Factors Affecting Pubertal Timing and Perceptions of Birth Control

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Factors Affecting Pubertal Timing and Perceptions of Birth Control

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Interdisciplinary Honors in Biology and Psychology

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Abstract

Menarche is the occurrence of a first menstrual period in the female adolescent. The age of menarche has been decreasing over the past 150 years. While some factors have been identified, like increased body mass index (BMI), such factors alone cannot account for the overall decrease in age.

Due to the decreased age of menarche and as additional uses for oral contraceptive pills (OCPs) have been identified, it is becoming clear that females no longer use “birth control” or “oral contraceptives” primarily to prevent pregnancy, but instead for a myriad other reasons including “menstrual suppression.” Menstrual suppression is the use of hormonal methods to diminish undesirable effects of cyclicity such as changes in mood, painful cramps, and unpredictability. OCPs combine estrogens and progestins in a pill form that is taken orally for 21 days, followed by a placebo pill taken for seven days, mimicking the idealized 28-day menstrual cycle. OCPs require a prescription and are 99.7% effective at preventing pregnancy, when taken as directed. Mechanistically, most hormonal interventions prevent the positive-feedback loop between estrogen and luteinizing hormone necessary for ovulation. In addition, some also impact the endometrium and cervical mucus, making both less suitable for implantation and fertilization. Thus, young women begin using OCPs from a young age and switch their prescriptions throughout their reproductive years, yet very little research exists on these modern modifications to OCP use. One goal of this study is to better define and clarify these additional new uses of the birth control pill.

The purpose of this study is two-fold. Firstly, to determine factors affecting the earlier onset of menarche in young girls. Secondly, to better define socio-cultural norms affecting the use of “birth control pills” otherwise known as “the pill.” Additionally, this study aims to document and organize an inventory of women’s OCP brands, cycle characteristics, symptoms and/or side effects, and several other factors while using OCPs. An overall goal of this study is to develop a more accurate understanding of current rationale underlying benefits to OCP use that reside outside of contraceptive-use only.
# FACTORS AFFECTING PUBERTAL TIMING AND PERCEPTIONS OF BIRTH CONTROL

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1. **Introduction: Age Shift in Menarche and the Role of Contraceptive Use**

Over the past 150 years, the age of menarche in girls has been steadily decreasing worldwide, (Figure 1). Menarche is the occurrence of a first menstrual period in the female adolescent (Lacroix & Langaker, 2019). Age of menarche is an important biological and societal developmental marker for young females. In the United States, as of 2019 the average age of menarche is 12.4 years old (Lacroix & Langaker, 2019), as compared to 1960 where the average age was 13.08 (MacMahon, 1972). Previous research supports many factors that influence the age at which a girl experiences menarche. Age of menarche is determined by factors that are introduced as early as conception. Menarche can be studied as a heritable trait, meaning a characteristic that is passed down from one generation to the next (Karapanou & Papadimitriou, 2010b). There are many studies on biological factors that may influence age at menarche, additionally, there are also a variety of environmental factors that have scientific evidence for affecting age at menarche. A large number of factors impacting menarche and a global decrease in age of menarche may be a reason for girls to start using birth control methods, such as oral contraceptive pills (OCPs), at an even younger age than previous generations.
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Currently, more women than ever are using contraceptives, and in 2017, 64.9% of women aged 15-49 in the United States were using some form of birth control, with 12.6% of that being OCPs (Martinez, 1995). The popularization and availability of the birth control pill in the United States lead to the expansion of uses for OCPs. The birth control pill was invented with the intended use of preventing pregnancy. In 1914, public health nurse Margaret Sanger came up with the term “birth control”, stating that enforced motherhood is the most complete denial of a woman's right to life and liberty, (Wardell, 1980). At the time, birth control was not readily accessible to women in the United States, unlike today. Today, OCPs can be used to treat a variety of symptoms caused by hormonal imbalances and the menstrual cycle. Also, more OCPs are being prescribed in order to treat these hormonal and menstrual symptoms, regardless if the female is sexually active. Currently, OCPs are clinically prescribed to treat primary

Figure 1. Secular Trends Regarding Age of Menarche Globally. This graph provides data on age of menarche from 12 countries. The first data points are age of menarche from the 1900s, which are then compared to the second data points which are age of menarche from the 2000s. This tracks the decline in age of menarche over the past 100 years.
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dysmenorrhea, endometriosis, amenorrhea due to low weight, menstrual cramps, premenstrual
syndrome, primary ovarian insufficiency, menorrhagia, acne, and polycystic ovary syndrome
(Bansode et al., 2021). The results of this study aim to provide a clearer picture of newer OCP
usage trends.

2. The Tanner Stages: Stages of Puberty and Role of Hormones

Puberty is a protracted integrative process that affects physical, cognitive, and biological
development in adolescents resulting in sexual maturation and reproductive capacity in
adulthood (Lacroix & Langaker, 2019). Measurement of the rate of maturation in adolescent
females and males is outlined in the Tanner Stages of Development, or Sexual Maturity Rating.
The Tanner Stages, also known as the Tanner scale, (Marshall & Tanner, 1969), are divided in
three categories, with each category consisting of five stages. In females, the categories are the
onset of each of the following: pubic hair growth, breast development, and “other” changes
which includes onset of menarche and changes in BMI.

Stage 1 of the Tanner cycle takes place during pre-adolescence, ages ranging from 0-15 years
old. Stage 2 occurs during ages 8-15, stage 3 occurs during ages 10-15, stage 4 occurs during
ages 10-17, and stage 5 occurs during ages 12-18 (Guidi & Sapra, 2020).

The pubic hair criterion is measured equally for males and females, and includes five stages
beginning at stage 1, which is preadolescent and pubic hair is absent. Stage 2 describes pubic
hair as sparse and downy, stage 3 as scant and darker, stage 4 as curling and fills the triangle
over the pubic region, and stage 5 as adulthood where pubic hair extends onto the thighs
(Marshall & Tanner, 1969). In females, pubic hair growth starts near the labia and spreads to the
inner thigh by the end of maturation. Throughout these stages, pubic hair is continuously
growing and being distributed, with increased pigmentation.
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The female breast development criterion also includes five stages, starting with preadolescent stage 1 where breast tissue is not palpable, stage 2 is the formation of the breast bud (this stage is also referred to as thelarche), stage 3 breast tissue builds around the areola, stage 4 the areola forms a secondary mound above the breast tissue, and lastly by stage 5, breast maturation results in a single breast contour and areolar hyperpigmentation (Marshall & Tanner, 1969). According to (Bozzola et al., 2018), delayed puberty in females is defined as the absence of breast bud by age 13, or no menstruation by age 16.

Females undergo peak growth velocity increases during stages 2 and 3, ranging from ages 8-17. The onset of menarche occurs in most girls during stage 4, or 1-3 years following thelarche. A small number of females, approximately 2%, will experience menarche earlier in stage 3 (Guidi & Sapra, 2020). Also, a small number of girls, approximately 10%, will experience menarche later in stage 5. According to (Bozzola et al., 2018), delayed puberty in females is defined as the absence of breast bud by age thirteen, or no menstruation by age 16.

2.2 Stages of Sexual Maturation

Sexual maturation can be divided into five stages: adrenarche, gonadarche, thelarche, pubarche, and menarche. Adrenarche is the earliest stage of sexual maturation and is defined by the activation of the adrenal glands. Activation of the adrenal glands results in the synthesis and secretion of sex hormones, or androgens (Abreu & Kaiser, 2016). Increased androgen production and secretion accounts for changes in axillary hair, pubic hair, body odor, and acne.

The next stage of sexual maturation is gonadarche (Wan et al., 2012), which is the activation of the reproductive glands by gonadotropins and the two pituitary hormones: follicle stimulating hormone (FSH) and luteinizing hormone (LH). FSH is secreted by the anterior pituitary gland, which activates the growth of ovarian follicles prior to ovulation and increases estradiol secretion.
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in females. LH is also secreted by the anterior pituitary gland and stimulates ovulation in females and the synthesis of androgens in males.

Thelarche begins the differentiation in the secondary sex characteristics between males and females, as it is around this stage females undergo breast maturation (Wan et al., 2012). Estrogen and progesterone are continuously secreted by the ovaries; estrogen causes the proliferation of adipose tissue in the breasts and progesterone aids in the development of the mammary glands and areolae.

Pubarche is established by the first appearance of pubic hair. At the peak of adrenarche, androgens are increasingly secreted by the adrenal glands, causing the growth of pubic hair and establishing the transition to pubarche.

The last stage of sexual maturation in females, which is often viewed as the “end” of puberty, is menarche. Menarche is the first menstruation, which is the shedding of the lining of the endometrium that results in menses, or bleeding.

2.3 The Menstrual Cycle

The menstrual cycle is the manifestation of the interaction between the ovarian and uterine cycles (Goyette & Craton, 2013a). In a menstrual cycle in which fertilization does not occur, hormone levels begin to diminish about a week prior to the actual menstruation. The menstrual cycle begins with day one of menstruation. In the absence of a fertilized egg, the ovaries will stop releasing estrogens and progestins. As the cycle continues, the uterine lining is eventually dismantled and shed from the endometrium. The endometrium is composed of two layers, the stratum functionalis, which is responsive to hormones, and the stratum basalis, which is not. At the same time, negative feedback begins the cycle of gonadotropin releasing hormone (GnRH)
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release which restarts hormone release from the ovaries. As the follicle grows and matures, estrogen levels increase causing the antrum, a fluid filled cavity, to form in the follicle. The secondary follicle produces androgens from thecal cells which gets converted to estradiol by aromatase secreted from the granulosa cells. Around day 14, prostaglandins cause the fimbriae of the fallopian tubes to contract on the antrum which breaks the follicle and releases the oocyte, this process is called ovulation (Hawkins & Matzuk, 2008). Simultaneously, positive feedback creates peak levels of LH and FSH secreted by the mature follicle, known as the LH surge, which stimulates the ovaries to produce more estrogen and triggers ovulation. The follicle that remains after the oocyte has been expelled is referred to as the corpus luteum. During the luteal phase (Hawkins & Matzuk, 2008), the corpus luteum increase progesterone production, causing the uterine walls to thicken in preparation for fertilization. If fertilization does not occur, then the corpus luteum degenerates and progesterone and estrogen levels decrease which, at day 28, triggers the shedding of the endometrium and begins the cycle of menstruation again.

2.4 The Hypothalamic-Pituitary-Axis

The secretion of androgens, such as testosterone and estrogen, is mediated by the hypothalamic-pituitary-gonadal axis, (Figure 2). This biological pathway begins at the hypothalamus, which is a brain region that maintains homeostasis by keeping the body in a controllable stable state (Demorrow, 2018). The onset of puberty reactivates the hypothalamus’ pulsatile release of gonadotropin-releasing hormone (GnRH) which activates anterior pituitary gland secretion. The anterior pituitary gland is a primary organ of the endocrine system. The pituitary gland is responsible for mediating sexual maturation through secretion of hormones. LH and FSH are hormones released by the anterior pituitary gland which stimulates the gonads to secrete androgens. LH is a gonadotropin that causes the release of estrogen and progesterone, which
initiates ovulation. FSH stimulates the growth of ovarian follicles in women and precipitates sperm production in men.

The hypothalamic-pituitary-gonadal axis is a primary stress response mechanism along with the sympathetic nervous system that regulates acute stress. The hypothalamus releases corticotrophic releasing hormone (CRH) in response to stressful stimuli (Demorrow, 2018). This triggers the anterior pituitary gland to secrete adrenocorticotropic hormone (ACTH) which causes the
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Adrenal glands to release cortisol. Cortisol is a steroid hormone that regulates metabolism, immune system function, and suppresses reproductive capacity. The zona reticularis of the adrenal glands releases a class of gonadocorticoids, that can be converted into testosterone and estrogen (Demorrow, 2018). On the other hand, during a stress response, the adrenal glands release cortisol, which in turn suppresses gonadal hormones. Many GnRh neurons within the hypothalamus also contain adrenocorticoid receptors, which forms a connection between the HPG and HPA axis. Prolonged exposure to stress, meaning a reduction in the secretion of androgens, can impair reproductive function and cause irregular menstruation (Ranabir & Reetu, 2011). There are many aspects that influence the feminine biological marker that is menarche, including biological and sociocultural factors as discussed herein.

2.5 Precocious Puberty

When an adolescent male or female undergoes thelarche, the development of secondary sex characteristics before age 8, is referred to as precocious puberty (Kota & Ejaz, 2021). There are two major types of precocious puberty: central precocious puberty (CPP), which is GnRH dependent, and peripheral precocious puberty (PPP), which is GnRH independent. CPP results in earlier maturation and onset of puberty due to activation of the HPG-axis. For most females, CPP is idiopathic, meaning it arises spontaneously from a disease or condition without cause (Kota & Ejaz, 2021). For most males, CPP is usually due to an underlying pathology. Hypothalamic hamartoma is the most common type of brain lesion that causes CPP, the neural cells in this lesion assist in GnRH release (Kota & Ejaz, 2021). Conversely, PPP causes earlier onset of puberty due to the production of sex steroids from endogenous or exogenous sources and is completely independent of GnRH pulsatile secretion (Kota & Ejaz, 2021). Genetic
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hormonal disorders such as congenital adrenal hyperplasia and McCune-Albright syndrome are common pathological causes of PPP.

3. Biological Factors: Factors Involved in the Timing of the Onset of Menarche

The age at which a girl may experience menarche is influenced by many biological factors such as body fat content, hormones, stress, genes, ethnicity, and chemical composition (Karapanou & Papadimitriou, 2010b).

3.1 Body Fat Content

When an ideal ratio of body fat to lean mass is attained, the sensitivity of the hypothalamus to estrogen increases which stimulates the maturation of reproductive functions (Hossain et al., 2010). Estrogens are released by adipocytes so consequently, girls with a higher body mass index (BMI) experience menarche at younger ages (Abreu & Kaiser, 2016). This association has been researched extensively and has shown similar results across many countries. A study conducted in the Brazilian Amazon (Barcellos Gemelli et al., 2016) found a positive association between excess weight and body fat with age at early menarche. Similarly, research in China shows earlier menarche is related to a steady increase in weight in adolescent girls over the past 30 years (Wang et al., 2016). Growth status and body fat content are influenced by hormones, which can also be attributed to the decrease in age of menarche.

3.2 Hormones

Leptin

The hormone leptin is secreted by adipose cells to inhibit hunger when body fat increases. An increase in leptin triggers the hypothalamus to release more GnRH which directly impacts the hypothalamic-pituitary-gonadal axis, potentially speeding up the onset of puberty by increasing
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the amount of estrogen released by the ovaries (Mohamad et al., 2013). Individuals with
decreased leptin levels, caused by mutation in the leptin gene, experience obesity at a young age
but do not undergo early onset puberty (Elias, 2012). So, while high body fat content is
associated with early onset of puberty, if leptin is not present, body fat will increase but the
secretion of GnRH will decrease, resulting in a delay or absence of puberty. Data links leptin as a
critical player in regulation of the onset of puberty, and as such, an understanding of how
premature exposure to OCPs may impact leptin levels is important.

**Thyroid Hormone**

Other hormones that affect the onset of menarche are secreted by the thyroid glands. Thyroid
hormone (collectively, thyroxine or THs, triiodothyronine or T3, and T4) regulates the
development of uterine, ovarian, and placental tissues (Silva et al., 2018). Irregularities of the
thyroid, like hypothyroidism, occur when the thyroid gland is underactive and does not produce a
sufficient amount of thyroid hormone. In hypothyroidism, increased levels of thyrotropin-
releasing hormone (TRH) inhibit GnRH secretion, therefore decreasing LH levels resulting in
delayed puberty (Tsutsui et al., 2018). Alternatively, precocious puberty, or when maturation
occurs earlier than average, may be caused by elevated levels of thyroid-stimulating hormone
(TSH) which increases FSH secretion in the gonads. Late maturation is also affected by
gonadotropin-inhibitory hormone (GnIH), which is released by the hypothalamus and suppresses
gonadotropin synthesis in the thyroid gland (Tsutsui et al., 2018). GnIH expression is regulated
by thyroid hormone. A recent study found that mice with hypothyroidism had excess amounts of
T3 causing increased GnIH activity, which decreased LH and FSH levels, delaying maturation
(Kiyohara et al., 2017). However, mice with hypothyroidism that did not have GnIH present, did
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not experience delay in puberty. These results demonstrate the reciprocal relationship between the hypothalamic-pituitary-thyroid axis and the hypothalamic-pituitary-gonadal axis.

**Dehydroepiandrosterone (DHEA)**

The zona reticularis of the adrenal cortex synthesizes and secretes large quantities of androgen precursors such as dehydroepiandrosterone (DHEA). Precursors enter the bloodstream and are further converted to more active and potent androgens in the gonads, like testosterone and estradiol (Antoniou-Tsigkos et al., 1979). DHEA is converted into its sulfate ester, DHEA-S, which regulates the production of adrenal androgens. For example, DHEA-S is a precursor for estradiol synthesis and assists in the conversion of androstenedione (A4) to testosterone (Turcu et al., 2014). This suggests that the sulfation of DHEA, referred to as DHEA-S, may influence the onset of puberty due to an increase in androgen synthesis. Previous research (Pereira et al., 2017), found that elevated levels of DHEA-S were correlated with higher BMI and premature menarche in girls. These findings also demonstrate the relationship between leptin, BMI, and onset of puberty. Adolescent females with elevated leptin usually have higher BMI’s which increases DHEA-S levels, potentially resulting in early menarche.

The adrenal gland secretes several male sex hormones, like testosterone and DHEA. This is triggered by the anterior pituitary gland releasing adrenocorticotropic hormone (ACTH). DHEA can be converted into estradiol, a form of estrogen, which begins the formation of body odor and oily skin in males and females.

**Kisspeptin**

The hormone kisspeptin is released by the hypothalamus and plays an important role in regulating sex steroid secretion. Kisspeptin-releasing neurons found in the infundibular nucleus
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of the medial basal hypothalamus control gonadotropin release in all species (Kauff & Editors, 2013). The binding of kisspeptin to the KISS1R (GRP54) receptor activates the hypothalamic secretion of GnRH, which stimulates the release of LH and FSH from the anterior pituitary gland. Expression of kisspeptin mRNA increases during puberty, triggering a surge of GnRH and LH, causing ovulation to occur and early onset of menarche (Terasawa et al., 2013).

Mutations in kisspeptin or GRP54, may cause the inability of kisspeptin to bind with its receptor, resulting in insufficient secretion of GnRH, which is associated with the absence of, or extremely delayed, puberty known as hypogonadotropic hypogonadism (HH) (Li et al., 2009).

3.3 Chemical Composition

Estrogens are a class of sex steroids that include the hormones estrone, estradiol, estriol, and estetrol. These four major endogenous estrogens are synthesized from cholesterol, and therefore, all share a common steroidal structure, consisting of seventeen carbons in four fused rings. Estrone (E1) has one hydroxyl (OH) group, estradiol (E2) has two, estriol (E3) has three, and estetrol (E4) has four hydroxyl groups (Thomas & Potter, 2013a). Estradiol is the most potent of the estrogens, having the most significance and impact for non-pregnant women between menarche and menopause (Thomas & Potter, 2013a). Estriol and estetrol are found in extremely low levels in non-pregnant women. Estrone and estradiol are synthesized by the aromatization of testosterone and androstenedione (Thomas & Potter, 2013b). More specifically, the enzyme aromatase removes a hydrogen atom from, or dehydrogenates, androstenedione or testosterone which converts a cyclohexane into a benzene ring, increasing molecular stability.

Estradiol is very significant in maturation during puberty, as it is consistently being secreted by the ovaries at this time. Increased estradiol levels signal the ovaries to release the oocyte during ovulation, following menstruation. This suggests that levels of estradiol may contribute to the
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Timing of menarche. Previous research (Bozzola et al., 2018), found insufficient estradiol secretion led to delayed puberty, and increased estradiol levels contributed to hypogonadism.

3.4 Genes

Several studies have attempted to identify genes directly responsible for the onset of puberty. (Gajdos et al., 2010), examined mutations in genes responsible for hypogonadotropic hypogonadism (HH) and its effect on age of menarche. There was no significant correlation between HH gene variants and pubertal timing. However, there was an association between genetic ancestry and onset of menarche, suggesting the age of pubertal development may be a heritable trait. This notion that pubertal age is a characteristic to be “passed down” genetically is demonstrated in a previous study (Karapanou & Papadimitriou, 2010b), which found that the mother’s age of menarche influences the daughter’s age of menarche. Although, transgenerational socioeconomic and sociocultural factors are likely contributors to the association between the mother-daughter age of menarche.

In another study, two genes involved in the synthesis of estrogen, CYP17 and CYP19, were examined in their association with age of menarche (Guo et al., 2006). Results showed CYP17 did not affect onset of menarche, however, CYP19 was significantly associated with age of menarche variations. The CYP19 gene synthesizes the enzyme aromatase which converts testosterone to estradiol. This suggests that an overproduction of aromatase, and therefore estrogen, may provide evidence for early menarche.

Kisspeptin is a hypothalamic hormone, that when bound to its gene receptor, KISS1R, increases GnRH secretion causing the anterior pituitary gland to release LH and FSH, stimulating the gonads to produce sex hormones essential for menarche. The function of both kisspeptin and KISS1R is essential for pubertal onset. A mutation in the KISS1R gene, causing kisspeptin the
inability to bind, would inhibit GnRH secretion resulting in absence of puberty, or HH (Wahab et al., 2015). Previous research in Rhesus monkeys (Kauff et al., 2013), showed when a kisspeptin agonist was introduced in the hypothalamus, GnRH levels significantly decreased. This provides evidence that the KISS1R gene has a direct influence on GnRH release, ultimately affecting pubertal timing.

GnIH is a hypothalamic neuropeptide that inhibits reproduction by suppressing kisspeptin. The activity of KISS1R is suppressed when RFRP, the GnIH encoding gene, is active. GnIH neurons are located in the dorsomedial hypothalamus and form close synaptic connections with GnRH neurons (Wahab et al., 2015). Contiguous neural axons may indicate that GnIH and GnRH activity is significantly influential of each other. GnIH controls gonadotropin output by forming pathways with the median eminence, a connection between the hypothalamus and pituitary gland that releases regulatory hormones (Ubuka et al., 2012). The binding of GnIH to the RFRP gene decreases secretion of LH and FSH which inhibits gonadal androgen production, potentially resulting in delayed menarche.

4. Sociocultural Factors: Factors Involved in the Timing of the Onset of Menarche

The age at which a girl may experience menarche is influenced by many environmental factors such as socioeconomic status, family composition, and stress in early life.

4.1 Socioeconomic Status

There is extensive research on the relationship between pubertal timing is socioeconomic status (SES). Girls from families with a lower SES experience menarche at earlier ages than girls from families with a higher SES (Karapanou & Papadimitriou, 2010b). One theory for this association is that girls from low-income families are at a higher risk for obesity and higher BMI’s, which is
FACTORS AFFECTING PUBERTAL TIMING AND PERCEPTIONS OF BIRTH CONTROL linked to early menarche. A previous study (Obradovic, 2005), found families with a low SES have less access to safe physical activity and healthy foods, which contributes to obesity.

Another study (James-Todd et al., 2010), was able to pinpoint the age at which SES is most influential for age of menarche. This study (James-Todd et al., 2010), found that lower SES, specifically at age 7 and early during childhood, is associated with earlier onset of menarche. Interestingly, the same study also found that a 20 unit decrease in SES was associated with a 4 month decrease in age of menarche.

4.2 Family Composition

Family composition factors, specifically, the absence of the biological father during childhood and presence of older sisters, are thought to have an impact on age of menarche.

Absence of Biological Father during Childhood

One study (Mendle et al., 2006) concluded that households with family conflict, such as the absence of the biological father, may predispose girls to lower metabolisms, therefore increasing body weight and lowering the age of menarche. Another study (Steppan et al., 2019), supports the findings that earlier menarche is associated with father absence. It was found that girls in living conditions without two biological parents reported earlier menarche. A reason for this may be that family environments without two biological parents are associated with lower physical activity and increased BMI, which is a social determinant of menarche (Steppan et al., 2019). On the other hand, the same study found that living with a stepfather, which indicates the absence of a biological father, was significantly associated with earlier menarche and stress in early life. Overall, this factor may be related to broader family relationships, which may influence age of menarche. For example, previous research (Mishra et al., 2009) found that
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paternal affection, positive family relationships, and paternal involvement during childhood was associated with delayed menarche. Whereas divorce, increased family conflict, and durations of paternal absence was associated with earlier menarche.

**Presence of Older Sisters**

The presence of older sisters is a family composition factor that has little research yet shows consistent trends for having an influence on delayed menarche. One study (Karapanou & Papadimitriou, 2010a), concluded that, the presence of sisters, especially older ones, in the household while growing up, was associated with delayed menarche. There is minimal research on this association and little explanation as to why this association occurs. The family composition factor of older sisters could be related to positive family relationships, which is associated with delayed menarche. Similarly, another study (Goyette & Craton, 2013b), found that girls with no older sisters were more likely to experience menarche at earlier ages, (eg. \(\leq 11-12\) years old). Whereas, girls with even just one older sister were more likely to experience menarche at later ages, (eg. 12-15 years old).

Girls who had older sisters experienced menarche at older ages than girls who did not have any sisters. Girls experienced delayed age of menarche even in the presence of only 1 older sister. These results support previous research (Goyette & Craton, 2013c), which also found a significant correlation between number of older sisters and age of menarche. In both the present and previous study, it was found that girls with no older sisters were more likely to experience menarche at ages 11-12, while girls with 1 older sister were more likely to experience menarche at ages 13-14, (Figures 3 and 4).
Older Sisters Phase Delay Menarche

Figure 3. Older Sisters Phase Delay Menarche. Previous work (Goyette & Craton, 2013) shows girls with no older sisters experienced menarche at younger ages than girls with older sisters, p<0.05.

Compared to No Older Sisters Even Just One Older Sister Phase Delays Menarche

Figure 4. Compared to No Older Sisters Even Just One Older Sister Phase Delays Menarche. Previous work shows that girls with older sisters experienced menarche at older ages than girls who did not have any sisters. Girls experienced delayed age of menarche even in the presence of only one older sister, p<.05. (Goyette & Craton, 2013).
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4.3 Stress in Early Life

Biologically, stress responses are directly related to the hypothalamic-pituitary-adrenal axis, which affect gonadal secretion. This explains why age of menarche and pubertal timing are strongly associated with stress levels during childhood. The age at which a child experiences stress influences the acceleration or delay in the onset of puberty. Previous research found that girls in temporary foster homes and internationally adopted families in the United States were more likely to experience early sexual maturation and age of menarche (Mishra et al., 2009). These results concur with previous studies that associate lack of paternal investment and childhood adversities with earlier onset menarche. The same study, (Mishra et al., 2009), found that girls that experienced childhood during periods of war, psychological trauma, or physical injury were more likely to experience delayed menarche. This study (Mishra et al., 2009), concluded that exposure to stress in early childhood was associated with earlier onset menarche. Whereas, exposure to stress shortly before or during puberty was associated with delayed menarche. In other words, girls that experienced stress earlier in life were more likely to experience menarche at younger ages, while girls who experienced stress later in life were more likely to experience menarche at older ages.

5. Age of Menarche and OCPs

The decline in age of menarche (Figure 1), may cause girls to begin using oral contraceptives (OCPs) at younger ages. Most women that use birth control pills begin taking it at age 16 (Gesselman et al., 2017) however, as girls are reaching menarche at younger ages, it can be expected that the age of starting the pill may decrease in order to lessen the negative impacts of the menstrual cycle or to increase cycle predictability. This would mean that women are exposed to exogenous hormones for a longer period of time than prior generations. The effects of
prolonged exposure to hormonal contraceptives has not been extensively studied. One study (Bosetti et al., 2002) found that OCP use may aid in the prevention of ovarian cancer and that the OCP protection from ovarian cancer persists for a long time after stopping use. However, a different study (Ji et al., 2019) found that there is a linear relationship between age of first use of OCPs and breast cancer risk, meaning that the younger a woman starts using birth control the greater her risk of developing breast cancer. The use of OCPs has transformed from strictly prevention of pregnancy into a contemporary aid in treating several biological issues faced by women, such as regulating their menstrual cycle, relieving menstrual pain, and controlling hormonal acne. Most girls begin taking birth control pills at age 16, however, on average they are not becoming sexually active until age 17 (Gesselman et al., 2017). This provides potential evidence that OCPs are no longer being used for their intended purpose, which is contraception, but instead are more likely being used to modulate the menstrual cycle. There is an unspoken assumption that individuals who use oral contraceptives or birth control pills are sexually active, when it seems that this may no longer be the case. Our research set out to answer this question. Furthermore, the sexual stigma behind birth control use may negatively impact young women due to perceived stereotypes or sociocultural judgments of those who are morally allowed to engage in sexual activity.

6. Oral Contraceptive Pills (OCPs)

Currently, the number of young women using birth control methods is increasing in the U.S. According to the CDC, approximately 65% of women ages 15-49 use some form of contraception, with oral contraceptives as the second most popular method (12.6%) following female sterilization (18.6%). The use of OCPs is most common in women ages 15-19 (16.6%)
6.1 Combination OCPs

There are three primary types of OCPs available; combination, extended-cycle, and progestin-only. Combination pills are the most common type of birth control pills prescribed and used. Combination pill packs are structured to mirror the average 28-day menstrual cycle (Brynhildsen, 2014). They are administered as 21 pills that are composed of a combination of progestins, estrogens, and seven placebo “sugar” pills. The first 21 pills are considered active because they contain synthetic versions of estrogen and progesterone hormones. The seven remaining pills are considered inactive because they do not contain hormones. Monophasic combination pills are administered in one-month cycles and each active pill contains the same dose of hormones (Van Vliet et al., 2006). During the last week of the cycle, the seven inactive pills trigger menstruation. Multiphasic combination pills are also administered in one-month cycles; however, each active pill contains a different dose of estrogen and progesterone hormones. Like monophasic pills, during the last week of the cycle, the seven inactive pills trigger menstruation. Biphasic active pills release a constant amount of exogenous estrogen but contain 2 different doses of progestin that switch mid-cycle (Van Vliet et al., 2006). Triphasic pills contain fluctuating amounts of estrogen and progestin in the first 21 active pills.

6.2 Extended-cycle OCPs

Extended-cycle pills are a type of combination pill, meaning they contain both hormones estrogen and progesterone. Instead of imitating the average one-month menstrual cycle, extended-cycle pills are most commonly administered in 13-week cycles (Edelman et al., 2014). The beginning 12 weeks of the cycle provide active combination pills that contain doses of
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Estrogen and progesterone. The last week of the cycle involves taking the remaining non-hormonal inactive pills, which intends to trigger menstruation. If menstruation does occur during the inactive phase of the 13-week cycle, a woman may menstruate only three to four times a year.

Extended cycle pills can be used to reduce a woman’s number of periods from 13 per year to 4, so one period every season. As the intended use of OCPs is beginning to shift, extended cycle pills offer women the option of less periods, which seems to be a growing use for birth control rather than preventing pregnancy. In Brazil, most women use hormonal birth control methods for “menstrual suppression” which stops the occurrence of a period completely (Sanabria, 2016). This may become a social norm for women in the US, like it is for women in Brazil, as more women begin taking the pill for extended periods of time.

6.3 Progestin-only OCPs

Progestin-only pills, also known as “minipills”, are made primarily of the hormone progesterone and do not contain any estrogen (Yancey & Raleigh, 2014). Similar to combination pills, progestin-only pills are administered in one-month cycles and mimic the average 28-day cycle length. However, all pills in progestin-only packs are considered active because every pill contains progesterone, unlike the seven inactive sugar pills in combination packs that do contain any hormones. This can cause menstruation to be unpredictable and bleeding may or may not occur during every cycle depending on each individual woman (Yancey & Raleigh, 2014).

6.4 Biological Mechanisms: The Menstrual Cycle on OCPs

Most hormonal OCPs are effective in contraception because they prevent ovulation by regulating hormones, specifically LH and FSH, secreted by the hypothalamic-pituitary-gonadal axis (Stubblefield, 1994). In a typical 28-day cycle, active bleeding and menstruation occur during
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the first seven days. Menses, or bleeding, during a combination OCP cycle occurs with the ingestion of the last seven inactive pills in a 28-day pack. Menstruation is triggered by decreased levels of estrogen, progesterone, FSH, and LH. Combination pill packs contain seven inactive, nonhormonal sugar pills to replicate the low hormonal levels that naturally occur during the seven days of the menstrual phase. In both naturally occurring cycles and hormonal OCP cycles, decreased levels of estrogen and progesterone trigger the lining of the uterus, or endometrium, to shed. The thinning of the endometrium breaks down the uterine wall which causes menstrual bleeding and prevents pregnancy by decreasing the likelihood of successful implantation of a developing embryo into the uterine wall.

Hormonal OCPs, like combination or extended-cycle pills, contain both estrogen and progesterone which alter the lining of the uterus and change the composition of cervical mucus so that implantation and fertilization does not occur or is not successful (Stubblefield, 1994). Implantation is the attachment of a developing embryo to the uterine wall, or endometrium, until birth. During the phase of the cycle when active pills are ingested, the hormones estrogen and progesterone build up and thicken the uterine lining to prepare for potential pregnancy. In combination OCPs, fixed amounts of estrogen and progestin are administered into the body through the active pills to replicate the natural elevation of estrogen level observed during the proliferative phase. This can impact the endometrium and cervical mucus, making both less suitable for implantation and fertilization.

6.5 Contemporary OCP Use

Since its invention, birth control has always increased body autonomy in females. Beginning in 1914, Margaret Sanger’s advocation for safe birth control access led to the medicalization of OCPs in the United States. Sanger believed women should have knowledge of contraception
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have every right to know about their own bodies (Amory, 2011). Nearly 100 years later, females are still using birth control methods to gain control over their bodies. However, in 1914, OCPs were created to relieve women of the excessive child-bearing that was occurring at the time, Sanger even stating that her own mother’s death was due to having too many children and working herself to death (Amory, 2011). The primary use of OCPs has been preventing pregnancy, they have the word *contraceptive* in their name. It seems today though, that more women are benefiting from the regulatory effects of taking OCPs, even if they are not sexually active, thereby not in need of the contraceptive benefit of this intervention. This modern phenomenon of women having the control to regulate their own menstrual cycles calls for a redefinition of *oral contraceptives* to *menstrual modulators*. Renaming OCPs to “menstrual modulators” more accurately defines the use of OCPs and removes the connotation that females are taking OCPs because they are sexually active and need some form of contraception.

**OCP Use in Female Athletes**

Today, it is approximated that the number of female athletes taking OCPs is equal to the number of females taking OCPs in the general population (Burrows & Peters, 2007). OCP use can increase cycle-length predictability and decrease negative premenstrual symptoms such as headache, muscle pain, fatigue, fluid retention, acne, breast tenderness, bloating, diarrhea, appetite changes, mood changes, depression, anxiety, insomnia, and a variety of other symptoms depending on the individual. It has been noted by numerous female athletes from differing countries that their menstrual cycle has affected their athletic performance. For example, following the 2016 Summer Olympics, female Chinese swimmer, Fu Yuanhui, stated, “Actually, my period started last night, so I'm feeling pretty weak and really tired.” (Olympic Swimmer Fu Yuanhui’s “Period” Comment Breaks Taboos In Sports — And In China : Goats and Soda :
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NPR, 2016). Similarly, in 2016 British tennis player Heather Watson remarked that her athletic performance was impacted by “girl things”, making her feel lightheaded (Sport and Menstruation: Periods Stop Play? - CNN, 2016). In 2015, London marathon runner, Kiran Ghandi, completed a 26.2-mile marathon while free-bleeding instead of skipping the run due to her painful menstrual symptoms (26-Year-Old Woman Free Bleeds Proudly Through Her First Marathon, 2015). Some women are completely incapacitated by their period symptoms, which can interfere with athlete’s training and exercise schedules. OCP use decreases menstrual cycle variability and may alleviate a variety of symptoms. Alongside, OCPs such as extended cycle OCPs, can decrease the total number of periods a female may experience overall. Active or excessive bleeding also interferes with athletic performance but can be regulated or reduced with OCP use. More research must be conducted on the role of OCPs in exercise and athletic performance in order to fully understand its effects and the demographics and intent underlying their use.

Menstruation and School Absenteeism

Adolescent girls in many countries have reported missing school due to menstruation. According to a 2018 study (State of the Period, 2018), 51% of US girls reported having missed at least part of class or class period due to menstruation symptoms, such as cramps. One reason that girls miss school when menstruating is not having access to menstrual products, termed as period poverty. Public awareness regarding period poverty has led to the call for an increase in free accessible menstrual hygiene products. A similar solution to period poverty would be universal access to birth control methods, like OCPs, which would allow adolescent girls to regulate their menstrual cycles while possibly reducing negative period symptoms.
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A 2018 study in India (Vashisht et al., 2018), found that 40% of girls reported that they remained absent from school during their menstruation. This study (Vashisht et al., 2018), discovered that school absenteeism was significantly influenced by the type of absorption product used, lack of privacy at school, social restrictions imposed during menstruation, mothers’ education, and source of information about menstruation. It was also found that nearly 65% of girls reported that menstruation affected their daily activities at school and that they had to miss their class tests and classes as a result of pain, anxiety, shame, anxiety about leakage, and staining of their uniform (Vashisht et al., 2018). Free and safe access to birth control methods, such as OCPs, would allow girls to regulate their menstrual cycle, which would possibly decrease school absenteeism rates in these studied populations. OCPs increase menstrual predictability and decrease many of the symptoms listed by girls as reasons why they miss school or school related activities.

The current study aims to investigate the factors that are thought to determine age of menarche and to collect data regarding the current use and perceptions of OCPs. We hypothesized that the biological and sociocultural factors outlined in the introduction (eg. BMI, absence of biological father, number of sisters, etc.) would have a significant relationship to the age of menarche.

7. Methods

Participants

Participants (n=121), were Bridgewater State University students enrolled in the Introductory Psychology (PSYC 100) course. Of these participants, 79 were women who self-identified as cis female. These women account for the data concerning onset of menarche. Both men (n=47) and these women answered questions concerning attitudes about oral contraceptive use.
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Materials

The survey used in this study consisted of 94 multiple choice questions, beginning with a participant consent form and ending with a debriefing form. The survey was composed of questions thought to be reflective of factors affecting menarche as well as questions aimed at understanding contemporary perspectives on OCP use. Questions used in the survey were multiple-choice, true/false, and fill in the blank and did not include any standardized scales. Participants were asked to answer questions as honestly as possible. Participants were also given the response option “I don’t know” and had the option to “decline to answer” for every question in the survey. For organizational and analysis purposes, the survey was divided into 9 different sections, each with varying amounts of questions.

Section 1

The first section of the survey consisted of 16 multiple choice questions. Questions in section 1 collected data on factors thought to influence age of menarche. This section included questions about familial environment, food intake, activity level, and BMI during adolescence. Examples of questions in this section include: “My biological father was absent during my first year of life”, “I have ___ older sisters”, “Which of the following best characterizes your eating choices:”, and “Please describe how much exercise you got during elementary school until 8th grade”.

Section 2

The second section of the survey consisted of 2 questions. The first question asked participants to specify their biological sex assigned at birth as either male or female. The second question asked participants to specify their gender identity as male, female, or other. Because the age of onset
of puberty differs between biological males and females, participants were asked about their biological sex and gender identity.

**Section 3**

The third section of the survey consisted of 14 questions that were either multiple choice or “true or false” statements. Questions in section 3 collected data from participants about the type of grade school they attended. Examples of true-false statements in this section include: “I attended a public middle school”, “I attended an “all-girls” middle school”, and “I attended a private, religious high school”.

**Section 4**

The fourth section of the survey consisted of 2 questions. Questions in section 4 aimed to pinpoint the onset of puberty in both male and female participants. The first question asked, “Females, only please, I had my first period when I was:”. The second question asked, “Males, only please, I experienced my first nocturnal emission (“wet dream”) when I was:”.

**Section 5**

The fifth section of the survey consisted of 11 questions that were either multiple choice or “true or false” statements. Questions in section 5 collected data regarding different aspects of childhood experience that may affect the onset of puberty. This included questions about adolescent stress levels, health status, and socioeconomic status. Examples of questions and true-false statements in this section include: “In the 8th grade, my gender identity matched my biological sex”, “As a child, I was allowed to watch whatever I wanted to on TV”, “During my childhood, I took a multivitamin supplement”, “During my childhood, my family was a part of
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the ___ socioeconomic class”, “My extended family contains members about my age”, and “In my home puberty was discussed:”.

Section 6

The 8 multiple choice questions in section 6 collected data related to birth control methods. Participants were reminded that all responses were confidential and non-identifiable. If participants had never taken the “pill” or used other forms of hormonal contraception, they were instructed to skip to the next section which began at question 73. Examples of questions in this section include: “Are you currently taking birth control pills?”, “What type of birth control pills do you use?”, “When did you start taking birth control pills?”, “Do you remember how you started taking the pill originally?”.

Section 7

The seventh section of the survey consisted of 3 questions. The first question asked participants to specify if they have any diagnosed hormonal disorder, such as polycystic ovarian syndrome (PCOS), thyroid disorders or diabetes. Data collected from male and female students with any hormone disorder were not analyzed in the current study due to the relevance of their data in relation to the research question. However, their data will be held for analysis in future expansion of the study. The second question asked, “Choose one answer that BEST describes why you began taking the birth control pill:”. The third question in this section asked, “For what amount of time have you been regularly and continuously taking birth control pills?”.

Section 8

The eighth section of the survey consisted of 17 questions that were either multiple choice or “yes or no” questions. Questions in section 8 collected data regarding participants’ birth control
FACTORS AFFECTING PUBERTAL TIMING AND PERCEPTIONS OF BIRTH CONTROL use, habits, and symptoms. Examples of questions in this section include: “For me, another benefit of taking the pill is:”, “Have you experienced any of these side effects while using birth control pills?”, “Have you ever had to change from one birth control pill brand to another?”, and “When you stopped taking birth control pills did you experience any of the following?”.

Section 9

The 21 multiple choice and true/false questions in section 9 collected data related to social aspects and misconceptions around ideas of menstruation, hormones, and the pill. Examples of questions in this section include: “I learned the majority of what I know about birth control pills from:”, “Birth control pills protect me against STI’s”, “In general, only women have hormones that fluctuate. Men’s hormones do not fluctuate”, “When someone misses a pill, she can just take two the next day”, and “Taking the pill long term is fairly safe”. The last question in the survey was open-ended and asked, “Is there anything else you would like to share with us or you would like us to look into as part of this research:”.

Participants were debriefed and informed if they were unsure about a response, they can contact the researchers anonymously at www.menstrualmyths.com.

Procedure

Participants enrolled for this study online through Bridgewater State University’s SONA system. SONA system is an online resource for Bridgewater State University psychology research students to conduct online studies, recruit participants, and securely collect anonymous data. Participants freely chose to participate in this study out of multiple studies that were offered on SONA. The survey was administered to participants online, outside of laboratory settings. Students were able to complete the survey using their own personal devices (mobile phones,
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laptops, etc.) in the environment of their choice. The study and survey used were approved by Bridgewater State University’s Institutional Review Board (IRB). Before starting the survey, participants completed informed consent online by reading and approving the ethics statement. It took students 30 minutes to complete the survey, which consisted of 94-multiple choice questions and statements. Once completed, participants were debriefed and granted credit on SONA that would apply to the PSYC 100 course.

Analysis

Answers to survey questions were entered into SPSS, version 27, and analyzed via PLUM ordinal regression. Post-hoc Pearson Chi square analyses were run to determine significance of individual factors on menarche. Findings were considered significant at $p<0.05$.

8. Results: Factors Thought to Influence Age of Menarche

A PLUM Ordinal Regression was carried out with the following predictors (1) absence of father during the first year of life, (2) first generation college student, (3) number of older sisters, (4) BMI, (5) elementary-middle school set-up, and (6) whether participants agreed with statements regarding the roles of “boys versus girls” and using the Model Fit Chi square was found to be significant, Pearson Chi Square (n=79) = -0.138, $p<0.05$.

Presence of the Biological Father

For participants whose biological fathers were absent during childhood the most common age of menarche was $\leq 11$ years old, whereas participants whose biological fathers were present during childhood the most common age of menarche was 11-12 years old (Figure 5).
**Number of Older Sisters**

The number of older sisters had a significant correlation with age of menarche, Pearson Chi Square (n=79) =0.182, p<0.01 (Figure 6).
First-generation College Student

Given the data described previously, we wondered whether socioeconomic status would impact menarche. When we asked whether one or both parents attended college, the findings were not significant, but when we asked whether the student herself—or whether her generation i.e. siblings —were first-generation college students, we found a significant correlation with age of menarche, Pearson Chi Square (n=79) =0.32, p<0.01 (Figure 7).
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There was not a significant correlation between number of parents that attended college and age of menarche. PLUM Ordinal Regression shows the Model Fit Chi square is significant, Pearson Chi Square (n=79) =-0.16, p>0.05.

BMI

Overwhelming data, as described previously, have shown that BMI plays a significant role in menarche onset. However, we were unable to replicate that data with a significant finding. Instead, we were able to show a trend between BMI and age of menarche, Pearson Chi Square (n=79) =-0.082, p<0.10 (Figure 8).

Figure 7. First-generation College Student and Menarche. In families where the participant or the participant’s siblings were the first in the family to attend college, menarche occurred earlier than for those who were not in the first generation of those in their family to attend college, p<0.05.
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Grade School Set-Up

There was no significant correlation between grade school and age of menarche. Even when we looked specifically to compare particular grade school set-ups, we did not find an effect (Figure 9).
Exposure to Sexist Statements

Some data suggest that being exposed to mature themes as a child predisposes to early menarche. We asked whether participants often heard statements such “girls don’t do that”, or “boys will be boys” (Figure 10).
8.1 Results: Birth Control Use and Perceptions

Most participants learned “the majority of what they know about birth control pills” from their doctor (24.8%), followed by friends (16.8%) and online resources (14.4%) (Figure 11).
Most participants (76%) answered “true” when asked “I feel confident that I understand when I can get pregnant”. However, when then asked the question “If someone is not on the pill, she can become pregnant:” only 9.6% of participants chose the correct answer “for a few days prior to ovulation” (Figures 12 and 13).
Figure 12. Confidence in Understanding when Fertilization is Most Likely to Occur. Participants (76%), answered “true” when asked “I feel confident that I understand when I can get pregnant”.

Figure 13. Participants are Unaware of When Fertilization Is Most Likely to Occur. Most participants answer incorrectly.
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When asked “A child born to a woman over 40 years of age has a higher likelihood of having an illness (e.g. Down’s Syndrome or autism)” most participants (71.2%) answered true. When asked “A child born to a man over 40 years of age has a higher likelihood of having an illness (e.g. Down’s Syndrome or autism)” most participants (55.2%) answered false (Figures 14 and 15).

Figure 14. Awareness of a Maternal “Biological Clock.”
Most girls (48.1%) started taking birth control pills “about 4 or more years later” than when they first got their period. These results coincided with most girls (17.7%) starting birth control pills “sophomore year of high school” and with 21.5% of girls reporting starting birth control pills at age 16 (Figures 16 and 17).
Figure 16. Age at which Participants Began Using OCPs based on Menarche. This graph shows that the majority of female participants (48.1%) started taking birth control pills “about 4 or more years later” following their first period.

Figure 17. Age at which Participants Recall Taking OCPs. This graph shows the majority of female participants (21.5%) began taking birth control pills at age 16. The second most common age to start taking birth control pills was 17 years old (13.9%).
Of the 53.2% of participants that answered “yes” to “Are you currently taking birth control pills?” the majority (46.8%) were unsure about the type of birth control pill they currently use (Figure 18).

When asked “choose one answer that best describes why you began taking the birth control pill” the majority of girls (29.1%) chose “to prevent pregnancy”, followed by “to regulate your menstrual cycle” (15.2%) and “to relieve menstrual pain” (11.4%). Secondary benefits to taking birth control pills were reported as: lighter periods (15.2%), acne improvement (3.8%), and fewer cramps (3.8%) (Table 1 and Figure 19).
### Reasons for OCP Use

Choose one answer that BEST describes why you began taking the birth control pill:

<table>
<thead>
<tr>
<th>Reason</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>to prevent pregnancy</td>
<td>23</td>
<td>29.1%</td>
</tr>
<tr>
<td>to regulate your menstrual cycle/make it more predictable</td>
<td>12</td>
<td>15.2%</td>
</tr>
<tr>
<td>to relieve menstrual pain</td>
<td>9</td>
<td>11.4%</td>
</tr>
<tr>
<td>to control hormonal acne</td>
<td>5</td>
<td>6.3%</td>
</tr>
<tr>
<td>to reduce risk of ovarian cysts</td>
<td>1</td>
<td>1.3%</td>
</tr>
<tr>
<td>to relieve menstrual migraines</td>
<td>1</td>
<td>1.3%</td>
</tr>
<tr>
<td>my mom/doctor/friend just assumed I should</td>
<td>2</td>
<td>2.5%</td>
</tr>
<tr>
<td>to ease my period (flow) so I could participate in sports</td>
<td>1</td>
<td>1.3%</td>
</tr>
<tr>
<td>to ease my period (flow) so I wouldn’t miss school</td>
<td>1</td>
<td>1.3%</td>
</tr>
<tr>
<td>other</td>
<td>4</td>
<td>5.1%</td>
</tr>
<tr>
<td>Missing System</td>
<td>20</td>
<td>25.3%</td>
</tr>
<tr>
<td>Total</td>
<td>79</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

Table 1. Reasons for OCP Use. This table lists the most common reasons why participants began taking birth control pills. The most common reason was pregnancy prevention (29.1%), followed by to increase menstrual predictability (15.2%), and to relieve menstrual pain (11.4%).
Of the following symptoms listed: nausea, vomiting, headache, breast tenderness, bleeding between periods, acne, mood swings, weight gain, decreased sex drive, ovarian cysts, and fatigue 25.3% of participants reported not having experienced any symptoms while taking birth control pills. However, 12.7% of participants reported experiencing 3 symptoms, 7.6% have experienced 5 symptoms, and 5.1% reported experiencing weight gain alone while using birth control pills. Combined, 40.5% of participants reported experiencing 2-8 symptoms (Table 2 and Figure 20).
Table 2. OCP Side-Effects. This table lists the most common side effects experienced by participants while using birth control pills. Of the symptoms experienced, most participants (12.7%) listed three symptoms, followed by two-five symptoms (7.6%). The most common side effect was weight gain (5.1%).
When asked to compare their average cycle length prior to taking birth control pills versus after, most participants (31.6%) reported their cycle length has “gotten shorter”. While using birth control pills most participants (38%) reported that their period or bleeding is “lighter than usual” (Figures 21 and 22).

Figure 20. Common Side-Effects of OCPs. This graph shows the most common side effects experienced by participants while using birth control pills. 25.3% of participants reported to not have experienced any symptoms. 40.5% of participants reported to have experienced 2-8 symptoms while using birth control pills.
Figure 21. Impact of OCP Use on Cycle Length. This graph shows that most participants (31.6%) reported that their cycle length has “gotten shorter” since taking birth control pills.

Figure 22. Impact of OCP Use on Menses. This graph shows that most participants (38%) reported that their menstrual bleeding was “lighter than usual” since taking birth control pills.
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Summary of Findings: Birth Control (OCP) Inventory

The most common OCP brand used by participants was Junel (31%). For all OCPs, each brand used the same type of estrogen, ethinyl estradiol, but most brands used different types of progestins (Table 3).

<table>
<thead>
<tr>
<th>Brand:</th>
<th>Number</th>
<th>Frequency (%)</th>
<th>Type/Hormones</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sprintec</td>
<td>3</td>
<td>9.30% Combination, norgestimate and ethinyl estradiol</td>
<td></td>
</tr>
<tr>
<td>Apri</td>
<td>1</td>
<td>3.12% Combination, desogestrel and ethinyl estradiol</td>
<td></td>
</tr>
<tr>
<td>Junel</td>
<td>10</td>
<td>31.25% Combination, norethindrone and ethinyl estradiol</td>
<td></td>
</tr>
<tr>
<td>Alyacen</td>
<td>1</td>
<td>3.12% Combination, norethindrone and ethinyl estradiol</td>
<td></td>
</tr>
<tr>
<td>Nikki</td>
<td>2</td>
<td>6.25% Combination, drosiprenone and ethinyl estradiol</td>
<td></td>
</tr>
<tr>
<td>Isibloom</td>
<td>1</td>
<td>3.12% Combination, desogestrel and ethinyl estradiol</td>
<td></td>
</tr>
<tr>
<td>Lo Loestrin FE</td>
<td>1</td>
<td>3.12% Combination, norethindrone and ethinyl estradiol</td>
<td></td>
</tr>
<tr>
<td>Kelnor</td>
<td>1</td>
<td>3.12% Combination, ethynodiol and ethinyl estradiol</td>
<td></td>
</tr>
<tr>
<td>Mylan</td>
<td>1</td>
<td>3.12% Combination, gestodene and ethinyl estradiol</td>
<td></td>
</tr>
<tr>
<td>Larissia</td>
<td>2</td>
<td>6.25% Combination, levonorgestrel and ethinyl estradiol</td>
<td></td>
</tr>
<tr>
<td>Tri-Previfem</td>
<td>1</td>
<td>3.12% Combination, norgestimate and ethinyl estradiol</td>
<td></td>
</tr>
<tr>
<td>Yaz</td>
<td>1</td>
<td>3.12% Combination, drosiprenone and ethinyl estradiol</td>
<td></td>
</tr>
<tr>
<td>Lessina</td>
<td>1</td>
<td>3.12% Combination, levonorgestrel and ethinyl estradiol</td>
<td></td>
</tr>
<tr>
<td>Kariva</td>
<td>1</td>
<td>3.12% Combination, desogestrel and ethinyl estradiol</td>
<td></td>
</tr>
<tr>
<td>Tri-Lo-Marzia</td>
<td>1</td>
<td>3.12% Combination, norgestimate and ethinyl estradiol</td>
<td></td>
</tr>
<tr>
<td>Vyfemla</td>
<td>1</td>
<td>3.12% Combination, desogestrel and ethinyl estradiol</td>
<td></td>
</tr>
<tr>
<td>Depo-Provera (arm injection)</td>
<td>2</td>
<td>6.25% Injection, progestin</td>
<td></td>
</tr>
<tr>
<td>Nexplanon (arm implant)</td>
<td>1</td>
<td>3.12% Implant, etonogestrel</td>
<td></td>
</tr>
<tr>
<td>Total:</td>
<td>32</td>
<td>100.00%</td>
<td></td>
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</tbody>
</table>

Table 3. Birth Control (OCP) Inventory. This table lists the most common birth control brands and methods used by participants. The most common brand used was June, used by 31.25% of participants. All brands used ethinyl estradiol and different types of progestins.

9. Discussion and Implications: Factors Thought to Influence Age of Menarche

To summarize, based on the data from the present study the factors that had a significant relationship with age of menarche were the absence of a biological father during childhood, the presence of older sisters, and being a first-generation college student. The factors that did not have a significant relationship with age of menarche but were thought to show a trend related to
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age of menarche, were BMI, attending K-5 vs. K-8 grade school, and exposure to sexist
statements during childhood.

**Family Composition: Absence of Biological Father**

Girls who did not have their biological father present during the first year of life experienced
menarche at younger ages than girls with present fathers. This finding supports previous
research, which found that the absence of a father also contributed to childhood stress, which led
to girls experiencing menarche at younger ages (Hoier, 2003). However, it is important to point
out that only seven participants reported the absence of the father during the first year of life, so
it’s unclear if the significant finding is an artifact due to the discrepancy in participant number in
each group (72 vs. 7). However, it is worth noting that of the 72 participants reporting the
presence of the biological father during the first year of life, only five reported having their first
period under 11 years old; however, of the seven reporting the absence of the biological father
nearly half (n=3) reported experiencing menarche before the age of 11.

**Family Composition: Number of Sisters**

As stated earlier, girls who had older sisters experienced menarche at older ages than girls who
did not have any sisters. Girls experienced delayed age of menarche even in the presence of only
1 older sister. These results support previous research (Goyette & Craton, 2013c), which also
found a significant correlation between number of older sisters and age of menarche. In both the
present and previous study, it was found that girls without older sisters were more likely to
experience menarche at ages 11-12, while girls with 1 older sister were more likely to experience
menarche at ages 13-14 (Figures 3 and 4).

**Being a First-generation College Student**
Girls who were the first in their family to attend college were more likely to experience menarche at younger ages than girls who were not first-generation college students. This association likely relates to socioeconomic status, which is thought to strongly influence age of menarche. Students who are first-generation college students are associated with a lower socioeconomic status (Wilbur & Roscigno, 2016), and low SES is associated with earlier menarche.

**BMI**

A trend in results may indicate girls with increased BMI’s are more likely to experience menarche at younger ages than girls with decreased BMI’s. Although data supported the hypothesis that BMI is a determinant of menarche, results were not as significant as originally estimated. Previous research (Abreu & Kaiser, 2016), supports that higher BMI’s are strongly associated with early menarche. However, most participants in the present study reported having an “average” BMI, which may have skewed results based on self-reported data.

**Grade School Structure**

A trend in results may indicate girls who attended K-8 grade school were more likely to experience menarche at ages 13-14 than girls who attended K-5 grade school. This trend also may indicate girls who attended K-5 grade school were more likely to experience menarche at ages 11-12. Meaning, girls who attended K-5 grade school were more likely to experience menarche at younger ages than girls who attended K-8 grade school. These results contradict previous research (Gleason et al., 2017) which found that girls who attended K-5 elementary schools experience menarche later than girls who attended K-8. However, since both studies found opposing trends, this points to a need for further investigation (Figure 23).
Exposure to sexist statements

A trend in results may indicate girls who often heard “girls don’t do that”, “boys will be boys”, or similar statements about how boy and girls should act during childhood were more likely to experience menarche at a younger age than girls who were not exposed to sexist statements during childhood. These results support previous research (Gleason et al., 2017) which found sexist statements in the home led to earlier onset menarche. This study found that girls who were exposed to these statements were more likely to experience menarche at ages 11-12, while girls who were exposed to very few sexist statements were more likely to experience menarche at ages 12-13 (Figure 24).
9.1 Discussion and Implications: Birth Control Use and Perceptions

Survey data from the present study revealed that most participants have either been exposed to misinformation about birth control use or are misinformed themselves. For example, the majority of participants did not know the correct window of time that a woman can become pregnant, even though majority reported being confident in their knowledge of when a woman can become pregnant.

The majority of both male and female participants were aware of the influence of maternal age and birth defects; however, majority were unaware of the influence of paternal age and birth defects, or that paternal age birth defects are even possible.
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Misinformation regarding women’s reproductive health may be attributed to lack of education. Only 13.6% of participants listed “school classes” where they learned about birth control pills and more participants listed “online” as a resource. Overall, these results shed light on the need for updated and increased information regarding women’s reproductive health and birth control use in K-12 education and at the college level. There is also a pressing need for more research regarding the long-term effects of birth control use and birth control use among adolescents.

9.2 Global Trends Regarding Age of Menarche

The continuous global decline in age of menarche may lead to future biological and socio-cultural changes in adolescent females. Younger reproductive ages may redefine what it means to be a sexually mature female in this world. These changes may have an overall impact on women’s reproductive health and perceptions regarding fertility, puberty, menstruation, and birth control use.

One noticeable trend is occurring in Haiti, where age of menarche is actually increasing, unlike trends seen in the majority of countries (Figure 25). In 1977, the average age of menarche was 14.63 (Allman, 1982) and in 1995 the average age increased to 15.37 (Barnes-Josiah & Augustin, 1995). The faculty members on this project and I, were able to reach out to Dr. Nathalie Boucher-Giger, Bridgewater State University Alumni who earned her medical doctorate in her home country of Haiti, for some insight on this trend. She explained the increasing age of menarche could be due to a number of factors like increased poverty and malnutrition, inadequate access to healthcare during childhood, or the use of exogenous chemicals in the agricultural industry.
9.3 Limitations

A widely studied association with age of menarche is socioeconomic status. Notably, some factors that are thought to influence age of menarche are also indicators for socioeconomic status, such as BMI, being a first-generation college student, ethnicity, and race. However, an association between socioeconomic status and age of menarche cannot properly be made with the results from the current study due to the limitations created by the subject pool. Factors associated with ethnicity and race were limited due to the majority of participants reporting their race being “white”, and the majority of participants reporting being part of the “middle
FACTORS AFFECTING PUBERTAL TIMING AND PERCEPTIONS OF BIRTH CONTROL socioeconomic class”. Data collected from participants were self-reported which may skew results based on participant biases or misinformation.

10. Conclusion

In conclusion, our research goals were met by identifying some of the factors that influence age of menarche and by collecting data on current birth control use and views surrounding it. The data from the current study was not representative of the general population, however, it revealed some important trends regarding women’s reproductive health that will require further investigation in the scientific community. Global trends regarding age of menarche must be further investigated to properly determine the factors that influence pubertal timing. Overall, research must be expanded in the areas of understanding the long-term effects of prolonged OCP use and OCP use among adolescents. The results of the study also bring forward the increased need for adequate education in the K-12 schooling systems regarding puberty and reproduction.
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References


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FACTORS AFFECTING PUBERTAL TIMING AND PERCEPTIONS OF BIRTH CONTROL


State of the Period. (n.d.).


FACTORS AFFECTING PUBERTAL TIMING AND PERCEPTIONS OF BIRTH CONTROL


FACTORS AFFECTING PUBERTAL TIMING AND PERCEPTIONS OF BIRTH CONTROL


**Appendix A. Survey**

**SECTION1:**

Q1: My biological father was present during my first year of life
   1. yes
   2. no
   3. I don’t know

Q2: My biological mother was present during my first year of life
   1. yes
   2. no
   3. I don’t know

Q3: My biological parents divorced or stopped living together by the time I was:
   1. 0-4 years old
   2. 5-8 years old
   3. 8-11 years old
   4. 12-15 years old
   5. 16 years old OR they are still together

Q4: I have __ older sisters
   1. 0
   2. 1
   3. 2
   4. 3
   5. 4 or more

Q5: If you have older sisters, please select the sister closest to you in age and then indicate how much older than you she is.
   1. 1 year
   2. 2 years
   3. 3 years
   4. 4 years or more
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5. I don’t have an older sister

Q6: I have __ older brothers
   1. 0
   2. 1
   3. 2
   4. 3
   5. 4 or more

Q7: If you have older brothers, please select the brother closest to you in age and then indicate how much older than you he is.
   1. 1 year
   2. 2 years
   3. 3 years
   4. 4 years or more
   5. I don’t have an older brother

Q8: I have __ younger brothers
   1. 0
   2. 1
   3. 2
   4. 3
   5. 4 or more

Q9: I have __ younger sisters
   1. 0
   2. 1
   3. 2
   4. 3
   5. 4 or more

Q10: As honestly as you can try to think about your weight during elementary school until 8th grade. If “normal” means having a healthy BMI or body weight, would you have characterized your younger self as:
   1. normal
   2. thinner than normal
   3. heavier than normal

Q11: Which of the following best characterizes your eating choices:
   1. I always make the healthiest choice
   2. I often eat things I like regardless of whether they are good for me
   3. I am somewhere in the middle
FACTORS AFFECTING PUBERTAL TIMING AND PERCEPTIONS OF BIRTH CONTROL

Q12: Please describe how much exercise you got during elementary school until 8th grade.
   1. I was always active playing a team or individual sport or involved in dance classes or something similar
   2. I didn’t do team or individual sports, but I exercised typical to the lifestyle of an active childhood
   3. I was not very physically active during elementary school

Q13: In terms of puberty:
   1. I was a “late-bloomer”
   2. I was an “early-bloomer”
   3. I was about average

Q14: __ attended college
   1. only my mother
   2. only my father
   3. both of my parents
   4. neither of my parents

Q15: I (or my brothers and sisters and I) are the first in our family to attend college.
   1. true
   2. false

Q16: I (or my brothers and sisters and I) are the first in our extended family to attend college.
   1. true
   2. false

SECTION 2:

Q17: I am a biological
   1. male
   2. female

Q18: My gender identity is:
   1. male
   2. female
   3. none of these really describe my gender

SECTION 3:

Q19: I attended which of the following:
   1. K-2
   2. K-3
   3. K-4
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4. K-5
5. K-6
6. K-7
7. K-8
8. none of these

Q20: The middle school that I attended consisted of:
1. 3rd-8th grade
2. 4th-8th grade
3. 5th-8th grade
4. 6th-8th grade
5. 7th-8th grade
6. none of these

Q21: For me, high school was set up as a 4 year school, 9th-12th grade
1. true
2. false

Q22: For me, high school was part of my middle school. My middle school ended in 9th grade or later
1. true
2. false

Q23: I attended a public middle school
1. true
2. false

Q24: I attended a private, non-religious middle school
1. true
2. false

Q25: I attended a private, religious middle school
1. true
2. false

Q26: I attended a public high school
1. true
2. false

Q27: I attended a private, non-religious high school
1. true
2. false
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Q28: I attended a private, religious high school
   1. true
   2. false

Q29: I attended an “all-girls” middle school
   1. true
   2. false

Q30: I attended an “all-boys” middle school
   1. true
   2. false

Q31: I attended an “all-girls” high school
   1. true
   2. false

Q32: I attended an “all-boys” high school
   1. true
   2. false

SECTION 4:

Q33: Females, only please, I had my first period when I was:
   1. under 11 years old
   2. 11-12 years old
   3. 13-14 years old
   4. 15-16 years old
   5. not applicable

Q34: Males, only please, I experienced my first nocturnal emission (“wet dream”) when I was:
   1. under 11 years old
   2. 11-12 years old
   3. 13-14 years old
   4. 15-16 years old
   5. not applicable

SECTION 5:

Q35: Which best described you in the 8th grade?
   1. stress-free
   2. mostly stress free, but some stress
   3. 8th grade was a stressful time for me
FACTORS AFFECTING PUBERTAL TIMING AND PERCEPTIONS OF BIRTH CONTROL

Q36: During childhood, which best applied to you?
   1. always healthy, occasional, non-serious sickness
   2. sick fairly frequently
   3. sick very frequently

Q37: In the 8th grade, my gender identity matched my biological sex
   1. true
   2. false
   3. can’t remember

Q38: During my childhood, my family was a part of the:
   1. lower socioeconomic class
   2. middle socioeconomic class
   3. upper socioeconomic class

Q39: During my childhood, I took a multivitamin supplement
   1. true
   2. false

Q40: My extended family was involved in my childhood
   1. true
   2. false

Q41: My extended family contains members about my age
   1. true
   2. false
   3. 4 or more years older/younger
   4. not applicable

Q42: As a child, I was allowed to watch whatever I wanted to on TV, (My parents didn’t “censor” what I watched.)
   1. true
   2. false

Q43: As a child, I often heard, “girls don’t do that,” “boys will be boys” or similar statements about how boys and girls should act.
   1. true
   2. false

Q44: In my home puberty was discussed:
   1. often
   2. only when necessary
   3. never
FACTORS AFFECTING PUBERTAL TIMING AND PERCEPTIONS OF BIRTH CONTROL

Q45: I was home-schooled until:
   1. 5\textsuperscript{th} grade
   2. 6\textsuperscript{th} grade
   3. 7\textsuperscript{th} grade
   4. 8\textsuperscript{th} grade
   5. high school
   6. I was never home-schooled

SECTION 6:

Q46: Have you considered using hormonal birth control methods such as the pill or IUD, for example, but then decided not to for any of the following reasons?
   1. weight gain
   2. fear of judgement/social stigma
   3. parental restriction
   4. could not afford
   5. other
   6. I do use birth control
   7. two or more reasons

Q47: Are you currently taking birth control pills?
   1. yes
   2. no

Q48: What type of birth control pills do you use?
   1. combination pills (contain estrogen and progestin)
   2. mini-pills (contain progestin only)
   3. continuous cycle pills (contain more pills per pack)
   4. not sure

Q49: If you know the name or brand of your current birth control pill, please enter it here:

Q50: Think back to when you first got your period. When did you start taking birth control pills?
   1. immediately
   2. within a year of getting my period
   3. about 2 years later
   4. about 3 years later
   5. about 4 or more years later

Q51: This coincided with which of the following grades:
   1. 5\textsuperscript{th} grade
   2. 6\textsuperscript{th} grade
FACTORS AFFECTING PUBERTAL TIMING AND PERCEPTIONS OF BIRTH CONTROL

3. 7th grade
4. 8th grade
5. freshman year of high school
6. sophomore year of high school
7. junior year of high school
8. senior year of high school
9. freshman year of college
10. sophomore year of college
11. junior year of college
12. other

Q52: At what age did you begin taking birth control pills?
1. younger than 14 years old
2. 14 years old
3. 15 years old
4. 16 years old
5. 17 years old
6. 18 years old
7. older than 18 years old

Q53: Do you remember how you started taking the pill ORIGINALLY? Was it:
1. my mom/parent suggested it
2. my doctor suggested it
3. my sister/female relative suggested it
4. my friend suggested it
5. my significant other suggested it
6. I decided to take the pill
7. other

SECTION 7:

Q54: I have been diagnosed with a disorder that my doctor told me may affect my hormones. Some examples are polycystic ovarian syndrome (PCOS), thyroid disorders or diabetes, but there are many others. If you have been diagnosed with a disorder that your doctor told you would affect your hormones, please indicate that here:
1. true
2. false

Q55: Choose one answer that BEST describes why you began taking the birth control pill:
1. to prevent pregnancy
2. to regulate your menstrual cycle/make it more predictable
3. to relieve menstrual pain
4. to control hormonal acne
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5. to reduce risk of ovarian cysts
6. to regulate mood/diminish PMS
7. to manage endometriosis
8. to relieve menstrual migraines
9. my mom/doctor/friend just assumed I should
10. to ease my period (flow) so I could participate in sports
11. to ease my period (flow) so I wouldn’t miss school
12. to completely avoid having my period
13. other

Q56: For what amount of time have you been regularly and continuously taking birth control pills? (If you switched prescriptions and missed a few months in between, please just go ahead and consider that “continuous,” even if the prescription changed and you missed a few months.) We will ask more specifically about that later.
1. less than 1 year
2. 1 year
3. 2 years
4. 3 years
5. 4 years
6. 5 years
7. 6 years
8. 7 years
9. 8 years
10. 9 years
11. 10 years
12. More than 10 years

SECTION 8:

Q57: Although this isn’t the primary reason I began taking the pill, I was happiest/relieved by this additional benefit of taking the pill:
1. pregnancy prevention
2. my menstrual cycle became more predictable
3. I experienced fewer cramps
4. my acne improved
5. my mood was better/PMS was diminished
6. my endometriosis got better
7. I had fewer headaches/migraines
8. lighter periods
9. none

Q58: For me, another benefit of taking the pill is:
1. pregnancy prevention
FACTORS AFFECTING PUBERTAL TIMING AND PERCEPTIONS OF BIRTH CONTROL

2. my menstrual cycle became more predictable
3. I experienced fewer cramps
4. my acne improved
5. my mood was better/PMS was diminished
6. my endometriosis got better
7. I had fewer headaches/migraines
8. lighter periods
9. none

Q59: Have you ever used a non-pill hormonal birth control method WHILE NOT taking birth control pills? If yes, please indicate which method(s):
   1. NuvaRing
   2. The Patch
   3. Nexplanon (arm implant)
   4. Depo Provera Injection (shot)
   5. Hormonal IUD (Skyla, Mirena, Kyleena, Liletta)
   6. other
   7. I have not

Q60: Have you ever used a second hormonal birth control method WHILE taking birth control pills? If yes, please indicate which method(s):
   1. NuvaRing
   2. The Patch
   3. Nexplanon (arm implant)
   4. Depo Provera Injection (shot)
   5. Hormonal IUD (Skyla, Mirena, Kyleena, Liletta)
   6. other
   7. I have not

Q61: Have you experienced any of these side effects while using birth control pills? Please select all that apply.
   1. nausea
   2. vomiting
   3. headache
   4. breast tenderness
   5. bleeding between periods
   6. acne
   7. mood swings
   8. weight gain
   9. decreased sex drive
   10. ovarian cysts
   11. fatigue
   12. other
FACTORS AFFECTING PUBERTAL TIMING AND PERCEPTIONS OF BIRTH CONTROL

13. I have not experienced any of these

Q62: Have you ever had to change from one birth control pill brand to another?
   1. yes
   2. no
   3. not sure

Q63: If you have switched birth control pill brands, why?
   1. could not tolerate side effects
   2. recommended by doctor
   3. could no longer take estrogen, switched to a progestin-only pill
   4. switched to an extended cycle pill (no "sugar pills")
   5. other
   6. I have not switched pill brands

Q64: Have you been sexually active while using oral contraceptives?
   1. yes
   2. no
   3. not sure

Q65: When sexually active, have you used any of the following non-hormonal contraceptives
   WHILE also taking birth control pills? Select all that apply:
   1. male condom
   2. female condom
   3. sponge
   4. cervical cap
   5. spermicide
   6. diaphragm
   7. natural family planning
   8. I have not used any of these
   9. I have only had sexual intercourse while not taking birth control pills
   10. other
   11. I am not sexually active

Q66: Have you ever had any of the following STD/STI’s WHILE taking birth control pills? Select all that apply
   1. chlamydia
   2. gonorrhea
   3. trichomoniasis
   4. genital warts
   5. genital herpes
   6. pubic lice
   7. scabies
FACTORS AFFECTING PUBERTAL TIMING AND PERCEPTIONS OF BIRTH CONTROL

8. syphilis
9. human papillomavirus (HPV)
10. other
11. none

Q67: Try to remember your average cycle length (time between periods) prior to when you started taking the pill. Since taking the pill, has your cycle length:
   1. gotten longer
   2. gotten shorter
   3. hasn’t changed much, stayed nearly the same
   4. I can’t recall

Q68: Have you ever become pregnant while taking birth control pills?
   1. yes
   2. no
   3. not sure

Q69: If yes, did you have any complications during pregnancy?
   1. yes
   2. no
   3. not applicable

Q70: Have you ever become pregnant after you stopped using birth control pills?
   1. yes
   2. no
   3. not sure

Q71: Has there been a time where you have stopped using oral contraceptives?
   1. yes
   2. no

Q72: When you stopped taking birth control pills did you experience any of the following? Select all that apply:
   1. cycle length changes (irregular periods)
   2. heavier flow
   3. lighter flow
   4. more painful cramping
   5. less painful cramping
   6. mood change
   7. weight gain
   8. weight loss
   9. acne
   10. I have not experienced any of these
FACTORS AFFECTING PUBERTAL TIMING AND PERCEPTIONS OF BIRTH CONTROL

11. I have not stopped taking birth control pills

Q73: While using oral contraceptives, is your period or bleeding… Select all that apply:
   1. lighter than usual
   2. the same as when I am not taking oral contraceptives
   3. heavier than usual
   4. less painful
   5. the same as when I am not taking oral contraceptives
   6. more painful
   7. shorter than usual
   8. the same as when I am not taking oral contraceptives
   9. longer than usual
   10. I do not menstruate while taking oral contraceptives

SECTION 9:

Q74: Think about your friends and other women you know. About what percentage would you say use some form of hormonal contraceptive, such as “the pill?”
   1. more than 95%
   2. somewhere around 75%
   3. about 50%
   4. less than 25%

Q75: When sexually active have you used any of the following non-hormonal contraceptives WHILE NOT taking birth control pills? Select all that apply:
   1. male condom
   2. female condom
   3. sponge
   4. cervical cap
   5. spermicide
   6. diaphragm
   7. natural family planning
   8. I have not used any of these
   9. I have only had sexual intercourse while not taking birth control pills
   10. I am not sexually active

Q76: Have you ever had any of the following STD/STI’s while not taking birth control pills? Select all the apply:
   1. chlamydia
   2. gonorrhea
   3. trichomoniasis
   4. genital warts
   5. genital herpes
FACTORS AFFECTING PUBERTAL TIMING AND PERCEPTIONS OF BIRTH CONTROL

6. pubic lice
7. scabies
8. syphilis
9. human papillomavirus (HPV)
10. other
11. none

Q77: Cycle length can be measured by counting the number of days between the 1st day of one period to the 1st day of the next period. What is your cycle length?
   1. shorter than 18 days
   2. 18-20 days
   3. 21-23 days
   4. 24-26 days
   5. 27-29 days
   6. 30-32 days
   7. 33-35 days
   8. longer than 35 days

Q78: I learned the majority of what I know about birth control pills from:
   1. my mom/parent/guardian
   2. my sister
   3. my friends
   4. my doctors
   5. school classes
   6. online
   7. other

Q79: I have heard that you can get “extra protection” from pregnancy if you double up and take 2 birth control pills before/after having unprotected sex.
   1. true
   2. false

Q80: Birth control pills protect me against STD/STI’s.
   1. true
   2. false

Q81: I feel confident that I understand when I can become pregnant.
   1. true
   2. false

Q82: If someone is not on the pill, she can become pregnant
   1. throughout the cycle
   2. only at ovulation
FACTORS AFFECTING PUBERTAL TIMING AND PERCEPTIONS OF BIRTH CONTROL

3. during the period
4. for a few days prior to ovulation

Q83: In general, only women have hormones that fluctuate. Men’s hormones do not fluctuate.
   1. true
   2. false

Q84: Do you think it is natural to have a period every month when one is not pregnant or nursing?
   1. yes
   2. no

Q85: There are hormonal methods that decrease the number of periods a woman has. Would you hesitate to take that form of birth control because it seems “unnatural?”
   1. yes
   2. no

Q86: For those hormonal methods that reduce the number of periods a woman has, I worry that it is unsafe to skip a monthly period.
   1. true
   2. false

Q87: When someone misses a pill, she can just take two the next day.
   1. true
   2. false

Q88: Progestin-only pills are healthier than “combination pills.”
   1. true
   2. false

Q89: Taking the pill long term is fairly safe.
   1. true
   2. false

Q90: Taking the pill increases the likelihood of breast cancer
   1. true
   2. false

Q91: Taking the pill increases the likelihood of ovarian cancer
   1. true
   2. false

Q92: A child born to a woman over 40 years of age has a higher likelihood of having an illness (e.g. Down’s Syndrome or autism).
Q93: A child born to a man over 40 years of age has a higher likelihood of having an illness (e.g. Down’s Syndrome or autism).
   1. true  
   2. false

Q94: Is there anything else you would like to share with us or you would like us to look into as part of this research: