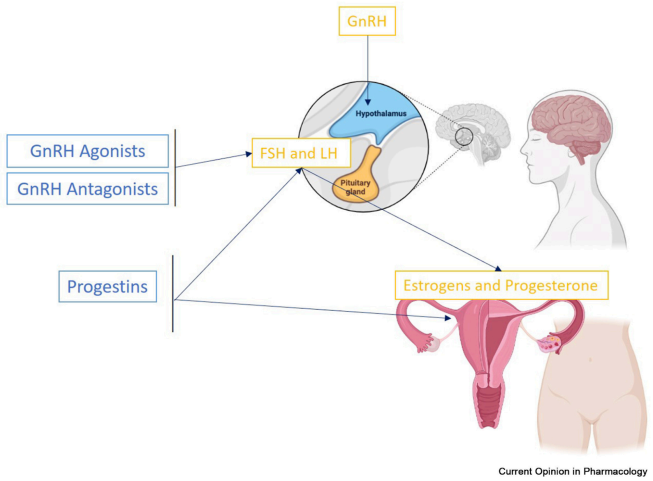


**Figure 6. Mechanism of action for hormonal drugs (Adapted from: Capezzuloi et al., 2022)**

The resistance to endopeptidase degradation and the extended receptor occupancy is enhanced by the modification of Gonadotropin-releasing hormone analogs (GnRH-a) with a D-amino acid at position 6. (Capezzuoli et al., 2022). GnRH-a binds to the pituitary GnRH receptors, which stimulates LH and FSH. However, due to constant levels of GnRH, low FSH and LH become apparent due to the downregulation of GnRH receptors, thus decreasing estrogen levels. The reduction in estrogen levels then leads to the absence of menstruation and the shrinking of endometriotic lesions. (Capezzuoli et al., 2022) On the opposing side, for GnRH antagonists, the suppression of GnRH and estradiol levels correlates with the antagonist dose, facilitating a specific suppression of estradiol that can be quickly reversed. Reduce pituitary gonadotropin hormone synthesis by directly competing with GnRH receptors, resulting in a dose-dependent hypoestrogenic condition that suppresses endometriosis cell proliferation. (Donnez et al., 2017) Progestins, which are related to progesterone, can inhibit GnRH release. In the context of endometriosis, progestins act through different mechanisms of action by

decreasing the secretion of FSH and LH. (Capezzuoli et al., 2022) As we know, because FSH and LH decrease, GnRH increases, leading to desensitization. Progestins can induce ovulation and endometrial pseudo decidualization by reducing inflammation associated with endometriosis, increasing cell death, inhibiting the formation of new blood vessels that support endometriotic lesions, minimizing cellular damage caused by free radicals, and reducing tissue remodeling and invasion by endometriotic cells. (Buggio et al., 2017; Reis et al., 2020)

Non-medical management of endometriosis with acupuncture, osteopathy, and yoga can help improve the QOL and can be offered in addition to the medical management of endometriosis. (Tourny et al., 2023) Advocating for physical activity and exercise as advantageous entails seeing skeletal muscles as an endocrine organ, whereby muscular contraction releases myokines. These myokines may directly affect the muscle or distant organs, including the liver, pancreas, or adipose tissue. (Tourny et al., 2023) Moreover, physical activity enhances the synthesis of white blood cells, stress hormone, and epinephrine, all of which have inflammation reducer properties. A study done in 2022 found that nonpharmacologic conservative therapies, like physical therapy, can be seen as a viable option for the management of endometriosis in terms of improving pain and functional independence. (Abril-Coello et al., 2023)

In the context of black women, the use of Complementary and Alternative Medicine (CAM) in the United states needs to be further studied but it can be said that African Americans who hold advanced degrees are more likely to investigate alternative therapies while those of lower education status ( i.e. people that received public

assistance and unlikely to have household income of more than $60000) either did not know about CAM use or use their own community based CAM. (Barner et al., 2010; Kronenberg et al., 2006a) In alignment with previous research, it was shown that African Americans using CAM for treatment may have inferior health status, attributed to heightened physician visits and limits in activities of daily living. (*ECP - Complementary and Alternative Medicine Use among Health Plan Members - A Cross-Sectional Survey*, n.d.; Kronenberg et al., 2006b; Najm et al., 2003; Paramore, 1997) The correlation between CAM. Use and disability remains ambiguous, and it is plausible that "sicker" African Americans were more inclined to employ CAM as a result of ineffective treatment for conventional medicine or o augment or supplement mainstream medical practices. Based on another study, White patients were more likely to have seen a CAM practitioner due to their use of CAM when compared to African Americans, but it was determined that socioeconomic status did not account for a difference in CAM use. (Kronenberg et al., 2006a)

Endometriosis-related chronic pain may be caused by nerve fiber involvement in the pelvis, according to emerging research. Researchers identified numerous small, unmyelinated nerve fibers within peritoneal endometriosis lesions in women diagnosed with endometriosis. The density of these nerve fibers was significantly greater in the peritoneum of affected women compared to those without the condition. (Tokushige et al., 2006; Wang et al., 2009) Because the sciatic nerve sits in the retroperitoneum, the nerve can become compressed due to the endometrial cysts growing, leading to worsening pain. (Gharaei & Gholampoor, 2023) Because the nervous system and the

endocrine system are the two primary regulatory systems in the body, the nervous system is an expeditious regulatory system that governs the functions of muscular and secret cells using nerve impulses and neurotransmitters. The endocrine system is a slower-responding system that affects almost all cells via hormones. The two systems interact closely, involving the hypothalamus serving as a relay to control pituitary activity. Knowing this, one way to manage endometriosis-associated pain is through the use of a superior hypogastric plexus block (SHPB). The SHP, located adjacent to the abdominal aorta, provides innervation to hindgut structures, including the descending colon, sigmoid colon, and proximal rectum, in addition to pelvic organs such as the uterus, ovaries, prostate, and testes. (Gharaei & Gholampoor, 2023) The inferior hypogastric plexus block (IHPB) can also manage pelvic, perineal, and genital pain of benign or malignant origin. (Gharaei & Gholampoor, 2023) It is important to note that this approach to treating endometriosis is heavily related to a patient's history, physical examination, and diagnostic ultrasound.

## Section Two: Intro to Aromatase Inhibitors

Standard therapies target the inhibitor of ovarian estrogen production(E2). However, they do not permit the regulation of alternative estrogen biosynthesis sites. Aromatase is an enzyme that converts adrenal androgens, namely androstenedione, and testosterone, into estrone and estradiol. Moreover, the enzyme is regulated at the transcriptional expression, protein expression, and enzyme activity level in endometriosis. (Pavone & Bulun, 2013) The enzyme contributes to a self-sustaining cycle that drives steroidogenic gene production. Estrogen triggers COX-2 expression, which in

turn increases prostaglandin E2 (PGE2) levels, a key promoter of aromatase activity in endometriotic tissue. The mechanisms results in the ongoing local synthesis of E2 and OGE2 inside endometriosis tissue. (Baldi et al., 2008) In the case of endometriosis, estrogens promote the proliferation and infiltration of endometriosis tissue, while prostaglandins are responsible for discomfort, inflammation, and infertility. Because of this, endometriosis-afflicted women have been investigated as potential therapeutic candidates for aromatase inhibitors (AIs).

AIs, originally designed and modulated for the management of estrogen receptor-positive breast cancer, have become a novel form of therapy in treating endometriosis. AIs suppress local estrogen synthesis in endometriotic implants, the ovary, the brain, and adipose tissue. (Bedaiwy et al., 2017) Women who suffer from endometriosis often have local estrogen prediction enhanced due to the overexpression of aromatase. Aromatase is not usually expressed in the endometrial tissue of women without endometriosis but is aberrantly expressed in the endometriosis lesions of affected individuals. Research indicates that the formation of ectopic endometrium into endometriosis is influenced by factors including estrogen and its receptors, estrogen-dependent alterations, local estrogen concentrations, macrophage-nerve interactions, the influence of environmental pollutants on estrogen pathways and intracellular estrogen synthesis in relation to aromatase function. (Laganà et al., 2019) As stated before, estrogen production in women occurs intracellularly by stimulating theca cells stimulated by LH to produce androstenedione. In addition to theca cells, granulosa cells are stimulated by FSH to produce abundant aromatase, which converts androstenedione from

theca cells to estrogen. Aromatase P450 is an enzyme that covers hormones and is present in unique tissue types, such as the ovarian and adipose tissue but is often absent in the endometrium. (Laganà et al., 2019) Women with endometriosis can find this enzyme prescient in endometriosis tissue and eutopic endometrium.

AIs exist in three generations: Aminoglutethimide, Fadrozole, Formestane, Letrozole, Anastrozole, and Exemestane. (Peitsidis et al., 2023) Letrozole, anastrozole, and exemestane possess modulatory characteristics thus, making them ideal for therapeutic practice. Once administered, the mechanism is as follows: estrogen levels are reduced, which in turn triggers an increase in FSH release from the pituitary gland. (Ferrero et al., 2011) The elevation of FSH promotes follicular maturation. At an oral dose of 1-5 mg per day, letrozole and anastrozole suppresses estrogen production by 97% to over 99%. In contrast, exemestane, a steroidal AI with irreversible effects, is effective at a dose of 25 mg per day. (Peitsidis et al., 2023) A study done in 1998, Takayama et al. conducted a study to investigate the use of aromatase inhibitors as a treatment for unusually severe and chronic postmenopausal endometriosis. Their findings indicated that anastrozole treatment decreased estradiol-17$\beta$ levels by 50% from baseline, illustrating its efficacy in pain management and implant removal in women with rectovaginal endometriosis, in contrast to a 2005 study of the proposed anastrozole as a means to mitigate systemic side effects. (Hefler et al., 2005; Takayama et al., 1998)

## Section Three: Clinical Relevance

As stated before, the regulation of aromatase expression and inhibition in endometriosis and ectopic endometrium occurs through the interaction of a stimulatory transcription factor and an inhibitory factor with the aromatase P450 gene promoter. (Bulun et al., 1999) Moreover, AIs are used to treat endometriosis due to endometrial like tissue outside of the uterus exhibiting aromatase activity, thus leading to local estrogen production. This then establishes a connection between extrauterine endometrial tissue and blood estrogen concentrations, further establishing that AIs help reduce estrogen levels to help manage the condition. (Słopień & Męczekalski, 2016) Several studies have investigated the efficacy of AIs in managing endometriosis-associated pain and lesion size. Nawathe et al. (2008) conducted a systematic review encompassing eight studies that included 137 women. They were able to demonstrate that over a six month period, the administration of aromatase inhibitors along with aGnRH, anastrozole and goserlin, resulted in a substantial reduction in pain relative to aGnRH monotherapy, as well as a notable enhancement in patient-reported symptom severity. (Nawathe et al., 2008)

A systematic review conducted by Ferrero et al. (2011) indicated that analgesics can reduce pain and enhance the quality of life for patients with endometriosis when used in conjunction with gestagens or oral contraceptives. A study indicated that the combination therapy of letrozole and norethisterone acetate provided superior pain relief, reduced dyspareunia, and lower rates of adverse effects and discontinuation compared to letrozole monotherapy. (Ferrero et al., 2011) According to the ESHRE recommendations, letrozole paired with a GnRH for six months post-surgery is more successful than aGnRH

monotherapy in patients with endometriosis, which only endorses AIs in conjunction with COCs or progestins. (*ESHRE Guideline: Management of Women with Endometriosis † | Human Reproduction | Oxford Academic*, n.d.; Słopień & Męczekalski, 2016)

### *Subsection 1: The Role and Utilization of Aromatase Inhibitors in the Treatment of Postmenopausal Endometriosis*

AIs are under consideration as possible therapies for postmenopausal endometriosis. The projected incidence rate of endometriosis in postmenopausal women is 2-5%. (Słopień & Męczekalski, 2016) Surgery is often favored over non-surgical therapy for this patient group because of the danger of cancer progression. (Borgfeldt & Andolf, 2004) Nonetheless, surgical intervention is linked to the recurrence of endometriosis, and not all elderly individuals qualify for this procedure. In contrast to the reduction of ovarian estrogen production caused by oral contraceptives, gestagens, aGnRHs, and danazol, aromatase inhibitors primarily obstruct estrogen synthesis occurring extragonadally. Consequently, the use of aromatase inhibitors becomes more pertinent in older individuals, given that the majority of the body's estrogen is synthesized extragonadal post-menopause. Polyzo et al. discovered that therapy with letrozole and anastrozole over the course of 15 months alleviated symptoms in people with endometriosis and enhanced urinary tract and bowel symptoms in those afflicted by the disease. (Polyzos et al., 2011) It is also important to note that in one patient, letrozole was able to relieve symptoms after not seeing improvements in endometriosis symptoms through the use of exemestane. Letrozole and anastrozole also showed positive effects on

endometriosis lesion size. Moreover, Imaging modalities showed a notable decrease in lesion size following treatment with AIs. (Polyzos et al., 2011)

### *Subsection 2: The Role of Aromatase Inhibitors in Managing Endometriosis-Related Infertility*

As we know, the expression of aromatase in the endometrium can play a critical role in developing endometriosis and endometriosis lesions. Moreover, prostaglandin E2, an inflammatory mediator, activates aromatase in endometrial stroma cells, resulting in inflammation within the peritoneal cavity. This inflammation enhances estrogen production, which aids in the formation of endometriosis lesions by inhibiting macrophage phagocytosis, thereby advancing the disease's progression. (Maia et al., 2009) Because of this, many women with endometriosis can experience infertility as a symptom. Numerous publications indicated the diminished efficacy of pharmacological treatment in individuals with mild to moderate endometriosis. In an RCT, live birth rates were observed to be 5.6 times higher (95% confidence interval (CI) 1.18-17.4) in couples with minimal to moderate endometriosis following controlled ovarian stimulation with gonadotrophins and intrauterine insemination (IUI) compared with couples after expectant management. (*ESHRE Guideline: Management of Women with Endometriosis † | Human Reproduction | Oxford Academic*, n.d.) Moreover, randomized clinical trials have provided evidence that IUI with ovulation induction may be efficacious for patients with endometriosis. Werbrouck et al. conducted a meta-analysis with 107 women, demonstrating that COH (controlled ovarian hyperstimulation) and IUI use shortly after surgery can be as effective as COH and IUI in patients with unexplained subfertility. In

2001, ovulation induction therapy started to integrate the use of Aromatase inhibitors. (Mitwally & Casper, 2001) The mechanism of action involves reducing estradiol production in the follicular phase. This leads to less estrogen-induced negative feedback on the hypothalamus and the pituitary. The reduced negative feedback increases GnRH pulses and FSH release, similar to the clomiphene mechanism. By lowering estrogen levels, AIs disrupt the normal hormonal signaling required for ovulation, effectively inhibiting the process. It can also be said that androgens have the ability to enhance follicular development and function by increasing sensitivity to FSH, which is crucial in ovarian follicular growth and maturation. (Słopień & Męczekalski, 2016). Clomiphene citrate functions as a selective estrogen receptor modulator, increasing GnRH pulse frequency, stimulating pituitary production of FSH and LH, and inhibiting the negative feedback effect of circulating estradiol. (Carson & Kallen, 2021) Compared to letrozole, letrozole reduces serum concentrations of estradiol stimulating pituitary gonadotropins. Moreover, letrozole inhibits estradiol synthesis rather than estrogenic activity. In terms of inducing ovulation, letrozole is administered at a dose of 2.5-7.5 mg/day on days 3-7 of the menstrual cycle. (Pritts, 2010).

Abu Hashim et al. performed a clinical study including 136 women with lifelong infertility who did not achieve conception within 6-12 months after laparoscopic surgery for mild to moderate endometriosis. Patients received treatment with letrozole and clomiphene citrate (CC), either individually or in conjunction with IUI, for a maximum of four cycles. The research demonstrated a linear relationship between the cumulative conception rate after four cycles and the pregnancy rate per cycle, respectively. (Fig. 7) It

is important to note that two twin pregnancies occurred in the CC/ IUI group. No twin pregnancies occurred in the letrozole group. Miscarriage and live births were also deemed analogous respectively. Abu Hashim et al. determined that letrozole was not more effective than CC for ovulation induction combined with schedule IUI in patients with mild to moderate endometriosis who failed to conceive within 6-16 months post-laparoscopic surgery.

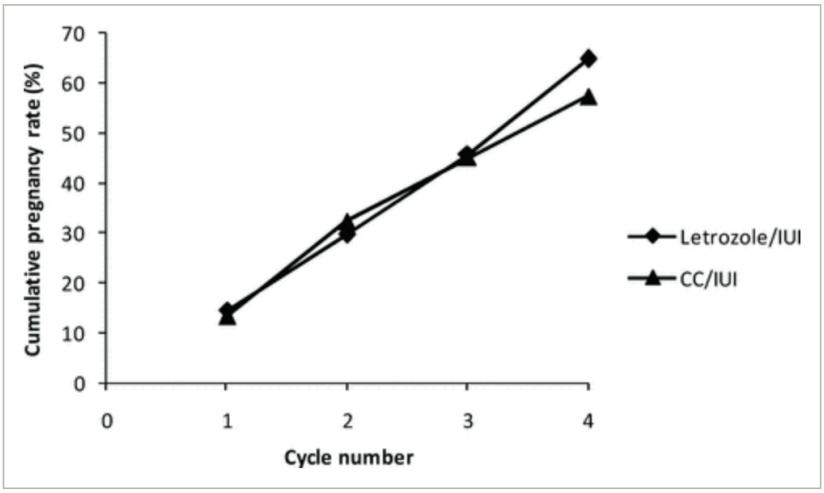


**Figure 7. Cumulative pregnancy rate ( Adapted from: Abu Hashim et al., 2011)**

**Section Four: Long-term outcomes and survival rates**

The long-term outcomes of AIs in treating endometriosis offer promising benefits and notable challenges. Because of the nature of endometriosis, sustaining symptom relief can be seen as the primary goal of any therapeutic strategy. The therapeutic approach for endometriosis has recently evolved to include new medications such as GnRH antagonists, angiogenic inhibitors, and third-generation aromatase inhibitors, which may be administered systemically or locally, potentially reducing the necessity for surgical intervention. (García-Izquierdo et al., 2024)Thus, in most studies involving

premenopausal women with endometriosis where long-term AIs have been utilized as a form of treatment, they have been combined with GnRH analogs to suppress gonadotropins and induce hypoestrogenism, which may also ameliorate endometriosis and its symptoms. (Kalaitzopoulos et al., 2021)

Soysal et al. performed a randomized study involving 80 women diagnosed with severe endometriosis, who were administered either goserelin in conjunction with anastrozole or goserelin alone over a period of 6 months. (Soysal et al., 2004) All participants received elemental calcium and vitamin D. The randomized controlled trial demonstrated that the dual-drug regimen had significantly decreased the percentage of women reporting pain recurrence at the 24-month follow-up, with 8% in the combination treatment group compared to 35% in the goserelin-only group. Additionally, combined treatment markedly extended the median duration until symptom recurrence compared to goserelin monotherapy. It is important to not that the combination treatment occurred over a 2.4-month period while the goserelin alone trial occurred over a 1.7-month period. The two research cohorts did not demonstrate a statistically significant variance in menopausal quality of life upon the conclusion of therapy.

A study conducted by Alborzi et al. included 144 infertile women who underwent laparoscopic endometriosis surgery. For a period of two months, participants were administered either letrozole, triptorelin, or a placebo. (Alborzi et al., 2011) It is important to note that the letrozole was taken every day at a dosage of 2.5 mg, while triptorelin was taken every 4 weeks at a dosage of 3.75 mg. The three groups exhibited comparable recurrence rates. One year post menstrual cycle restoration, endometriosis

recurrence was noted in 6.4% of patients treated with letrozole, 5.0% of those treated with triptorelin, and 5.3% of the placebo group. No significant difference was observed in the pregnancy rates among the three study groups: 23.4% for patients treated with letrozole, 27.5% for those treated with triptorelin, and 27.1% for the placebo group. There was, however, a direct correlation between the recurrence of symptoms and signs and the stages of the disease. Cyst formation was observed in the letrozole group, with functional cysts developing in 24.3% of cases, compared to 2.5Z% of the triptorelin group and none in the case-control group. Statistical significance differences were observed in functional cyst formation between patients who received letrozole and those who did not.

Scarpellin et al. conducted a controlled randomized study that explored AI's effectiveness in treating relapsing endometriosis. The research included 90 women, randomly assigned to two groups: the study group, which received aromatase inhibitors (AIs) in conjunction with a GnRH analog (Anastrozole 1 mg/day and Goserelin 3.6 mg/month), and the control group, which received only the GnRH analog for a duration of six months. (Scarpellini & Sbracia, 2010) The women included in the study were monitored for at least two years (range 2-7 years) and received annual pelvic ultrasounds and CA-125 assessments. It was found that patients in the study group had a more considerable reduction in pain compared to the control group, as shown by their pain scores ($P<0.001$). Their CA-125 blood levels were much lower than those in the control group. After at least two years of follow-up, the women in the study group were less likely to have their symptoms returned compared to the control group (13.3% vs. 53.3%;

P<0.01). Patients also stayed disease-free for a more extended period of time (2.7 years vs. 1.7 years; P<0.01).

Acién et al. conducted a clinical trial to determine how anastrozole works when combined with a hormone-releasing IUD (Mirena) to treat endometriosis. The study involved 31 women who were then split into four treatment groups. (Acién et al., 2021) Each group either received conservative surgery (CS), transvaginal ultrasound-guided puncture aspiration (TUGPA), or a combination of the two coupled with Mirena and/or anastrozole for six months. Overall, symptoms were significantly improved during the treatment, which was maintained between 1-2 years, especially for those using anastrozole. After four years, 88% of patients who had surgery were symptom-free, while only 21% of those who had TUGPA had similar results.

## Section 5: Risk Stratification

Risk stratification plays a crucial role in optimizing the use of AIs for treating endometriosis, allowing clinicians to identify which patients are most likely to benefit from said therapy while minimizing potential adverse effects. Given that endometriosis presents with varying degrees of severity and individual risk factors, evaluating a patient's overall health, disease progression, and other specific conditions is essential. While AIs ameliorate symptoms and diminish the extent of endometriotic lesions in patients; nevertheless, their application and estrogen reduction may lead to both temporary and permanent deleterious consequences, including hot flashes, vaginal atrophy, joint pain, and reduced bone mass. (Polyzos et al., 2011) Nonetheless, the

primary risk linked to AI administration is osteoporosis and a heightened incidence of fractures. (Duffy et al., 2006) The pharmaceutical application of AIs in the context of long term use, is correlated with a markedly increased incidence of bone fractures relative to tamoxifen, particularly among patients who are older, have a history of smoking, present with baseline osteoporosis, have experienced prior bone fractures, or have undergone previous hormonal replacement therapy. (Rabaglio et al., 2009)

In the Polyzo et al. study, only one individual experienced hot flashes after 4 months of letrozole treatment, attributed to the medication. Adding micronized estradiol 0.5 mg daily alleviated the hot flashes, and no recurrence of pain was observed in the subsequent four months. They found that the concomitant administration of bisphonates and aromatase inhibitors throughout prolonged therapy may diminish the risk of osteoporosis in high-risk individuals. (Polyzos et al., 2011)

## CHAPTER FOUR: DO I STILL HAVE TO BE STRONG?

Short answer: Yes.

Racial differences in endometriosis among Black women are evident and enduring. Disparities exist in frequency, symptom intensity treatment, and results. While the existing research on racial inequality in endometriosis primarily examines variations in tumor biology, symptomatology, and treatment options, it is evident that the underlying causes of health disparities among racial groups are considerably deeper than genetic factors, personal health behaviors, and healthcare access. The portrayal of social groupings and people, their societal perspectives, and stereotypes, as well as the behaviors, practices, and expectations of the dominant group shaped by these representations, have substantial health consequences. (Schulz & Mullings, 2005)

Moreover, structural racism acts on a systemic level, favoring certain groups and denying access to societal resources to others. Illetics of institutional racism work through organizational structures. The actions of others in medicine are interlaced, thus creating the illusion and bias that permeates Black women seeking menstrual health care. (Schulz & Mullings, 2005) This exploration further underscores the crucial need for a paradigm shift in how healthcare systems address their unique challenges. It has been established those systemic inequities, further compounded by cultural stereotypes like the Strong Black Woman schematic, lead to delayed diagnoses, suboptimal treatment, and

worsened health outcomes. As we look ahead, breaking down these barriers requires system-level reform, community advocacy, and new research approaches.

## Section 1: Future of Aromatase Inhibitors and Black Women Healthcare

The use of AIs as a new form of treatment for endometriosis can be perceived as a potential step forward in combating the treatment of Black women, both regarding prevalence and inequity within care. AIs, unlike alternative therapeutic agents, principally address reducing ovarian estrogen production, whereas they inhibit the synthesis of local estrogen on ectopic endometrial tissues, which seems to be a more profound management. The use of AIs not only provides symptom relief but also targets the hormonal and inflammatory pathways that perpetuate endometrial lesions. Because of the different hormonal profiles that are seen in Black women (Rumph et al., 2023), AIs can reduce the levels of estrogen in the body thus interfering with the negative feedback loops that are in place to maintain inflammation and tissue growth.

Currently, the literature suggests that AIs can be more beneficial when used together with progestins or GnRH agonists to reduce the risks of hypoestrogenism. However, there is limited research on the use of AIs, specifically in their use across a diverse study group. In Black Menstrual health care, the use of AIs in treatment plans offers a framework for more personalized and equitable care. However, to turn this into a reality, implementation requires clinical trials focusing on the racial and ethnic disparities in treatment and response. There also has to be studies examining the genetic and

environmental factors influencing endometriosis, especially because its management has conventionally focused on symptomatic control.

Through AIs, physicians will be able to address underlying disease mechanisms, making the disease easier in terms of long-term management, thus alleviating symptoms, and reducing the recurrence of lesions. This is particularly significant for Black women since the use of AIs will be able to exacerbate the chronic nature of the disease.

Despite the findings of the current literature on AIs, the integration of this therapy into the conventional practice presents a number of issues. Due to the severity of side effects which include hot flashes and night sweats, vaginal dryness, and bone loss, many women find it difficult to comply with the recommended treatment plan, thus reducing the effectiveness of the treatment. (Peters & Tadi, 2024) To reduce the problem of poor medication adherence, specifically adherence to AIs, healthcare providers need to be educated on aspects of prescription AIs such as how to deal with side effects and how to create individualize treatment plans according to the patient's hormonal profile. It is also important that healthcare providers also think about the availability and the cost of this form of therapy to ensure that it does not worsen the existing inequalities in the delivery of healthcare.

## Section 2: Implications of Policy and Practice

The recognition that Black women are not monolithic is why there must be a shift in this paradigm. This paper suggests that healthcare systems need to adopt an intersectional approach that will help to understand better how race, gender, class, and

environmental factors interact to influence the health of Black women. It is thus vital to identify the various subgroups that comprise this group to develop appropriate interventions for their needs. Moreover, giving Black women the space to contribute to forming policies ensures diversity inclusion in clinical practice guidelines and research studies.

Policy reform must address the root causes of inequity by promoting healthcare access, reducing environmental health risks, and mandating implicit bias training for medical professionals. (Giudice et al., 2023) It can be said that healthcare providers must mandate diversity quotas for participants in clinical trials related to endometriosis and reproductive health, ensuring better representation of Black women. Moreover, in clinical settings, healthcare providers are not to attach bias to Black women but are encouraged to adopt culturally competent care practices. By developing standardized guidelines for pain assessment and management, it can then help to mitigate the implicit biases in underestimating pain experienced by Black women as well. However, community-based initiatives are essential for true policy reform. Collaboration with Black organizations may assist in reducing the social stigma associated with menstrual and reproductive health. Whole awareness campaigns may equip Black women with the information needed to advocate for themselves. Allocating federal and state grants specifically for research on endometriosis in Black women, including genetic predispositions, environmental factors, and treatment efficacy can also be seen as a form of policy level changes in endometriosis research and treatment. The resilience of Black women must no

longer be seen as a justification for neglect but as a call of action to provide them with the support and care they deserve.

## Section 3: Final Conclusion

AIs present a new solution to the management of endometriosis. Initially applied for the treatment of breast cancer due to its capability of suppressing the hormonal and inflammatory pathways that support the disease, there is renewed hope for improved results, especially for Black women who have been sidelined for decades by gynecological research and practice. To be able to realize the potential of AIs, the medical field needs to ensure that there is equality in the conduct of research and, patients of all races should be involved in clinical trials. Furthermore, there should be changes made in the system to include the voices and needs of Black women.

This research calls for the sustained support of efforts that aim to explain the appearance of endometriosis in Black women all while discussing the relationship between this case and the analysis of health inequalities. Longitudinal studies and intersectional analyses will be critical in identifying the pathways through which systemic racism and socioeconomic inequities exert their effects on health outcomes. Only when these issues are examined, can we prevent the care and respect Black women have long been denied from continuing in the future.

It is important to know that this is a working foundation, not a conclusion. It is a demand to dismantle the structural barriers that create inequity and to reimagine a health care system in which Black women are not obligated to “be strong” but are free to be

seen, heard, and cared for. By centering their experiences, we are then able to ensure that the black female perspective is at the forefront of the efforts being made to bring about change and, therefore, can be led to the realization of health equity. By drawing from the existing literature on health equity, Black feminist thought, and social epidemiology, it is evident that there are various contextual factors that must be recognized as fundamental causes and components of racial disparities in endometriosis. These findings contends that the dimensions of data on racial disparities related to specific gynecologic conditions must be viewed in the framework of their fundamental determinants and drivers if meaningful advancement is to occur toward health equity. This research underscores the pressing necessity to tackle the fundamental determinants of health disparities via legislation, education, and projects that ensure all patients obtain socially and economically substantial care, while also investing in innovative testing, therapies, and adequate access to aromatase inhibitors.

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## Vita