CONTRACEPTION AND INDUCED ABORTION AS MINORITY HEALTH DISPARITIES

By

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A Thesis Submitted to The Honors College
In Partial Fulfillment of the Bachelors Degree
With Honors in
Physiology
THE UNIVERSITY OF ARIZONA
DECEMBER 2015

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Abstract

With an unintended pregnancy rate of over 50% in the United States and with 40% of those unintended pregnancies being terminated via an induced abortion, it is easy to see that abortion is an important medical procedure with numerous social and political implications for both women and men. In addition, public health research has consistently shown persistent minority health disparities with respect to abortion utilization, contraception use, and unintended pregnancy rates in women of color in the United States. It is impossible to talk about abortion use without talking about contraceptive use. They are inseparable entities in the realm of understanding of why women seek out abortions. Knowledge of the current state of abortion and contraception access in the United States is critical to health providers and women if the goal is to decrease the rate of unintended pregnancy, and minority health disparities are an integral part of that goal. A basic understanding of the physiology underlying contraception, therefore, can help to inform opinions, and better evidence-based and less polarized, violent debate between the pro-life and pro-choice sides can better inform policy and access surrounding this important issue.
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Acknowledgments

I would like to thank Randi Weinstein, PhD of The University of Arizona for her guidance and expertise in the physiology of human reproduction that served as the basis for choosing this topic. I was enrolled in her Human Reproductive Physiology course and it is in that course that my interest in this field was formed. She was a key editor of my manuscript drafts.

I would like to thank Pamela Lotke, MD, MPH, the obstetrician-gynecologist I consulted with, for her expertise in the clinical practice of contraception administration and abortion provision. Our initial meetings were important in making me realize that abortion alone was not the issue at hand, but that contraceptive access and freedom of sexual choice was underlying the minority health disparity discussed and the overall state of women’s health at large. She also was a key editor of my manuscript drafts.

I would like to thank Lisa Kiser, CNM, WHNP for her guidance and time in discussing the ideas presented here, for inviting me into her classroom, and for allowing me to shadow her in women’s health practice to solidify my foundational understanding of the importance of compassionate, fair care for diverse women seeking contraceptive services.
Part One: A Review of Female Reproductive Physiology

I. Anatomy of the Female Reproductive System

An overview of the anatomy of the female reproductive system provides the foundation for understanding the physiology underlying normal and abnormal conditions that are present during the reproductive lifespan of the human female. An understanding of the cyclical nature of ovarian and uterine function in response to a constantly changing hormonal environment is required for contraceptive use and development. The ovary, oviduct, uterus, vagina, and neuroendocrine axis are the key anatomical components of the female reproductive system reviewed here.

The Ovary

The ovary is the primary site of sex hormone synthesis and gamete development and release. A female possesses two identical ovaries. Each ovary rests in a position lateral to the centrally-located uterus, in a fold of the peritoneum called the broad ligament.

The ovary is unclearly divided into an inner medulla that is permeated by neural and vascular input and an outer cortex. The outer cortex contains the ovarian follicles—the cellular structures that contain the developing oocyte—and is densely cellular. The ovary is contained within a connective tissue tunica albuginea, coated with a highly mitogenic surface epithelium. This epithelium is eroded during ovulation, and it thus contains the capacity to regenerate fully via mitotic proliferation after each monthly ovulation (White & Porterfield, 2013).

The ovary has both endocrine and reproductive functions (some endocrine functions are indeed outside of typical reproductive purposes, especially with respect to the multi-functionality of estrogen in the female body at large). Consistent with the nature of most endocrine organs, the ovary contains specialized cells whose function is specific hormone production. In the ovary, the main female sex hormones, estrogen and progestogen, are synthesized and secreted. The main estrogen during the non-pregnant, non-menopausal reproductive lifespan of a healthy female is estradiol (E2). The main progestogen in a reproductive female is progesterone (Weinstein, Female Reproductive
Because the ovary’s medulla is highly vascularized, the lipophilic steroid cholesterol-derived hormones readily diffuse across the vascular endothelial membranes into the systemic circulation. Here, they are carried away from the ovary to targets throughout the body.

In contrast with other endocrine organs, the ovary contains no structured glands with adjoining ductwork from which hormone products are released. Instead, as previously mentioned, hormones enter the systemic circulation while the developing oocyte is actually released directly into the peritoneal cavity during ovulation. It must be successfully “picked up” by the open oviduct to be transported to the proper site of fertilization.

The Reproductive Tract

The reproductive tract is composed of a series of hollow muscular organs that is open at both ends. At one end, the fallopian tubes (oviduct) are open to the peritoneal cavity. At the other end, the vagina is open to the outside of the body. The uterus lies between the oviducts and the vagina, forming one continuous pathway from the oviduct to the vaginal opening.

There are two identical fallopian tubes that are the route of transport for the unfertilized oocyte, sperm from the male, and the fertilized embryo if fertilization occurs. They extend outward from the uterus and curve slightly downward toward the two ovaries on the lateral sides of the uterus. The fallopian tube is characterized by the main features of a typical hollow muscular organ. Each tube is lined by a simple secretory epithelium called the endosalpinx. The next layer, called the myosalpinx, contains a double layer of smooth muscle that is the motile source contributing to the transport function of the oviduct (this includes transport of the oocyte and embryo, which have no intrinsic mobility capacity of their own and a transport “boost” to the sperm, which do have limited inherent motile ability due to their own flagella). Each tube is covered by the perisalpinx, a layer of connective tissue permeated with numerous blood vessels (White & Porterfield).

The fallopian tube is functionally divided into four regions: the infundibulum, the ampulla, the isthmus, and the intramural segment. The infundibulum is the opening of the oviduct that is closely associated with the ovary; it contains finger-like projections and
elaborations of the tube that contain ciliated cells. It is responsible for “catching” the ovulated oocyte and for sweeping it into the proper tube. The ampulla is where the tube curves toward the ovary; it is the site of oocyte fertilization by sperm, and the endosalpinx is highly elaborated with numerous folds to provide a substantial amount of surface area for the oocyte to rest while it waits for sperm to arrive. The isthmus of the tube is the portion that extends back toward the uterus. Here, the tube is narrow, and many ciliated cells are present that can beat in a coordinated fashion to move sperm and an embryo in the proper direction. Finally, the tube ends with the intramural segment, which is the segment that extends through the uterine wall and opens into the uterine cavity (White & Porterfield).

The uterus can also be described as a hollow fibromuscular organ that is specialized to accommodate and support a developing fetus (Nayak & Giri, 2015). The uterine lining, called the endometrium, comprises a mucosa with a surface epithelium supported by a deeper layer of vascularized connective tissue. The endometrium is a glandular tissue with many epithelial invaginations to form the uterine glands. The epithelium is a single layer of columnar cells (Nayak & Giri). The connective tissue layer is fed by spiral arteries and straight arteries. The entire endometrium is divided into two zones. The stratum basalis, which makes up a third of the endometrium farthest from the uterine lumen, is perfused by straight arteries. The stratum basalis is not lost during menstruation. The stratum functionalis, however, which makes up the remaining two thirds of the endometrium that faces the uterine lumen, is lost during menstruation. It is perfused primarily by straight arteries that expand into venous lakes just below the surface epithelium (White & Porterfield).

The endometrium is surrounded by a thick layer of involuntary smooth muscle called the myometrium that provides the contractile power during parturition. The myometrial smooth muscle fibers are arranged in a complex but specific orientation in which fibers “from each half crisscrossing diagonally with those of the opposite side” (Nayak & Giri). Four layers of smooth muscle are present, including inner longitudinal muscles, the vascular layer that has ample blood vessels, a circular muscle layer, and the most superficial thin longitudinal muscle layer. The outer surface of the uterus is covered by the perimetrium, which is composed of peritoneal tissue (Nayak & Giri). The
uterus is also divided into four segments: the fundus, the body, the isthmus, and the cervix. The fundus is the superior section of the uterus that is above the openings of the fallopian tubes into the uterus. The body is the main portion of the uterus that narrows into the isthmus. The uterus ends with the cervix, which projects slightly into the vagina. The cervix is the important “gateway” between the uterus and the outside world. The endocervical canal is also lined with a mucosa, however, there is a transition point where the epithelium changes from the uterine epithelium to the nonkeratinized stratified squamous epithelium that is found in the vagina (Nayak & Giri). The cervix is characterized by having a highly elastic lamina propria which is vital for its function; most notably, the cervix dilates significantly during parturition (White and Porterfield).

The reproductive tract ends with the vagina, which is the copulatory structure and site of sperm reception during intercourse. The vagina is also the canal through which the fetus is delivered during parturition. Thus, the vagina must be able to accommodate both the penis and the large fetus; therefore, it has a thick, elastic lamina propria that allows it to expand and return to normal shape. However, there is a thin, weak muscularis that does not afford the vagina much intrinsic contractile power. The vagina is aglandular (the nonkeratinized simple squamous epithelium is akin to a layer of skin) but is intimately associated with relatively water-permeable vasculature. During sexual arousal, fluid is easily lost through these vessels and vagina to provide lubrication.

**The Hypothalamus-Pituitary-Ovary Axis**

The hypothalamus-pituitary-ovary axis (HPO) is a critical component of the female reproductive system. Because the ovary is an endocrine organ whose job is to synthesize and secrete hormone products, it is strictly regulated by this system. The anterior pituitary gland (AP) is situated centrally in the brain, inferior to the hypothalamus. It is attached to the posterior pituitary, which is a direct extension of the neurons of the hypothalamus-the anterior pituitary is not composed of neural tissue and is thus not directly connected via neurons to the hypothalamus. The AP is composed of many tropic-hormone producing cell types including the gonadotropes. The gonadotropes synthesize and secrete the tropic hormones that act on the ovary to stimulate sex hormone production. The gonadotropes are regulated by hormone release from the hypothalamus and by negative
feedback. The hypothalamus maintains the role of integrating several types of information from all over the body, including free hormone levels in the blood. The hypothalamus then translates this information into communication with the AP via parvocellular neurons. Parvocellular neurons can release factors into the median eminence, a region in the hypothalamus, which are then delivered directly to the AP via the hypothalamic-hypophysial portal system. A portal system is a unique vasculature system in the human body where blood from one organ is directly shunted to another organ without first going through the heart and the pulmonary circulation. Important to this regulation is the presence of long, short, and ultra-short feedback loops (Weinstein, *Hypothalamus & Pituitary Gland*, 2015) that allow the hypothalamus to respond to hormones in the circulation. The hypothalamus and AP can respond to these levels. This includes endogenous and exogenous hormones such as those in hormonal contraceptive methods (Weinstein, *Hypothalamus & Pituitary Gland*, 2015).
II. Female Reproductive Physiology and Endocrinology

Female reproductive physiology can be described as a complex system of coordinated cycles regulated by hormonal conditions that change daily. Reproductive biology in females is arguably more complicated than male reproductive biology, partly due to the significantly greater reproductive responsibility of the female body; it must produce viable gametes, receive male gametes, support a fertilization event, and, of course, support a pregnancy and deliver a fetus at term. Most forms of contraception, therefore, target some aspect of the female body, and an understanding of the intricate details of hormonal control and reproductive response, gamete development, ovulation, and those processes as integrated into the overall menstrual cycle are absolutely critical for understanding contraceptive mechanisms.

Hormone Synthesis

The synthesis of estrogen and progestogen is the responsibility of the ovary in non-pregnant women (the adrenal glands also produce a minute amount of estrogen in both females and males). Biosynthesis of these hormones is achieved via a two-cell two-gonadotropin model and is regulated by the HPO axis. In the hypothalamus, parvocellular neurons in the arcuate nucleus (ARC) of the hypothalamus produce and release gonadotropin-releasing hormone (GnRH) into the median eminence. This tropic hormone is delivered to the AP via the hypothalamic-hypophysial portal system. Gonadotropes in the AP respond to GnRH by synthesizing and secreting two more tropic hormones: luteinizing hormone (LH) and follicle-stimulating hormone (FSH) (Hall, 2014). LH and FSH are of the glycoprotein family, each containing two protein subunits and different glycosylation carbohydrate moieties (Weinstein, Hypothalamus & Pituitary Gland, 2015).

LH and FSH travel via the systemic circulation to the ovary. They are directly responsible for stimulating sex hormone synthesis in the ovary. In the ovarian cortex, each follicle that contains an ovary also contains two cell types. Granulosa cells immediately surround the immature oocyte, and they express FSH receptors. Theca cells exist surrounding the most superficial layer larger follicle structure, and they express LH
receptors. Individually, either cell cannot produce estradiol alone. Instead, they each express certain required enzymes that catalyze steps in the synthetic pathway sequentially (Strauss, 2014).

First, theca cells respond to LH-receptor binding via an increase in cyclic AMP (the LH receptor is a Gs-linked G-protein coupled receptor) second messenger to catalyze the conversion of dietary or liver-produced cholesterol into pregnenolone. Progesterone is then converted into androstenedione, a weak androgen, by 17 alpha-hydroxylase (Strauss). This enzyme is expressed only by theca cells, therefore, the ability to convert cholesterol into androgens is specific to theca cells. The androstenedione produced by the theca cells then must leave the theca cells and enter the granulosa cells. There, granulosa cells respond to FSH-receptor binding again via an increase in cyclic AMP by converting androstenedione to testosterone, the male sex hormone via 17β-OH-steroid dehydrogenase (Strauss). Finally, the testosterone is converted into estradiol by aromatase, an enzyme specific to granulosa cells. Therefore, the conversion of androgens to estrogens is specific to granulosa cells1. (Weinstein, Female Reproductive Physiology & Endocrinology, 2015).

**Oogenesis and Follicle Development**

Oogonia (singular oogonium) are the female germ cells from which all future oocytes originate. In the fetal ovary, primordial germ cells are proliferating as early as three weeks after fertilization (Strauss & Williams, 2014). The number of oogonia that are housed in the ovary reaches a maximum of between six and seven million by around twenty weeks gestation. After twenty weeks gestation, oocytes have two fates: they will either be incorporated into primordial follicles (an oocyte with a single layer of undifferentiated cells surrounding it) or they will undergo atresia. By the time the fetus is born, the number of oocytes that will be incorporated into primordial follicles is approximately two million (a greater than 50% reduction). This cohort of two million oocytes incorporated into primordial follicles begins meiosis, but the oocytes are arrested in the first meiotic division where they will remain until ovulation and possible fertilization. At birth, the primordial follicles will give rise to the cohort of follicles selected each menstrual cycle to resume development. Prior to puberty, all follicles are destined for
atresia—the appropriate hormonal environment for follicular development is not present until sexual maturity—and the ovary loses another significant proportion of follicles during this time. After puberty, the remaining 400,000 follicles will give rise to a cohort of ten to fifteen follicles per cycle to resume development (Strauss & Williams). The selection of the cohort is poorly understood and is theorized to be gonadotropin-independent. However, the actual developmental process is gonadotropin-dependent. Typically, a single follicle becomes dominant (generally it is the largest follicle), however, all of the follicles of the cohort are responding to LH and FSH and are producing estradiol. The non-dominant follicles will eventually undergo atresia (degeneration) when FSH and LH levels are insufficient to support their function. As the follicles develop, they undergo a number of changes, including a proliferation of granulosa cells around the oocyte, the integration of theca cells into the outer surface of the follicle, the formation of the mucopolysaccharide zona pellucida that separates the oocyte from the granulosa cells, and formation of the estradiol-filled fluid antrum. As the dominant follicle grows in size (now called the graafian follicle), the amount of secreted estradiol increases. This large follicle expresses many LH receptors on its granulosa cells, and it becomes even more sensitive to circulating LH so that estradiol secretion is markedly increased prior to ovulation. This dominant follicle will be ovulated mid-cycle. Of the 400,000 primordial follicles that are available in the ovary’s reserve after puberty, only 450 to 500 will be ovulated from puberty to menopause in a fertile female (typically one per month) (Weinstein, *Female Reproductive Physiology & Endocrinology*, 2015).

**Ovulation**

The HPO axis is sensitive to circulating levels of estrogen, LH, FSH, and GnRH (Hall). In the arcuate nucleus of the hypothalamus, a population of neurons called Kiss1 neurons exist that express classical estrogen receptors (GnRH-secreting neurons lack these receptors do not sense estrogen levels) (Popa, Clifton, & Steiner, 2008). Kiss1 neurons release kisspeptin in response to estrogen-receptor binding, which exhibits its action on the GnRH neurons which do express kisspeptin G_{q/11}-linked G-protein coupled receptors. In a typical negative feedback loop, elevated estrogen levels in the systemic circulation (such as those that precede ovulation) will inhibit kisspeptin release from Kiss1
neurons. Thus, GnRH neuron release of GnRH will be decreased, and LH/FSH release from gonadotropes in the AP will be decreased. This is happening during most of the menstrual cycle. However, just before ovulation, rapidly increasing levels of estrogen lead to a shift from negative feedback on ARC Kiss1 neurons to a positive feedback response in a different population of Kiss1 neurons in the anteroventral periventricular nucleus (AVPV) of the hypothalamus. These Kiss1 neurons also express estrogen receptors, however, they respond to high levels of estrogen by secreting more kisspeptin. Thus, GnRH release is heightened, LH/FSH release is heightened, and estrogen secretion continues to increase (Popa, Clifton, & Steiner). The LH/FSH increase is so rapid that this period in the cycle is called the LH surge, and LH concentrations in the blood can increase tenfold over the span of a few days (FSH also surges at this time, however, inhibin secretion from granulosa cells selectively inhibits FSH secretion and the surge is blunted) (Hall).

The LH surge is required for ovulation, and typically happens approximately thirty-six hours before the oocyte is released. LH has the role of reinitiating the first meiotic division so that meiosis I is completed just before ovulation. It also causes the differentiation of granulosa and theca cells to granulosa-lutein and theca-lutein cells. These cells now become primarily progesterone-producing, which is critical for uterine endometrium preparation (Hall). Finally, it stimulates the follicles to produce prostaglandins, which are inflammatory components needed to initiate inflammation near the bulging graafian follicle in the ovarian wall so that it may be eroded.

Combined with the action of these prostaglandins, collagenases, and proteases collectively break down the tunica albuginea and overlying epithelium of the ovarian wall surrounding the bulging follicle. In an inflammatory event, the wall ruptures and the oocyte within the follicle is released with a surrounding “cloud” of granulosa-derived cumulus cells into the peritoneum where it will be swept up by the fimbriae of the oviduct and transported to the ampulla to await fertilization by sperm (Weinstein, Female Reproductive Physiology & Endocrinology, 2015).
The Menstrual Cycle

The timing and coordination of hormonal release and response with ovulation and uterine changes is critical in preparing the female body for implantation of an embryo after fertilization. The menstrual cycle is also the key to hormonal contraception effectiveness, and thus it is important to understand the cycle intimately (Figure 1).

Day one of the menstrual cycle is the first day of menstrual bleeding. This is the beginning of the follicular phase of development where the cohort of ten to fifteen follicles is selected from the pool of primordial follicles to resume development. The follicular phase is variable from woman to woman, but it typically lasts for around twelve to fourteen days. Estradiol production gradually increases throughout the follicular phase. Near the end of a typical fourteen-day follicular phase, the graafian follicle is producing the largest amounts of estradiol. Estradiol has a direct effect during this phase on the endometrium. In response to estradiol, the endometrium undergoes hyperplasia and hypertrophy—the number and size of endometrial cells in the stratum functionalis increases. This is required after menses which results in endometrial shedding. In addition, the large amount of estradiol present at the end of the follicular phase causes the LH surge.

Following the LH surge, ovulation occurs. This typically happens around day fourteen of the cycle (about mid cycle in a twenty-eight day menstrual cycle). Again, this day can vary among women, but it is typical to observe ovulation thirty-six hours after the surge. Home predictor ovulation kits thus measure LH in the urine so that a woman can track and estimate her ovulation date (American Society for Reproductive Medicine [ASRM], 2006).
After ovulation, important changes in the ovary and endometrium occur that prepare the body for implantation. First is the transformation of granulosa and theca cells into granulosa-lutein and theca-lutein cells. A large structure that is a conglomerate of these cells is formed, called the corpus luteum. The corpus luteum begins secreting large amounts of progesterone in response to the gonadotropins. Thus begins the luteal phase. During the luteal phase, progesterone levels increase gradually. Progesterone has the effect of turning the proliferating endometrium into a secretory endometrium (Busillo, Rhen, & Cidlowsky, 2014). The endometrial glands begin to produce glycogen, which will be the main energy substrate for the implanted embryo should fertilization occur. Therefore, the luteal phase is critical for pregnancy; it also is the phase of the menstrual cycle that must be fourteen days long for a successful implantation. If there is a luteal phase defect and there is not enough progesterone being produced by the corpus luteum, the endometrium will not respond appropriately and implantation will be very unlikely.

If the woman conceives and an embryo implants (implantation and complete burrowing of the embryo into the uterine wall is the accepted marker of pregnancy), the corpus luteum will remain for the first trimester of pregnancy until the placenta takes over hormone production (Weinstein, *Pregnancy*, 2015). In addition to making the endometrium secretory, progesterone also causes uterine myometrial quiescence to avoid preterm contractions and is thus required for the entire gestation period (Busillo, Rhen, & Cidlowsky). If the woman does not conceive, the corpus luteum will degenerate after the fourteen-day luteal phase. In the presence of expressed luteolysins, the corpus luteum slowly shrinks, and progesterone levels fall. The secretory endometrium will lose its ability to maintain any pregnancy.

After the luteal phase, the cycle starts over, and menses occurs. Falling progesterone leads to matrix metalloprotease upregulation in the endometrium, and in conjunction with prostaglandins, leads to alternating vasoconstriction and vasodilation of the spiral arteries in the stratum functionalis. The constantly increasing and decreasing blood flow to the area leads to hypoxic necrosis and reperfusion injury. The tissue of the stratum functionalis is thus weakened and shed from the body (White & Porterfield).
Part Two: The Physiology of Contraception and Abortion

1. Contraception

Many contraceptive measures target female anatomy and physiology. The purpose of contraception is to inhibit fertilization. Several types of contraceptives exist with several different mechanisms of action, thus there are many ways in which contraceptives prevent pregnancy. It is important to make the distinction between contraceptives and abortifacients. Abortifacients are agents that actively prohibit the development of an embryo. Contraceptives do not have this action. Contraceptives only reduce the likelihood that an oocyte will be fertilized to result in conception.

Hormonal Methods

Hormonal methods of birth control include oral contraceptives (OCPs), intrauterine systems (IUSs), transdermal patches, injections, vaginal rings, and implants. The hormonal methods differ mainly in their routes of administration; the actual mechanisms of exogenous hormone are not wildly different among the different hormonal types. Efficacies, advantages, and disadvantages do differ, however.

OCPs, colloquially referred to as “the pill”, represent a number of different exogenous hormone products that one ingests orally. Usually taken daily, OCPs include progestin-only and combined progestin and estrogen forms. Current generation progestin-only contraceptives include low doses of levonorgestrel, norgestimate, desogestrel, norethindrone, and others. Combined OCPs vary in the hormone concentrations, but contain ethinyl estradiol plus one of the aforementioned progestins.

There are several general mechanisms that afford OCPs their ability to prevent pregnancy, and the mechanisms are often characterized as primary or secondary. The primary function of hormonal contraception (i.e. the delivery of exogenous sex steroids to the systemic circulation) is the inhibition of ovulation (Renner & Jensen, 2011). Introducing exogenous progestin and estrogen has the effect of increasing the negative feedback on the HPO axis at the level of the hypothalamus and AP production of LH and FSH. Ovarian follicle development is dependent on these tropic hormones; thus, by
inhibiting adequate LH and FSH release, ovarian follicle development can be suppressed to the point that ovulation of a viable oocyte is not likely. In addition, introducing exogenous progestin has the effect of reducing the pulsatility of GnRH secretion. This lowered pulsatility also leads to decreased LH and FSH release (Hall). As a result of interrupted follicle development, endogenous estrogen secretion will also be inadequate to cause the shift from ARC Kiss1 neuron activity to AVPV Kiss1 neuron activity (Popa, Clifton, & Steiner) the LH surge will not be stimulated and all of the events that are critical for ovulation will not happen. Therefore, this mechanism prevents ovulation and disrupts normal oocyte development. Together, they reduce the likelihood that a viable oocyte will ever be present in the oviduct to be fertilized. It is important to note that both progestin-only and combined OCPs have the same mechanism. However, studies have shown that the combined OCPs are more effective because estrogen potentiates the ability of progestin to disrupt LH and FSH production (Erkkola, 2007).

This primary mechanism occurs rapidly after administration of exogenous hormone. However, to completely suppress follicular development, seven consecutive days of administration must occur. It is typical for a woman to be on a 21-day regimen of daily hormone-containing pills with a 7-day placebo week. This simulates the “normal” 28-day menstrual cycle. However, it is possible (and opted for by many women) to go on a longer regimen to reduce the number of bleeding days throughout the year. Consideration is given to breakthrough bleeding when deciding if this option is possible for certain women. (Rivera, Yacobsen, & Grimes, 1999).

There are secondary mechanisms of hormonal birth control. During the normal menstrual cycle, progesterone has the effect of making cervical mucus thick, sticky, and viscous to impede sperm penetration or to form the mucus plug that keeps the uterus sealed during pregnancy (ASRM). Exogenous progestin has the same effect. Thus, during the time period where active OCPs are being administered, the cervical mucus is hostile to sperm penetration. This effect is acute and short-lasting, and is considered the front-line defense against sperm penetration. Cervical mucus changes occur at very low doses of exogenous progestin (Weinstein, Female Contraception, 2015).

Exogenous progestin may have an effect on endometrial development in the uterus during regular administration. This mechanism, therefore, results in a reduction of
the likelihood that a fertilized egg and subsequent blastocyst would implant to initiate a pregnancy. Exogenous progestin decreases endometrial proliferation as measured by a decrease in endometrial gland size and number (Renner & Jensen). This reduction occurs because of the loss of normal follicular development to synthesize and secrete sufficient quantities of estradiol—estradiol is required for the endometrium to proliferate following menses. However, there is simultaneous down-regulation of estrogen and progestin receptor expression on endometrial cells, inhibiting their ability to respond to any endogenous sex hormone produced during the menstrual cycle. The ability to proliferate in response to estrogen and the ability to become secretory in response to progestin is thus diminished. This action of the progestin in the pill is independent of its action on follicular development and ovulation, but, in conjunction with one another, these mechanisms both reduce the chances of conception and/or implantation (Weinstein, *Female Contraception*, 2015). If endometrial disruption was the only mechanism of hormonal OCP action, ovulation would occur normally.

The final secondary mechanism of hormonal OCPs is a change in the oviduct that results in slowed oocyte transport and a possible inhibition of sperm motility, capacitation, and storage (Renner & Jensen). The number of cilia on the tubal epithelial cells is reduced by exogenous progestin. In addition, the small number of cilia that are present beat with diminished intensity and frequency. The ciliary action of the tubal epithelium is critical for oocyte, sperm, and embryo transport to their respective sites of action. Therefore, reducing ciliary action is protective against fertilization and implantation.

These five mechanisms occur simultaneously and independently when a fertile woman takes exogenous progestin. Individually, the efficacy of each mechanism ranges from 20% to 50% (Weinstein, *Female Contraception*, 2015); however, in combination, the efficacy of OCPs at reducing the likelihood of pregnancy is higher; the failure rates of hormonal OCPs are less than 1% with perfect use, and less than 10% with typical use (Shoupe, 2006). In combined OCPs where ethinyl estradiol is included with progestin, there is better cycle control and bleeding regularity, and some evidence suggests that certain mechanisms are enhanced in the presence of the added estrogen, such as the negative feedback on hypothalamic GnRH secreting neurons (Erkkola).
Exogenous estrogen has the capability of exerting negative feedback on FSH and follicular development as well, however, there are risks to consider when women are taking exogenous estrogen alone. For example, uncontrolled hypertension, a significant family history (significant is defined here as several immediate family members experiencing a cardiovascular insult at a young age) of cardiovascular disease especially where vascular insults have occurred, smoking, or diabetes may disqualify a woman from taking combined OCPs (she may only be allowed to take the progestin-only method). Exogenous estrogen alone and unopposed has been linked to an increased risk of developing cardiovascular disease (including myocardial infarction and stroke) (Renner & Jensen).

**Non-Hormonal Methods (Barrier Methods, Other Methods, and Permanent Methods)**

Barrier methods of contraception include male condoms, female condoms, spermicides, cervical caps, diaphragms, and sponges. There is not a physiological change that occurs when barrier methods of contraception are used; rather, barrier methods constitute anatomic impedance to sperm entry into the uterus.

The male condom—usually made of latex rubber or polyurethane plastic—wraps the entire length of the penis and acts as a reservoir for semen to be deposited into during ejaculation. This prevents sperm from coming into contact with any part of the female reproductive tract (when used correctly). Importantly, male condoms are also very effective at limiting the spread of most sexually transmitted infections, while hormonal methods are not. Condom failure results from any action that compromises the integrity of the latex barrier, including tears, breaks, slippage, holes, or thinning usually as a result of misuse or aging (for example, it too small a condom, an expired condom, or no lubricant is used, the risk of failure is increased). Condoms also require couples to use condoms with every act of intercourse. With typical use for a year, eighteen out of one hundred women will get pregnant using male condoms (The American College of Obstetricians and Gynecologists [ACOG]).

The female condom is similar to the male condom in that is usually made out of polyurethane plastic. However, female condoms have an inner ring and an outer ring, and
a wider, more shallow shaped pouch that is inserted into the vagina before intercourse. They also reduce the risk of STI transmission and obviously impede sperm penetration into the uterus. In a year of typical use, twenty-one out of one hundred women will get pregnant using female condoms (ACOG).

Spermicides are produced as creams, foams, jellies, films, and vaginal suppositories that have the action of directly killing sperm on contact. It is recommended that they be used with other barrier methods, as spermicides have no documented effect at reducing the risk of STI transmission. Of the barrier methods, spermicides alone are the least effective; twenty-eight of one hundred women will get pregnant within a year of typical use of spermicides only (ACOG).

A cervical cap is a small, dome-shaped piece of plastic that must be sized by a healthcare provider (requiring a prescription) and fitted tightly to each individual woman's cervix for correct use. Cervical caps are usually filled with a spermicide to kill any sperm that make their way into the vagina. They afford no STI protection. In a year of typical use, thirteen of one hundred women who have never given birth and twenty-three of one hundred women who have given birth will get pregnant using the cervical cap alone (ACOG).

The diaphragm is similar to the cervical cap in that it is a dome-shaped piece of latex or silicone users fill with spermicide and inserts into the vagina to cover the cervix before intercourse. It also must be fitted by a healthcare provider and thus requires a prescription. They also afford no STI protection. In a year of typical use, twelve of one hundred women will get pregnant when using the diaphragm (ACOG).

The sponge is a circular-shaped piece of foam that is covered with a spermicide. It also must be inserted into the vagina and covers the cervix, however, it is not fitted to each individual woman and can be bought over the counter. It affords no STI protection. In a year of typical use, twelve of hundred women who have never given birth and twenty-four of one hundred women who have given birth will get pregnant using the sponge (ACOG).

Each of the barrier methods has its own benefits and risks. In general, inserting a foreign object into the vagina carries the risk of vaginal irritation. Only the condom is protective against STIs. Some barrier methods are available over the counter while some
require a prescription. However, barrier methods can be advantageous because they can be easily accessed at the time of intercourse to work immediately, and are often recommended as backup methods when hormonal contraception either is not an option or a daily dose is missed. However, the coitus-based characteristic of barrier methods is also their biggest weakness, as many couples fail to use them correctly or at all in the “heat of the moment”.

Intrauterine devices (IUDs) are similar in structural design to IUSs but lack the hormonal component. Instead, IUDs contain a coiled copper wire that when placed in the uterus elutes copper ions into the surrounding areas of the uterus. Copper ions are toxic to sperm cells and impede capacitation, and their presence initiates a low-grade inflammatory response that is constantly active in the endometrium that virtually eliminates its ability to support a pregnancy if conception occurs (Crosignani, 2008) (Weinstein, Female Contraception, 2015).

During withdrawal, known colloquially as “pulling out”, the male simply removes his penis just prior to ejaculation so that no semen will enter the vagina. However, this method is problematic because it requires the self-control of the male partner to stop intercourse right before or during his orgasm to remove his penis before any sperm are ejaculated. Interestingly, despite its seemingly risky nature, withdrawal is the primary form of contraception used by almost 5% of U.S. women using contraceptives in 2012, according to the Guttmacher Institute—withdrawal is free, requires no prescription or public embarrassment of having to purchase it in a store, and is always available.

Cycle planning involves the tracking of one’s menstrual cycle, usually done by the woman herself, to predict periods of relatively high fertility around the time of ovulation vs. low fertility during the rest of the cycle. Knowing the approximate day in the cycle of ovulation can indicate the time when a woman should be more cautious with respect to unprotected sex. Based on the twenty-four-hour viability period of an ovulated oocyte and the three to six day viability of sperm in the female reproductive tract, there is a typical five-day window of time during each cycle that conception is possible (Wilcox, Weinberg, & Baird, 1998). Therefore, she can abstain from sex during that period or use several barrier methods to ensure conception won’t occur. Only women with regular, predictable menses can use such a method. Studies have also shown that women are not very skilled
at predicting their own ovulation without the use of in-home predictor kits, which makes cycle planning a less effective form of primary birth control (Novikova, Weisberg, Stanczyk, et. al., 2007).

The “most effective” form of birth control is abstinence. For many women and men, however, complete celibacy is not a realistic form of birth control, as sexual gratification fulfills several social, physical, and emotional needs on a regular basis (Satcher, Hook, & Coleman, 2015).

Permanent methods of birth control are the surgical methods, which involve a permanent physical disruption of either the female or male reproductive tracts. In men, a vasectomy is performed to remove a section of the vas deferens, the tube that originates in the testes and carries sperm through to the proximal part of the urethra (Sovrin, 2014). In women, a similar procedure is done to the oviduct—a tubal ligation—to prevent the meeting of any sperm with an oocyte (this is colloquially referred to as “having your tubes tied”). (Storck, 2014). These methods are reversible in theory, but in practice are very difficult to reverse and are thus considered the only permanent methods of contraception. In addition, women can undergo a hysterectomy, where the entire uterus is removed and the ovaries are left intact. This procedure should not be done solely for contraceptive purposes because it carries much greater risks than tubal ligation. Hysterectomy affords no STI protection.

**Emergency Contraception**

Although emergency contraception should not be viewed as a form of regular contraception, it is still a physiologically relevant form of after-intercourse pregnancy prevention. Like regular contraception, emergency contraception can be both hormonal and intrauterine (Bastianelli, Farris, & Benagiano, 2008). Hormonal emergency contraception (often called the “morning after pill”) involves a high dose of exogenous progestin or combination estrogen/progestin. For example, Plan B, a popular brand of emergency contraception now available over-the-counter, involves two 0.75 mg doses taken twelve hours apart or a one-time does of 1.5 mg of levonorgestrel (Weinstein, *Emergency Contraception & Abortion*, 2015). While most effective the soonest it is taken after unprotected intercourse, Plan B can actually be taken up to three days after
unprotected intercourse with some efficacy up to five days after (Bastianelli, Farris, & Benagiano). A newer emergency contraceptive is a selective progesterone receptor modulator, ulipristal (Ella) which still requires a prescription, though may be more effective than the progestin-only methods in the three to five day window and for overweight women. The high dose of exogenous progestin may have similar mechanisms as daily-administered OCPs with respect to HPO axis feedback loops. Studies have shown that emergency contraception is only effective at preventing ovulation, and thus is not an abortifacient (Noe, et al, 2011). No effect on endometrial morphology, sperm function, or embryo transport has been found (Bastianelli, Farris, & Benagiano). Intrauterine emergency contraception involves placement of a copper-eluting IUD with the intention of immobilizing any sperm present in the uterus after unprotected intercourse and does not have the effect of interrupting an already established pregnancy. This is the most effective method of emergency contraception, is not affected by the woman’s weight, can be used up to five days beyond the expected day of ovulation, and can remain in place to provide long term contraception.
II. Induced Abortion

Abortion involves the deliberate termination of a viable pregnancy via medication or surgery that results in the arrest of development and removal of a fetus. Women desire abortions for a variety of social and medical reasons. Induced, or therapeutic medical/surgical abortion is distinct from spontaneous abortion, also known as miscarriage, where the termination of a viable pregnancy is not deliberate, or a missed abortion, where discovery of a nonviable embryo/fetus is made. These may occur as the result of a fetal abnormality, trauma, infection, luteal phase defect, or random chance.

Medication Abortion

A medication abortion can be performed up to seven weeks according to FDA approved guidelines (Lotke) or up to ten weeks after the first day of the last menstrual cycle by evidence-based protocols. It involves a combined dosage of two different medications. The first medication administered is usually mifepristone, or rarely methotrexate. Mifepristone is a selective progesterone receptor antagonist. Methotrexate is an inhibitor of folic acid metabolism that disrupts DNA and RNA synthesis in the fetus, which stops development completely. In either case, the embryo is rendered nonviable. In addition to mifepristone or methotrexate, misoprostol is administered. Misoprostol is a prostaglandin derivate that acts on the cervix and the uterus to stimulate cervical dilation and uterine contraction so that the nonviable fetus can be delivered from the body (Planned Parenthood Federation of America) (Weinstein, Emergency Contraception & Abortion, 2015). Abortion can also be achieved by misoprostol alone, although the efficacy is diminished. These protocols are frequently used in countries where there is little or no access to mifepristone.

Surgical Abortion

The type of surgical abortion performed depends on the gestation age of the developing fetus. Before sixteen weeks gestation, an aspiration abortion is performed. A cannula is used to suction out the fetus and placenta from the uterus through a manually dilated cervix. After 16 weeks gestation, a dilation and evacuation (D&E) is performed.
Depending on gestational age, the cervix may be dilated prior to the procedure, or manually at the time of procedure, after taking misoprostol to aid in cervical ripening. A cannula and forceps are used in conjunction to remove all fetal tissue from the uterus. In some cases with advanced gestational age, fetal death is induced first with an injection of potassium chloride or digoxin (Epner, Jonas, & Seckinger, 1998) (Paul, 1999).

**Late-Term Abortions**

In late-term abortions, fetal demise is intentionally induced prior to the induction of labor of the still-born fetus (Epner, Jonas, & Seckinger). Late-term abortions performed during the third-trimester are performed for a wide variety of reasons, often because the health of the mother or fetus is threatened by carrying the pregnancy to term.
Part Three: Abortion as a Minority Health Disparity

I. Contraception and Abortion Use in the United States

Contraception and abortion use are inseparable entities with respect to individual decision-making, policy, and women’s health at large in the United States. The ongoing, passionate, extremely polarized debate between the “pro-life” and “pro-choice” sides is a disagreement about the morality of abortion; however, at its core, it is truly a debate about sexual freedom of choice. Use of contraception is at the heart of sexual freedom in the U.S. It is important to know the statistics regarding contraception use among women of reproductive age in order to understand why abortion is accessed among that same population. For example, it is well-known in the world of sexual public health that close to half of all pregnancies in the U.S. are unintended. Over forty percent of those end in an abortion. Therefore, it is imperative that the discussion of contraception and abortion not be treated as separate issues; rather, access to both must be understood for safe and fair health policy making.

Contraceptive Need and Use

According to the Guttmacher Institute\(^7\), there are sixty-one million American women within their childbearing years (ages 15-44). Of those, approximately seventy percent (forty-three million) of them are “at risk” of unintended pregnancy—meaning they are sexually active and have no current intention or desire to become pregnant but can become pregnant if they fail to use a contraceptive method correctly. Over the span of a year, a typical male and female couple has an eighty-five percent chance of conceiving without using any method of contraception. However, in the U.S., the average woman only wants two children. Therefore, in the span of ages 15-44, she would have to use contraceptives consistently and correctly for almost thirty years in order to avoid having more than the two desired children (Guttmacher). Obviously, there are some women who do desire to have more than two children; however, without contraception, the amount of time a woman would spend bearing children does not match the typical woman’s goals for her own life.
A staggering ninety-nine percent of U.S. women aged 15-44 have ever used contraception during sexual intercourse (Guttmacher), and more than sixty percent of those women currently use contraception. The pill is currently the most popular method of birth control used, followed by tubal ligation, the male condom, the IUD/IUS, vasectomy, withdrawal, injectable hormones, and the vaginal ring. Other methods like cycle planning, hormonal implant, patch, and emergency contraception all account for less than one percent each of current usage by reproductive age women in the U.S. Close to seven percent of at risk women use no contraception. Sixty-seven percent of women using contraception regularly opt for reversible forms. Thanks to the concentrated work effort of family planning advocates in promoting education and improving access, certain forms of long-acting reversible contraception (LARC) such as the IUD/IUS and implant, have become more popular among women of reproductive age, increasing from two percent in 2002 to nine percent in 2009 (the newest studies show that just over twelve percent of women currently use LARC). Women who have had children before are most likely to use LARC methods.

As of 2010, approximately one in nine sexually experienced women used emergency contraception. Of those women, fifty-nine percent had only used emergency contraception once, meaning more than forty percent of those women used emergency contraception more than once. Use of emergency contraception is highest in young women aged 20-24 at twenty-three percent. Close to fifty percent of women using emergency contraception report doing so because of an unprotected sexual encounter, while the other half report fear of the failure of their primary method (for example, condom breakage or forgetting to take a day’s dose of the pill).

Abortion Need and Use

During the eight years between 2000 and 2008 in the U.S., the rate of induced abortion access among reproductive age women declined from 21.3 abortions per 1,000 women to 19.6 abortions per 1,000 women (an eight percent decline). The highest rate of abortion with respect to age stratification was among women aged 20-24 (39.9 abortions per 1,000 women aged 20-24). The second highest rate of abortion access was in women aged eighteen and nineteen (34.7 abortions per 1,000 women aged 18-19).
These rates declined from 2000-2008 for both groups. In women aged 15-17, the rate reduction was the most dramatic; the rate decreased from 14.6 abortions per 1,000 women aged 15-17 to 11.3 abortions per 1,000 women (22.4%). (Jones & Kavanaugh, 2011). According to Jones and Kavanaugh, if these rates of abortion continue, close to a third of all American women will obtain an abortion in their lifetime. This is down from nearly half of all American women seen in the previous generation. However, abortion rates are influenced by a large number of variables that relate to personal choice of sexual activity, policy, economy, population demographics, and, of course, contraception access. More recent studies of abortion incidence performed by Jones and Jerman in 2014 showed further decreases in abortion rates between 2008 and 2011 across the United States to its lowest rates since 1973 (post Roe v. Wade). It remains, however, an important medical service as unintended pregnancy rates have not yet been reduced significantly and hover around 50% (Finer & Zolna, 2014).

Reasons cited by women for obtaining an abortion are varied. Women frequently report that having a child would interfere with their educational or career goals, their ability to care for dependents, lack of funds required to support an additional child, no desire to be a single mother, relationship problems, completion of intended childbearing, and a lack of readiness to have a child in general (Finer, et. al. 2007).
II. Minority Contraception and Abortion Use

Research has strongly established that unintended pregnancy and abortion rates are not uniformly distributed among racial groups, and thus represent a minority health disparity in the United States. Rates of abortion among Black and Hispanic women, for example, are consistently higher than rates of abortion among White women, even when adjusted for certain factors like education and income. Unintended pregnancy rates among minority populations are also higher (unintended pregnancy rates are a good predictor of abortion usage since most abortions are the result of an unintended pregnancy). Contraceptive use among minorities and among teenage women are lower than that of White women.

Minorities Have More Unintended Pregnancies and Abortions

Ninety-one percent of White women at risk of unintended pregnancy currently use a contraceptive method, versus eighty-three percent of their Black counterparts. Reliance on tubal ligation (as a form of female sterilization) is greater among minority women (specifically Black and Hispanic women) than among White women (Guttmacher, 2015).

In 2008, 36% of all induced abortions were had by White women, 30% by Black women, 25% by Hispanic women, and 9% by women of other races (7% Asian and 2% in another ethnic category) (Jones, Finer, & Singh, 2010) while the racial distribution of White, Black, and Hispanic people in the U.S. is 65%, 13%, and 17%, respectively. Non-white women obtaining abortions thus accounted for more than 60% of all abortions performed in 2008. According to abortion data from 2004 cited by Susan Cohen, the rates of abortion use are even more disparate: in Black women, abortion rates were 50 per 1,000 women aged 15-44 compared to 11 per 1,000 and 28 per 1,000 in White women and Hispanic aged 15-44, respectively. Importantly, these rates mirror the rates of unintended pregnancy for the same year. Black women had an unintended pregnancy rate of 98 per 1,000 women aged 15-44, compared to a rate of 35 per 1,000 and 78 per 1,000 in White and Hispanic women.

Black women are three times as likely as their White counterparts to be faced with an unintended pregnancy (Cohen, 2008). However, Black women “as a group want the
same number of children as White women” (Cohen). Because of this disconnect, the abortion rates among the Black population are much higher to achieve the same number of desired children because Black women experience the highest rates of unintended pregnancy.

**Why Black Women Have More Abortions**

There are a multitude of possible reasons underlying the five times higher rate of abortion use that is observed in the Black female population when compare to the White female population. Some of these reasons are well supported by empirical data, and some are conjectures from both the pro-life and pro-choice sides that have been twisted as tools to support or deny claims from the opposing side. Regardless, it is important for women’s health providers and the population at large to understand some of the potential barriers to contraception access that could be a cause of the higher unintended pregnancy and abortion rates, and thus, several possible reasons will be discussed here.

Governmental policy with respect to abortion services is a critical factor when considering barriers to abortion. The Supreme Court ruling of 1973 in the case of *Roe v. Wade* made it legal throughout the country for women to obtain an abortion before the viability of the fetus was achieved. This right was upheld in the ruling of 1992 in *Planned Parenthood v. Casey* while simultaneously expanding states’ abilities to pass laws that have the effect of limiting abortion access (Guttmacher, *State Facts About Abortion: Arizona*). Therefore, although there is legal protection of abortion at the national level, there are still several powers regarding abortion procedures that are maintained by individual states. For example, in Arizona a woman seeking an abortion must comply with state-sanctioned consent agreement with a licensed medical doctor. Then, she must wait twenty-four hours after this counseling session before the procedure is performed. This requires two trips to the location of the services. In Arizona, health plans that are offered in the state exchange program under the Affordable Care Act can only cover abortion services if the woman’s life or health is in danger. Abortion is only covered for public employees on insurance policies or for Medicaid recipients in the same case. No minor may have an abortion without the explicit consent of a parent in the form of notarized consent. Finally, a woman must undergo an ultrasound twenty-four hours prior to the
abortion, and the provider must give the woman the chance to see the image of the developing fetus (Guttmacher). All of these state-enacted provisions create barriers to abortion access for all women in general.

Nearly all U.S. states allow certain health providers or institutions to refuse contraception and abortion services. All of these states have provisions that allow individual providers to refuse abortion services. Forty-three states permit health care institutions to refuse abortion services. Twelve states (including Arizona, Arkansas, Florida, Mississippi, and Tennessee) allow health care providers to refuse contraception services (nine allow individuals, six allow pharmacists to refuse dispensing contraceptives, including Arizona, Arkansas, Georgia, and Mississippi) (Guttmacher, *State Policies in Brief: Refusing to Provide Health Services*).

With respect to insurance coverage of contraceptives, only twenty-eight states have mandates that require insurers to include all prescription contraceptives that are FDA approved to be included in their list of drugs that are covered. Twenty of these states allow some employers and insurers to refuse to comply (nine of these include an “expansive” refusal section that can apply to religious organizations) (Guttmacher, *State Policies in Brief: Insurance Coverage of Contraceptives*). Alabama, Florida, Louisiana, Mississippi, South Carolina, and Tennessee are not on this list, meaning they do not have state-mandated insurance coverage of contraceptives. With respect to minor access to contraceptive services, Alabama, Florida, Louisiana, Mississippi, Missouri, South Carolina, and Texas do not explicitly allow all minors to provide their own consent for contraceptive services. Some of these states have specific allowances, such as for high school graduates (Guttmacher, *State Policies in Brief: Minors’ Access to Contraceptive Services*). It is worth mentioning that with the passage of the Affordable Care Act, the federal government has mandated that any new insurers must provide all FDA approved methods without cost sharing to the patient.

It is commonly accepted in the field of women’s health that making abortion illegal or difficult to access does not discourage women from getting abortions; rather, women seek out other ways to get abortions instead. These other ways often are unsafe and lead to more bodily and mental harm to women than legal, safe abortion does, including the immediate outcomes of hemorrhage, infection, traumatic lesion of the genitals, and toxic
reactions to chemicals placed in the reproductive tract in addition to life-long sexual difficulties, chronic pelvic pain, and infertility (Ladipo, 1989 as cited in Faundes & Hardy, 1997). Mortality associated with abortions is especially prevalent in countries where abortion is illegal. There are sometimes legal repercussions to this “illicit” self-abortion practice, but for many women, it is their only option, especially in cases where the closest abortion clinic is several hours’ drive and several days of work missed away or they do not have the financial means to fund an abortion procedure.

Poverty is a major factor influencing adequate access to contraception and abortion services. Of women obtaining abortions in 2008, forty-two percent self-reported family incomes that put were 100-199% of the federal poverty level (FPL). This proportion was an increase from the year 2000, where 27% of women reported a family income of 100-199% of the FPL when seeking abortion services. The abortion rate of poor women was twice as high as the abortion rate of all women (Jones, Finer, & Singh, 2008).

It is also prudent to consider a state’s policies (in addition to those discussed above) legislating sexual education of minors in public school systems, access to contraceptive services (to include insurance coverage), and the allowance of health providers to refuse certain services based on religious grounds or otherwise. According to the Guttmacher States in Brief article regarding sex and HIV education, over half of U.S. states have no mandated sex education—meaning schools in these states are not legally required to provide any form of sexual education to students. Many of these are the Southern states, including Alabama, Arkansas, Florida, Louisiana, Mississippi, Missouri, North Carolina, South Carolina, Tennessee, and Texas. Racial minorities are not equally distributed geographically throughout the U.S. It is well established that a significant portion of Black people in the U.S. are currently living in the South and make up a disproportionate percent of the population in several southern states. One can see a possible connection between the lack of government-mandated sex education and high unintended pregnancy rates in these areas. In addition to laws mandating sex education in general, there are also more specific state laws defining the content of sex education. Some state governments mandate that when provided, sex education must be “medically accurate”, “culturally appropriate and unbiased”, and “cannot promote religion”. Not surprisingly, the states that lack these protections against inaccuracy and bias are
Alabama, Arizona, Arkansas, Florida, Georgia, Louisiana, Mississippi, Missouri, North Carolina, South Carolina, Tennessee, and Texas. Therefore, even if schools in these states do opt to have a sex education program for their students (many of which will be Black students based on population distribution), there is no guarantee that they will be medically accurate and free of some sort of cultural or religious bias. Finally, states can also mandate the inclusion or omission of contraception and abortion information in their sex education programs to include the degree with which contraception or abortion is discussed (it can be required that abstinence be “stressed” over contraception). Some of the states that “stress” abstinence are Alabama, Arizona, Arkansas, Florida, Georgia, Louisiana, Mississippi, Missouri, North Carolina, South Carolina, Tennessee, and Texas. Of these states, only Alabama, North Carolina, and South Carolina actually mandate that contraception must be mentioned) (Guttmacher, State Policies in Brief: Sex and HIV Education).

A study performed by Aarons and Jenkins in Washington, DC illustrating the impact of misinformation that can result from lacking sex education involved focus groups of Black and Hispanic teenage men and women (age 14-19) to gauge their attitudes on sex, pregnancy, and birth control. The study reports a large degree of misinformation among the young women of color in the focus groups, stating that “there appears to be large amounts of erroneous information circulating among these participants, their peers, and others in their environment”. Misinformation about their friends, classmates, and family members experiencing adverse effects like sterilization and even cancer was being circulated throughout the young women, in addition to information regarding negative side effects like bleeding, weight gain, and varicose veins. For young Latina women, the “machismo” of their male counterparts (especially of older Latino men), was cited as being a major reason that condoms were not used. More interestingly, both young Latina and Black women stated that their male partners reported a reduce pleasurable sensation when using a condom in addition to feeling pressure by their male sex partners to forego condom use in the interest of trust and expected fidelity. Misinformation was also present among the young men in the focus group, where some reported misinformation that the heat that was produced in one’s pocket was enough to render a condom ineffective if he carried it in his pocket. The study found that the idea of carrying a condom around on
one’s person at all times for sexual preparedness was not endorsed by any of the young people involved in the focus groups (young women are often seen or fear they will be seen as “sluts” if they do carry a condom with them in public).

Birth control conspiracy beliefs held by Black women and suspicion of abortion rights activists have been previously documented, and the history of the reproductive rights movement has been laden with deeply complex issues of race, exclusion of minorities, and even abuses such as forced or unknown sterilizations (Davis, 1993). The history of forced or unknown permanent sterilizations includes the publicized case of the Relf sisters, a pair of Black twelve- and fourteen-year old sisters who were surgically sterilized after their mother unknowingly consented to what she assumed was a continuation of the Depo-Provera hormonal injection contraception they had already been receiving. She claims that the social workers who were responsible for the Relf sisters’ case were deceptive and failed to explain the true nature of the procedure. After this case went public in 1973 (the summer after the passage of Roe v. Wade made abortion legal in the U.S.), there were at least eleven reported instances of similar forced or unknown sterilizations in the state of Alabama alone. Other government-funded birth control clinics in other states allegedly were performing similar forced sterilizations. Some women reported coercion in sterilization abuse, including threats to withdraw government assistance like welfare if they did not comply with a surgical sterilization. One reported case of this sterilization abuse and coercion was filed by Nial Ruth Cox in North Carolina. In North Carolina, the Eugenics Commission of North Carolina authorized over 7,500 sterilizations after 1933—5,000 of these were performed on Black Americans despite the justification that the measures were aimed at preventing the reproduction of “mentally deficient” people (Slater, 1973 as cited in Davis, 1993). South Carolina was also a center of similar abuses. An obstetrician, Dr. Clovis Pierce, was tried for such abuses after eighteen women charged him with sterilization abuse in the early 1970s. He allegedly required sterilization be performed in order to provide labor and delivery services to women on Medicaid with two or more children. During the trial, he was backed by the South Carolina Medical Association, who asserted that physicians are morally and legally obligated to insist on the permission of sterilization before agreeing to treat a patient. Davis writes,
“The domestic population policy of the U.S. government has an undeniably racist edge. Native American, Chicana, Puerto Rican, and Black women continue to be sterilized in disproportionate numbers. According to a National Fertility Study conducted in 1970 by Princeton University’s Office of Population Control, 20 percent of all married Black women have been permanently sterilized…Moreover, 43 percent of the women sterilized through federally subsidized programs were Black” (Davis, 22-23).

A small survey conducted by Bird and Bogart interviewed seventy-one Black individuals about their beliefs regarding certain birth control conspiracy beliefs that had been previously described. In the study, the largest percentage of respondents agreed that “Whites want to keep the numbers of African American population down”, and close to 6% of respondents agreed somewhat that birth control was a mechanism employed by Whites to commit Black genocide. Over 35% of respondents agreed with some degree that the government uses Black people as “guinea pigs” to test new contraceptives. Perceived discrimination by health care providers was much more prevalent among this group of respondents. Close to half of all respondents endorsed statements describing provider discrimination such as the assumption that Black women have a lot of children and need birth control, have multiple sexual partners, and have STIs like chlamydia, gonorrhea, and HIV, demonstrating the perception of prejudice held by Black patients with White providers. There was also the belief that doctors and nurses coerce Black women to use certain birth control methods. Perceived group discrimination was different from and higher than the individual (personal) experiences reported by the same population, which were significantly lower (some were even 0%).

American Black people have a significant sense of mistrust of the American health system and of the movement for birth control and abortion rights as a result of the sterilization abuse and coercion they experienced in the 20th century. When combined with dangerous misinformation, real and perceived discrimination, state policies that are restrictive to contraception and abortion access and accurate sex education in states where disproportionate numbers of Black women live, and a generally hostile atmosphere
for women at large are all reasons to explain why contraception use, abortion, and, at its core, unintended pregnancy result in minority health disparities in the United States. For Black women who truly believe that “birth control” is a genocidal or eugenic tool used by White people to limit Black population growth, or for young men and women who do not know how to access contraception or use it appropriately, these barriers are major reasons to explain why consistent contraception is not used, unintended pregnancy rates are high, and, consequently, abortion rates are similarly high. Knowledge of the history of sterilization abuse might discourage Black women and men from using any type of birth control, as the lay term “birth control” often describes all forms of hormonal, non-hormonal, and surgical methods as lumped into one category. It is not unlikely, therefore, that there is a combination of this suspicion for all birth control and a serious lack of education that results in persistent high unintended pregnancy rates among Black women because contraception is not being used consistently during all sexual encounters.

The Pro-Life Movement in America

The existence of the minority health disparity should not obscure the importance of the war on women’s health in general. Cristina Page’s book *How the Pro-Choice Movement Saved America: Freedom, Politics, and the War on Sex* details the pro-life movement’s adamant and often times violent opposition to the freedom of choice in the U.S.—the freedom to use contraceptives to engage in recreational sex, the freedom to use family planning to decide when to and when not to have children, and the freedom to have an abortion if an unwanted pregnancy occurs. This extreme pro-life side has a loud, well-funded voice in the United States despite being the minority opinion among Americans (the violence that is directed towards abortion providers and towards women seeking abortions is, according to Page, not a surprising outcome). With respect to the dynamic between contraception rights and Black Americans, Page discusses how one pro-life advocate links contraception to “black rage”. She quotes,

“Until contraception became easily available, the black man could be told where he could live, where he could work, where he could be educated, but at least he could be a man; he could have children. With contraception, and
five years later with abortion, anything a man could do could be made void by a woman. This may have been part of the driving anger of the summer of 1968” (Page, quoting Hanna Klaus, 108).

The pro-life movement does not rely on peer-reviewed evidence-based study to support its actions. Historically, when it does cite scientific evidence for its opposition to contraception and abortion use, the evidence is biased, inaccurate, or completely fabricated. For example, the pro-life movement invented the concept of “partial-birth abortions” which (inaccurately) described the practice of late-term abortions as involving the induced abortion of full-term and healthy babies, despite the reality that most late-term abortions are performed for women who carried an unviable fetus and that far less than 1% of all abortions are performed late-term. The campaign against “partial-birth abortions” was successful in convincing the public that “something that [wasn’t] a problem [was]” (Page, 11), and they invested large amounts of money and time pushing the idea that all late-term abortions were sought by women with no moral conscience and by providers who only sought the payout of performing such a procedure. Similar fabrications of inaccurate medical information have occurred in the pro-life movement, including fake evidence regarding “post-abortion stress syndrome” despite American Psychological Association research that showed decreased anxiety and increased self-esteem post-abortion in women who experienced an unintended pregnancy. Misinformation observed in the American public is bolstered by intentionally fabricated pseudoscience presented in media by the pro-life movement. An investigation of the website of the American Life League (ALL) (a large pro-life educational organization in the U.S.) reveals a lack of reliable source citation and correct explanation of the medical realities of abortion and contraception. There are pages nested under the “Learn” tab that contain information about abortion, contraception, euthanasia, sex education, Planned Parenthood, and even in vitro fertilization and organ donation. On the abortion web page, ALL writes that “the partial birth abortion [is] designed to kill the preborn child when the birth process is almost complete” but fails to note instances of life-threatening causes to both mother and child that could be prevented with a late-term abortion. It also discredits Planned Parenthood, the United Nations World Health Organization, the American Medical Association, and
the American College of Obstetricians and Gynecologists and asserts that they “falsely define pregnancy as beginning at implantation and not at fertilization”. They characterize the pill and IUDs as abortifacients. This page contains no peer-reviewed source citations. The page on contraception again asserts that the pill and any hormonal method can be an abortifacient. They briefly mention that the main mechanism by which hormonal contraception works is via inhibition of ovulation, but they center their focus on the potential that exogenous hormone can cause endometrial thinning. The ALL says that this mechanism can lead to a “chemical abortion” because this “mode of action can occur”. It fails to report any evidence to suggest that breakthrough ovulation, sperm penetration of a thickened cervical mucus plug, and therefore fertilization occur with significant frequency in the population. Again, there is not a single scholarly source cited on this page.

The American Life League is only one example of pro-life organizations that distort medical science in the interest of convincing the public that contraception and abortion are morally wrong without providing any evidence basis for their claims. The Arizona Right to Life Foundation (a branch of the National Right to Life Foundation) performs school outreaches to high school and college students throughout Arizona because students of this age “are sexually promiscuous”, “ignorant of fetal development”, and are “ignorant of the consequences of abortion”. No evidence exists on the website to support these claims. In a brochure that is distributed to these students at these outreach events titled “Top 10 Questions Asked About Abortion” (found by clicking a link called “Fetal Development Brochure”) AZRTL defines abortion as “the killing of the pre-born child in the womb of his or her mother”. They list the “most common complications following an abortion”, provide no incidence data about these complications, and then post the question “Does this sound safe to you?” alongside graphic pictures of aborted fetuses. There is no medical information on fetal development.

It seems that the pro-life movement has no qualms about stating its reasons for opposing freedom of choice as fact. To the uneducated layperson, to someone who knows nothing about the truth of fetal development, abortion procedures, and the well-established interventions that decrease unintended pregnancy, the false claims that the
pro-life movement makes are especially dangerous. Targeting young adults and children with this false information is especially insidious.

**The Pro-Choice Movement and Solutions to Disparities**

The unfortunate fact of the health disparity with respect to minority access to birth control and abortion use has one silver lining; because there are several possible causes of the problem, there are several places where intervention is possible. Misinformation and ignorance must be eradicated through the implementation of comprehensive sexual education to all American youth. In schools, it should be mandated that all students be taught sex education with an unbiased, non-gendered methodology so that the perceived barriers about contraception use can be eliminated. In the Aarons and Jenkins study, the focus groups that discovered young people’s views on contraception showed the dangerous ignorance that permeated the thoughts of young people of color and likely permeate the thoughts of all youth in the U.S. who are subjected to biased sex education. Therefore, providing those youths with scientifically accurate discussions about contraceptive effectiveness is key in combating that ignorance. In addition, the double standard and stigma that surrounds sex in the United States must be discussed and dismantled for its harmful effects on sexual decision making. Sex exists everywhere in the media, yet it is viewed as a taboo topic. This conflict creates confusion for youth who end up making poor sexual decisions because they are truly uninformed. Reversing restrictive abortion mandates federally is also a key part of lessening the harm done to women by limiting access.

To show that education and counseling are truly effective in reducing unintended pregnancy and abortion use, The Contraceptive Choice Project, a prospective cohort study of 10,000 reproductive age women in St. Louis, Missouri (Washington University School of Medicine), found that when its participants were educated and informed about all methods of birth control with no associated cost, 75% of participants chose a LARC method (IUS or implant). LARC methods have a significantly low failure rate (less than 1%) because they do not involve continued, repeated use as is required by the pill or condoms. According to The Choice Project, “women using LARC…had the lowest unintended pregnancy rates during year 1, year 2, and year 3 of their follow-up”
(www.choiceproject.wustly.edu), and the abortion rate among participants was only 6 per 1,000 women compared to a national rate of 20 per 1,000 women. The Choice Project reports that only 10% of American women use LARC methods, mainly because they are not aware that such an option exists. Therefore, intervention in provider education—training providers to increase their awareness of LARC methods and ensuring they are counseling patients on options other than the pill or barrier methods when available—in addition to better education of the public through youth sex education that is not focused on abstinence only can be important parts of the solution to reduce unintended pregnancy rates among Black women in the U.S. Affordable access to a variety of contraceptive options is a key path to reducing abortion rates. The 75% LARC-use rate in the participants of The Choice Project was a result of free access to those methods, and, given that almost half of all women who seek abortions are at the federal poverty level, there must be a movement at the national level to open access to all forms of birth control so that they are affordable, easy to obtain, and effective.

The Colorado Family Planning Initiative (CFPI) in recent years has increased access to LARC methods and increased provider education that resulted in enabling over 30,000 Colorado women to choose LARC methods. This resulted in a dramatic 42% decrease in abortion rate in women ages 15 to 19 and a 40% reduction in teen birth rates. These efforts, however, were funded by a private grant, and state funding for the initiative was not approved in Colorado legislature in the Spring of 2015.

In addition to the eradication of public misinformation regarding sex, pregnancy, contraception, and abortion through the means of better education, high quality research must be done in the field to conclusively support the claims that freedom of choice in contraception and abortion use are protective against adverse health outcomes for women. The Guttmacher Institute is a leading source of such research, and is one of the only non-university organizations dedicated to producing a variety of resources that are peer-reviewed. Two peer-reviewed journals are housed by the Guttmacher Institute, and it is funded by the National Institutes of Health.
Part Four: Personal Experience and Provider Discussion

In the interest of adding original content to the final product of this Honors Thesis, I had the privilege of developing a relationship with a women’s health nurse practitioner who was able to contribute valuable insight into the world of women’s health and to my knowledge of the topic. I met with her to discuss the topic, attended her lecture on sexuality at the UA College of Nursing to her nursing students, and shadowed her in a clinical setting.

These encounters all highlighted everything I had learned in my reading while preparing this Thesis. For example, during her lecture, she asked all students if they knew how many days out of the normal menstrual cycle conception is possible. No student knew the correct answer; this is an example of how much misinformation or complete lack of information there is among American young adults about sex—even among professional students who are more exposed to the science of the human body, including sexuality, more than the average layperson. Presumably, they should be more informed about health-related issues like sexuality and reproductive health. When asked about how sex was addressed by each students’ parents, most students reported that sex was either not discussed, or it was discussed sheepishly by parents who were reluctant to go over such a “taboo” topic with their children. I observed that most of the discussions in the classroom resulted in nervous laughter from the students, highlighting the very nature of sex talk in the United States as being comical and not accepted in every day discussion. Her goal as an educator is to show her students that sex is and always will be a critical part of daily life for most people, and, as future healthcare professionals, knowing a patient’s sexual history is just as important as knowing the other aspects of their medical history.

Comprehensive sex education and universal access to free contraception were the two major solutions that we discussed. Of course, this would require that the pro-life side compromise most of its current ideals in the interest of women’s health, and we discussed how if the “rhetoric of polarized politics” cannot be transcended, then there is “too much practical damage” done to women’s health (Kiser, 2015).
My own personal view of abortion has changed dramatically after the completion of this Thesis. Before, although I was pro-choice, I was naïve about how hostile the atmosphere is surrounding abortion and contraception in the United States. I viewed the United States through rose-colored glasses as a progressive, post Roe v. Wade world where Planned Parenthood was free to practice its work without any opposition or violence. This Thesis showed me that the opposite case was actually true, and despite the federal ruling of Roe v. Wade, the state of women’s health freedom in the U.S. is a precarious one as is the safety of women seeking abortions and providers performing them; the incidence of “pro-life”-fueled (via inflammatory rhetoric and smear campaigns) violence targeted at women and providers in facilities that provide abortions is substantial, including several murders, attempted murders, bombings, shootings, arsons, death threats, assaults, and anthrax threats (Page, 102).
Conclusion

Contraception has been hailed as one of the great public health advances of the last century. With greater access to it, men and women have enjoyed the invaluable freedom to decide when to have children. More women have entered the workforce with its help, men have benefitted with the opportunity to become more involved fathers as their women partners can pass on more parenting responsibility, and sex can be enjoyed as the pleasurable experience it has evolved to be. Eradicating misinformation through comprehensive sex education, enhancing provider abortion training, and opening a discussion between the opposing sides of the abortion debate are all key steps in reducing the number of unintended pregnancies in the world. As with all minority health disparities, recruitment of culturally diverse and sensitive providers, education of existing providers, improving access to and education about all methods of contraception and continued research into their causes will be a vital part of eliminating them. Studying the reproductive biology that underlies contraceptive mechanisms leads to a better understanding of how to use them and why they are important. In any society, taking care of women and promoting their freedom of choice is a key way in which good outcomes are made possible for everyone.
Notes

1. Aromatization of androgens to estrogens can also occur peripherally in the human body outside of the ovary.

2. Progestins are defined as synthetic progestogens. Progesterone is the naturally-occurring progestogen in the human body. Progestogen, then, is an all-encompassing term used to describe synthetic and natural steroids of this specific type.

3. The pulsatility of GnRH secretion as modulated by the hypothalamus determines how the anterior pituitary responds with preferential LH or FSH secretion. Faster pulsatility favors LH secretion, while slower pulsatility favors FSH secretion. Exogenous progestin slows pulsatility to the point where both LH and FSH secretion are blunted.

4. Perfect use is defined as using a contraceptive measure correctly and consistently all the time. Typical use is defined as not using a contraceptive measure correctly and consistently all the time.

5. Some smartphone apps exist that can track a woman's menstrual cycle. Important to note is that the 28-day cycle is widely variable among women of reproductive maturity.

6. In perfect use abstinence, it is 100% effective in theory only. However, perfect use abstinence is not a practical or common method of birth control in practice.

7. The Guttmacher Institute is a non-university-based institution for the advancement of sexual and reproductive health through research, policy analysis, and public education.
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