

Immature Pelvic Growth and Obesity: A Biocultural Analysis of Risks Associated With Adolescent Pregnancy in the United States

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Abstract

Adolescent pregnancy in youth aged 10-19 years is associated with higher rates of adverse outcomes for both the mother and infant than adult pregnancy. Obesity and immature pelvic growth compound the associated risks of adolescent pregnancy. Black and Indigenous youth in the United States (U.S.) experience disproportionately high rates of adolescent pregnancy and obesity. This research project aimed to answer two questions: (1) What are the contributing risks of pelvic immaturity and obesity on adverse outcomes in adolescent pregnancy, especially in the U.S.?; and (2) Why are Black and Indigenous youth at particular risk of adolescent pregnancy and obesity in the U.S.? In this research project, I have conducted statistical analyses of the biological and social factors associated with adolescent pregnancy using the CDC WONDER database, and I have used case studies and ethnographic accounts to gain insight on Black and Indigenous youth experiences with adolescent pregnancy. In this paper I examine the racial disparities in rates of adolescent pregnancy, obesity, and adverse outcomes in the U.S. My paper contributes research to a current public health issue by using an integrative biocultural approach.

Keywords: Adolescent pregnancy; pelvic immaturity; obesity; obstetrical dilemma; health care disparities

Note

This article is also archived as an unpublished honours thesis in the University of Victoria's Research and Learning Repository, DSpace: <https://dspace.library.uvic.ca>

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High rates of adolescent pregnancy and obesity in the United States (U.S.) are cause for concern. Globally, the leading cause of death in adolescent girls aged 15–19 years is complications in pregnancy and childbirth (WHO, 2020c, Key Facts). The term adolescence is defined by the World Health Organization as the period between 10 and 19 years of age (2018). Although rates in the U.S. have dropped in recent years (e.g., 7% decline in adolescents aged 15–19 years from 2016 to 2017), adolescent pregnancy is still more common in the U.S. than anywhere else in the Global North, and racial disparities persist (CDC, 2019a). Risk of adverse outcomes is increased when other health conditions, such as obesity, are present, and rates of adolescent and childhood obesity in the U.S. decrease with improved living conditions and increased level of education (CDC, 2019b). High rates of adolescent pregnancy and obesity in the U.S. are particularly exacerbated in Black and Indigenous adolescents (WHO, 2020c; WHO, n.d.). Although biological risks are involved, sociocultural factors compound those risks, resulting in higher rates of adolescent pregnancy, obesity, and adverse outcomes in pregnancy (Stone, 2016).

The main evolutionary hypothesis for human pelvic morphology, the obstetrical dilemma hypothesis, posits that bipedalism and increasing brain size in our evolutionary history led to increased risk of obstructed labour (i.e., infant cannot physically fit through the birth canal) (Washburn, 1960). However, causes of maternal mortality are not only, or even predominantly, related to pelvic morphology (i.e., cephalopelvic disproportion, or misfit of the infant head and maternal birth canal, in labour) (Stone, 2016). The role of female pelvic morphology in maternal morbidity continues to be challenged in emerging literature (Dunsworth, 2018; Stone, 2016). Although the obstetrical dilemma hypothesis may explain some complications experienced in early adolescent pregnancy and childbirth, it does not explain all challenges. Rather, there are multiple “obstetrical dilemmas” or factors that may cause complications in childbirth, many of which may be preventable (Stone, 2016). This study examines whether pelvic size (the original obstetrical dilemma hypothesis) in part explains adverse outcomes in early adolescent pregnancy but also whether other biological and sociocultural factors contribute to challenging childbirth in both younger and older adolescents at different stages of pelvic immaturity at the time of pregnancy. This research aimed to answer two questions: (1) What are the contributing risks of pelvic immaturity and obesity on adverse outcomes in adolescent pregnancy, especially in the U.S.?; and (2) Why are Black and Indigenous youth at particular risk of adolescent pregnancy and obesity in the U.S.?

The study data for the quantitative analysis are derived from the U.S. Centers for Disease Control and Prevention (CDC) National Vital Statistics reports and CDC WONDER births (natality) and infant death databases. Using filters in the databases, data have been sorted by maternal single race (African American or Black and American Indian or Alaska Native only) and maternal age. In order to highlight increased risk in adolescent pregnancy, adult women (≥ 20 years) have been analyzed for comparative purposes. For numerical analyses, I have produced graphs in Microsoft Excel and performed one-way ANOVA (analysis of variance) tests to highlight mean values that differ significantly (i.e., obstetrician estimated [OE] gestational age, birth weight, and pre-pregnancy body mass index [BMI]) between racialized identities. Ethnographic accounts of Black and Indigenous experiences with adolescent pregnancy are reviewed qualitatively to examine risk in these groups, given their high maternal and infant mortality rates. While the CDC WONDER databases use the terms Black or African American and American Indian or Alaska Native, I instead address these specific racialized groups using the terms Black and Indigenous to maintain consistency with the American Anthropological Association (Antrosio & Han, 2015) and the Association of Indigenous Anthropologists (n.d.).

This research is significant in that it contributes to the current public health issues of adolescent pregnancy and obesity in the U.S. from a unique biocultural perspective and highlights racial disparities in the U.S. health care system and adolescent pregnancy. This study works to break

down racial barriers and is important for public health researchers and Black and Indigenous adolescent girls in the U.S. Black women's experiences with adolescent pregnancy, obesity, and maternal mortality in the U.S. have gained growing research interest and media attention in recent years, but there has been comparatively less focus on Indigenous experiences. This essay aims to bring attention to both Indigenous and Black adolescent pregnancy and to highlight personal experiences with the U.S. health care system and adolescent pregnancy.

Background

Adolescent Public Health Issues in the U.S.

In the U.S., adolescent pregnancy is viewed as a public health, medical, social, and economic problem (Barcelos, 2014). This originates from the notion that pregnancy is a “choice,” and therefore female individuals who make good choices are those who have “earned the right to exercise choice properly by having enough [social and economic capital] to be a legitimate and proper mother” (i.e., not adolescents) (Solinger, 2005, as cited in Barcelos, 2014, p. 479). This belief normalizes childbearing in financially stable, married, heterosexual women who are old enough to avoid being called “teen” mothers (Barcelos, 2014), which is an example of stratified reproduction, where adolescents are devalued and stigmatized in reproduction (Greil et al., 2011). Those people who consider adolescent pregnancy a “problem” claim there are consequences of early childbearing including “poverty, child abuse, incarceration, and physical and mental health problems” (Hoffman, 2008, as cited in Barcelos, 2014, p. 479). However, some studies have found positive effects of early pregnancy, including improved self-esteem, pride in motherhood, and a “sense of direction and purpose” (Wilson & Huntington, 2006, as cited in Barcelos, 2014, p. 479). Problematizing adolescent pregnancy stigmatizes adolescent reproduction and “reinforces and reproduces existing health and social inequalities” (Barcelos, 2014, p. 486).

Similar stigmas exist around adolescent obesity and obesity in general, where individuals are treated negatively as a socially acceptable form of discrimination (Puhl & Heuer, 2010). Stigmatization of overweight and obese individuals can have serious physiological and psychological health risks, therefore making it an issue of social justice and, in the context of adolescent pregnancy, reproductive justice (Puhl & Heuer, 2010). Weight stigma is defined as the “societal devaluation of a person because he or she [is overweight or obese]” and occurs in children as young as 3 years of age (Pont et al., 2017, p. 2). Weight stigma poses a serious threat to quality of health care, where preventative medical interventions are less common in overweight and obese individuals, and weight acts as a barrier to health care services (Puhl & Heuer, 2010). Children and adolescents are vulnerable to weight stigma from peers at school, family members, teachers, health care practitioners and society (e.g., social media) (Pont et al., 2017). Weight stigma may contribute to behaviours such as binge eating, social isolation, avoidance of seeking health care, decreased physical activity, and increased weight gain (Pont et al., 2017). These behaviours may worsen obesity and create further barriers to a healthy lifestyle (Pont et al., 2017). Rather than stigmatizing and devaluing overweight and obese youth, supporting them with positivity and inclusivity will boost both their mental and physical health (Pont et al., 2017). The only way to positively support overweight and obese children and adolescents is to “recognize, address, and advocate against weight stigma” (Pont et al., 2017, p. 2).

Multiple Obstetrical Dilemmas

The obstetrical dilemma hypothesis posits that balancing bipedalism and increasing brain size across our evolutionary history has led to increased risk of obstructed labour as a by-product (i.e., cephalopelvic disproportion) (Washburn, 1930). However, this hypothesis places blame on the

female body for not being equipped to birth safely while other researchers have pointed to societal and cultural factors that may shape obstetric risk (Stone, 2016). One argument is that humans have created a “childbirth dilemma” where human lifestyles and birthing practices make childbirth more difficult and dangerous than it is in other species (Dunsworth, 2018). This “dilemma” may include young age at pregnancy, where maternal pelvic bone growth is incomplete, and high instances of diabetes, gestational diabetes and preeclampsia, all of which encourage macrosomia (i.e., very large fetal size), thereby increasing risk of adverse outcomes in pregnancy and childbirth (Dunsworth, 2018).

Still, pelvic size may in part explain challenges in early adolescent pregnancy (≤ 15 years), where the pelvic bones have not finished growing (i.e., pelvic immaturity). Previous studies have set the age of pelvic maturity at 16 years, where older adolescent mothers are 16–19 years of age and younger adolescents are 10–15 years (Haeri & Baker, 2012). Although most girls’ pelvises are fully developed by 16 years, this may not be the case in girls with a later age at menarche, the age at which a female first menstruates (WHO, 2004). Earlier age at menarche is associated with both reduced pelvic dimensions relative to completed growth in adulthood and earlier age at first pregnancy (WHO, 2004). Because the pelvic bones can continue to grow for 2 more years post-menarche, pregnancy at this time can have serious risks, including fetal growth restriction and a higher incidence of caesarean section (Brosens et al., 2017; Haeri & Baker, 2012; Wells, 2017; WHO, 2004). In the U.S., Black adolescent girls have a significantly earlier average age of menarche (Chumlea et al., 2003), while non-Hispanic White girls tend to have the latest average age of menarche (Anderson & Must, 2005). Earlier age at menarche in affluent countries is most common among impoverished girls (Krieger, 2015), thereby supporting further racial disparities in the U.S.

While pelvic immaturity may impact adolescent pregnancy outcomes, adolescent obesity also has a significant negative impact on birth outcomes (Haeri & Baker, 2012). Obesity is a result of genetic, cultural, environmental, and evolutionary factors (Heitmann et al., 2012). Body weight is phenotypically plastic in response to genetic and environmental influences, meaning that it will fluctuate depending on living conditions and resource availability. High BMI and obesity in pregnancy are associated with challenging childbirth and postnatal complications such as lipid-poor breastmilk that contributes to the transgenerational perpetuation of obesity (Heitmann et al., 2012). Obesity is defined as a BMI over 30, where excess accumulated body fat has the potential to cause further health complications (WHO, 2020a). In their study on estimating the impact of pelvic immaturity and young maternal age on fetal malposition, Haeri and Baker (2012) conclude that pelvic immaturity alone does not explain adverse outcomes in adolescent pregnancy and that high BMI or obesity have a significant impact on pregnancy outcomes. Though obesity is often associated with macrosomia, low birth weight and preterm birth are also common in adolescent pregnancy (Haeri & Baker, 2012).

In the U.S., obesity prevalence among adolescents aged 12–19 years is 20.6% (CDC, 2019b). Rates of childhood and adolescent obesity decrease with increased level of education of the household head (CDC, 2019b, Obesity and Socioeconomic Status). Wells (2017, p. 716) describes the “new” obstetrical dilemma as a result of the “double burden of malnutrition and the global obesity epidemic,” where obesity in pregnancy and short maternal stature increase risk of gestational diabetes, contributing to higher incidence of macrosomic offspring. The double burden of malnutrition is defined as undernutrition in childhood and overnutrition in adulthood as a result of rapid urbanization and globalization, leading to malnourished, underweight children and a significant proportion of the adult population being in the overweight or obese BMI categories (Kolcic, 2012). The double burden of malnutrition is an issue in more than half of all malnourished households in the U.S. (Bowers et al., 2018). There tends to be a close relationship between maternal body mass, specifically pre-pregnancy weight or BMI, and neonatal size: High BMI or obese women tend

to develop very large neonates despite skeletal size, increasing risk of cephalopelvic disproportion, obstructed labour, and other obstetric complications (Papazian, 2017).

Socioeconomic circumstances not only compound biological risks in adolescent pregnancy but can also place Black and Indigenous youth at increased risk for adolescent pregnancy and obesity (WHO, 2020c; WHO, n.d.). These factors may include income inequality, poor living conditions, poverty, low levels of education, and limited access to health care services (Vilda et al., 2019). However, socioeconomic conditions alone do not explain disproportionate rates of adolescent pregnancy and obesity in Black and Indigenous adolescents. The mistreatment of certain racialized identities places vulnerable individuals at increased risk without adequate support (Castro & Savage, 2019). Although the CDC (2019c) has recently begun to acknowledge racial disparities in public health data, previous studies ignoring those disparities only reinforce their continuation in the U.S. The political, economic and social climate for Black and Indigenous adolescents in the U.S. “has been—and continues to be—a negative one” (Oxley & Weekes, 1997, p. 169). These sociocultural and political factors “compromise the pelvis and the birthing process” and must be further examined and improved (Stone, 2016, p. 152).

Definitions of Health, Maternal Mortality and Sociocultural Factors

While assessing adolescent pregnancy risks and outcomes, it is important to understand what constitutes a “healthy” pregnancy from a medical perspective. The New York State Department of Health (2006) defines a healthy pregnancy as one that lasts 9 full months; a pregnancy that results in a healthy baby (or babies), with no severe birth defects, and who weigh at least 2500 grams; and a pregnancy in which the mother feels well throughout the entire gestation period, other than manageable discomforts (morning sickness, etc.). Throughout pregnancy, expectant mothers are encouraged to take prenatal vitamins, stop tobacco, drug, and alcohol use, eat a balanced diet, gain the right amount of weight, take prenatal classes, exercise regularly, and attend prenatal appointments with a physician or midwife (New York State Department of Health, 2006). Lists of behaviours that pregnant persons are encouraged to do throughout and prior to pregnancy are extensive and not only assume a certain lifestyle of pregnant individuals but incorrectly assume that all pregnant individuals have the same access to resources and services.

Adolescent pregnancies are more likely to occur among girls living in poverty with limited education and employment opportunities (WHO, 2020c). Biological consequences of adolescent pregnancy include health risks to both mothers and infants while social consequences may vary enormously (WHO, 2020c). For example, in some parts of the world it is not only common but expected that first pregnancy will occur in adolescence (WHO, 2004). However, social consequences of adolescent pregnancy may include “stigma, rejection or violence by partners, parents and peers,” dropping out of school, and “[jeopardization of] girls’ future education and employment opportunities” (WHO, 2020c, para. 10).

The World Health Organization defines maternal mortality as mothers dying as a result of “complications during and following pregnancy and childbirth” (WHO, 2019, para. 8). Obstetric violence and obstetric racism are sociocultural concepts central to understanding pregnancy outcomes (Perera et al., 2018). Obstetric violence is defined as “the appropriation of [female bodies] and reproductive processes by health personnel resulting in a loss of autonomy and ability to decide freely about their bodies and sexuality, negatively impacting their quality of life” (República Bolivariana de Venezuela, 2007, as cited in Castro & Savage, 2019, p. 123). Obstetric violence may be increased in low- or lower-income settings and toward mothers of particular racialized identities “exposed to institutional and professional power characterized by oppressive and domineering behaviours” (Jardim & Modina, 2018, p. 2). Obstetric violence is used as a tool of reproductive governance: control of reproductive behaviours where health professionals produce “moral regimes”—

privileged standards of morality used to govern others—over those seeking reproductive health care (Morgan & Roberts, 2011, p. 242). Individuals of low socioeconomic status often receive lower-quality health care where inequalities between public and private health care are greater and more damaging (Castro & Savage, 2019). Obstetric racism is “an extension of racial stratification and is registered both from the historically constituted stigmatization of [visible minority females] and from the recollections of interactions with physicians, nurses, and other medical professionals during and after pregnancy” (Davis, 2018, p. 561). The mistreatment of female individuals in maternal health care based on racialized identities is appallingly widespread and has serious health consequences. Black and Indigenous females are two to three times more likely to experience maternal mortality than are White females in the U.S. (Rabin, 2019), which is an example of a health care disparity: “differences in the quality of health care that are not due to access-related factors or clinical needs, preferences or appropriateness of intervention” (Dehlendorf et al., 2010, p. 212). Most causes of maternal mortality are preventable or treatable complications, while others are pre-existing and may worsen in pregnancy (WHO, 2019, para. 8). Major complications that account for most cases of maternal mortality include haemorrhage, infections, preeclampsia or eclampsia, unsafe abortion, and complications in delivery (WHO, 2019).

Healthcare disparities in reproductive healthcare must be explored through a reproductive justice lens. Reproductive justice is defined by SisterSong (2020, para. 1) as “the human right to maintain personal bodily autonomy, have children, not have children, and parent the children we have in safe and sustainable communities.” Legalising reproductive health care services and resources in the U.S. is not enough to protect reproductive rights as many individuals cannot access services due to physical and economic barriers (SisterSong, 2020). Lastly, stratified reproduction is the concept that “some categories of people are empowered to reproduce and nurture, while others are disempowered” (Ginsburg & Rapp, 1995, p. 3), which is relevant to Black and Indigenous adolescents in the U.S., who are stigmatized in reproduction.

Biological Risks of Adolescent Pregnancy

Adolescent pregnancy is associated with higher risk of adverse outcomes for several reasons. While pregnancy involves biological risk at all maternal ages, adolescent pregnancies place mothers at increased risk for eclampsia, puerperal endometritis (i.e., uterine infections), and systemic infections (i.e., of the bloodstream), and infants at increased risk for low birth weight, preterm delivery, and severe neonatal conditions (WHO, 2020c, Key Facts). High pre-pregnancy BMI is associated with increased incidence of caesarean section in adolescent pregnancy specifically (Haeri & Baker, 2012), which may also be due in part to immature muscular development, as well as immature pelvic development. Failure of an infant to progress through the birth canal is often due to insufficient muscular force rather than poor fit. Pelvic floor muscles may be weakened in females with higher BMI or obesity, which can make childbirth more difficult (Childbirth Connections, 2020). Similarly, researchers Da Costa et al. (2004), in their study of uterine volume in adolescents, found that higher rates of adverse outcomes for pregnancy and delivery in younger adolescents may be due to immaturity of the female genital tract (e.g., limited uterine volume). Another example of a biological immaturity that may impact adolescent pregnancy outcomes is limited available energy in the maternal body, which must be allocated between maternal growth and fetal growth (i.e., reproduction) (Hill, 1993). When an adolescent invests energy in pregnancy, fetal development takes away from energy which would otherwise be used to continue maternal development, thereby limiting both fetal and maternal growth.

Adverse outcomes in adolescent pregnancy may include caesarean section, maternal mortality or morbidity, infant mortality or morbidity, short gestational age (preterm birth), and low birth weight (Brosens et al., 2017; Haeri & Baker, 2012). A high rate of surgical delivery and maternal mortality

in a young population is particularly concerning. It is important to understand that, to a certain extent, a bigger baby is a healthier baby. Average birth weight in U.S. adolescent pregnancies is over 2500 grams (CDC WONDER, 2019). However, occurrences of low birth weight and preterm birth may be due in part to adolescents having difficulty gaining enough weight in pregnancy. This is especially an issue if mothers are very young (≤ 15 years) and still growing, which would limit available energy for gestational weight gain (Haeri & Baker, 2012). Comparatively, a baby that is too large, one that is macrosomic, may be dangerous to deliver. Fetal head position also plays a role in adolescent childbirth outcomes, and malposition (i.e., abnormal position of the fetal head in relation to the maternal pelvis and birth canal) is often determined by maternal BMI, where a higher BMI indicates higher risk of fetal malposition and obstructed labour (Haeri & Baker, 2012; Health Education to Villages, 2020).

Both high and low BMI can cause complications in adolescent pregnancy. Low pre-pregnancy BMI and short maternal stature in pregnancy can cause growth restrictions and result in caesarean section, preterm birth, or low birth weight infants (Zeteroglu et al., 2005). Obesity is ultimately a result of globalization, where people in both affluent and developing nations increasingly have access to high-caloric, low-nutrient foods (Lev-Ran, 2001). Obesity or high BMI in adolescence leads to increased associated medical conditions and complications in pregnancy, including gestational diabetes, macrosomia, and surgical delivery (Haeri & Baker, 2012). Obesity and high BMI may result from biological factors, specifically genetic makeup; behaviour, including gestational weight gain, postpartum weight retention, and low levels of physical activity; and social determinants of health, including psychosocial stressors and socioeconomic position (Agyemang & Powell-Wiley, 2013). It is important to note that BMI calculations do not consider healthy (lean) fat or muscle mass and can therefore categorize individuals with high levels of muscle mass as overweight or obese. The use of BMI can be particularly problematic as an indicator of obesity in children and adolescents as height, level of sexual maturity, and weight vary and fluctuate throughout development (CDC, n.d.).

Materials and Methods

Quantitative Analysis

I used the U.S. CDC National Vital Statistics reports (2011–2018) and the CDC WONDER births (natality) and infant death datasets to analyze adolescent pregnancy outcomes. The data have been sorted by maternal single race (African American or Black and American Indian or Alaska Native) and maternal age. Maternal age groups were established as <15–19 years, 20–34 years, and 35–44 years to allow for comparisons among adolescents, young adults, and older adults. To maintain consistency with previous studies, age of pelvic maturity is set to 16 years (Haeri & Baker, 2012). Pregnancy outcomes and risks are assessed through the examination of mean OE gestational age (weeks), mean birth weight (grams), and mean pre-pregnancy BMI. Maternal racial groupings are used as reported in the databases, but these reflect self-reported racialized identities; races are not valid biological entities for grouping humans (Goodman, 2017). The data were examined visually using graphs to look for patterns across groups and a one-way ANOVA to test mean value differences between racial groups.

Qualitative Analysis

To contextualize the results of the quantitative data analysis, ethnographic accounts depicting Black and Indigenous adolescent experiences with pregnancy and childbirth in the U.S. were examined qualitatively. These include Black adolescent experiences with pregnancy and health care (Daley et al., 2017; Dienes et al., 2004; Oxley & Weekes, 1997), and Indigenous adolescent experi-

ences with pregnancy (Liu et al., 2004). Although health care disparities in adolescent pregnancies in the U.S. are not explained by socioeconomic status alone, living conditions, access to health care, poverty and lack of education can increase risk. A literature review of recent publications related to my research interests revealed the ethnographic accounts used in qualitative analysis. Narrative analyses of ethnographic accounts were performed to focus this research on the stories and experiences of Black and Indigenous adolescent mothers.

Addressing Research Questions

My research questions require an integrative, two-subfield approach to answer thoroughly: (1) What are the contributing risks of pelvic immaturity and obesity on adverse outcomes in adolescent pregnancy, especially in the U.S.?; and (2) Why are Black and Indigenous youth at particular risk of adolescent pregnancy and obesity in the U.S.? Maternal and infant mortality and severe morbidity are prevalent concerns today that require a biocultural perspective to understand, as many causes are preventable conditions and complications. From a biological anthropology perspective, I am using an evolutionary approach to examine the obstetrical dilemma hypothesis, the evolution of obesity in the U.S., and the biological risks associated with adolescent pregnancy, such as pelvic immaturity and obesity. While the obstetrical dilemma hypothesis blames the female body for childbirth complications, maternal mortality and adverse outcomes in pregnancy and childbirth cannot be minimized without first acknowledging both the sociocultural factors and preventable biological factors contributing to difficult childbirth (Dunsworth, 2018).

The methods used address the research questions by examining adolescent pregnancy rates in the U.S. by maternal single race. Contributing risk factors were assessed through both statistical and ethnographic analyses. Pelvic immaturity was not an isolated variable in this study and was instead examined through previous literature (Haeri & Baker, 2012). Maternal BMI was included in statistical analysis as an isolated variable in both adolescent and adult pregnancy. Finally, the research question asking why Black and Indigenous youth are at increased risk of adolescent pregnancy and obesity in the U.S. is addressed through ethnographic data and sociocultural studies examining relevant risk factors.

Results

Quantitative Results

Black and Indigenous females experienced disproportionately high rates of maternal mortality, infant mortality, and adverse pregnancy outcomes from 2011–2016. These risks are heightened in adolescent pregnancies. Black and Indigenous females are 3.3 and 2.3 times more likely, respectively, to experience a pregnancy- or childbirth-related death than are White females in the U.S. (Table 1).

Table 1. 2011–2016 maternal mortality ratios per 100,000 live births by maternal single race.

Maternal single race	Deaths per 100,000 live births
Black non-Hispanic	42.4
American Indian/Alaska Native non-Hispanic	30.4
White non-Hispanic	13.0

Table 2 shows racial disparities in infant mortality ratios by maternal race, where infant mortality is the death of an infant before completing its first year of age (WHO, 2020e). Black mothers' infants are 2.2 times more likely to die shortly after childbirth, and Indigenous mothers' infants are 1.8

times more likely to die than are White mothers' infants. Figure 1 breaks infant mortality down by maternal age group and single race in a visual manner. All three racial groups studied experience the highest rates of infant mortality in adolescence (<15–19 years). Black adolescents are the highest risk group for infant mortality, and Black mothers maintain the highest rates of infant mortality in all age groups. Indigenous females experience the next highest rates of infant mortality, while White females have the lowest rates.

Table 2. 2017 infant mortality rate per 1000 live births by maternal single race.

Maternal single race	Deaths per 100,000 live births
Black non-Hispanic	10.54
American Indian/Alaska Native non-Hispanic	8.63
White non-Hispanic	4.83

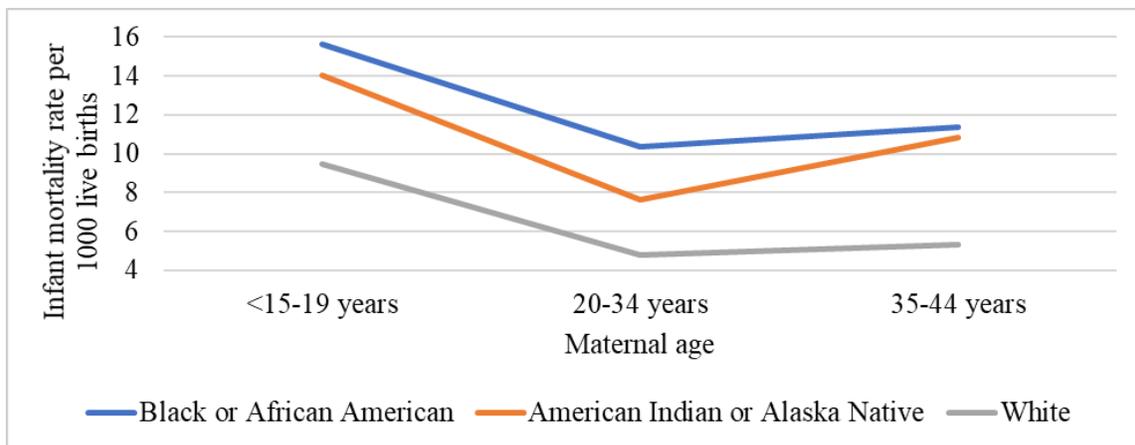


Figure 1. 2017 infant mortality rates per 1000 live births by maternal age and single race.

The CDC datasets used define a full-term pregnancy to be one that lasts at least 39 weeks. Figure 2 shows mean OE gestational age for adolescent and adult pregnancies by racial and age groups. Adolescent pregnancies tend to have shorter gestational length, while females aged 20–34 years have the longest pregnancies. Mean gestational age drops significantly in females aged 35–44 years. Black females experience the shortest pregnancies while White females have the longest gestation, except for a brief cross-over with Indigenous females in adolescence. It is important to note the minor scale increments of this figure. Although the increments are small, a slightly longer or shorter gestation can have significant impacts on fetal development. It is also worth noting that none of the average gestational ages displayed in Table 3 surpass 39 weeks. This does not mean that pregnancies in the U.S. are never full-term, but that the average pregnancy does not last a full 39 weeks.

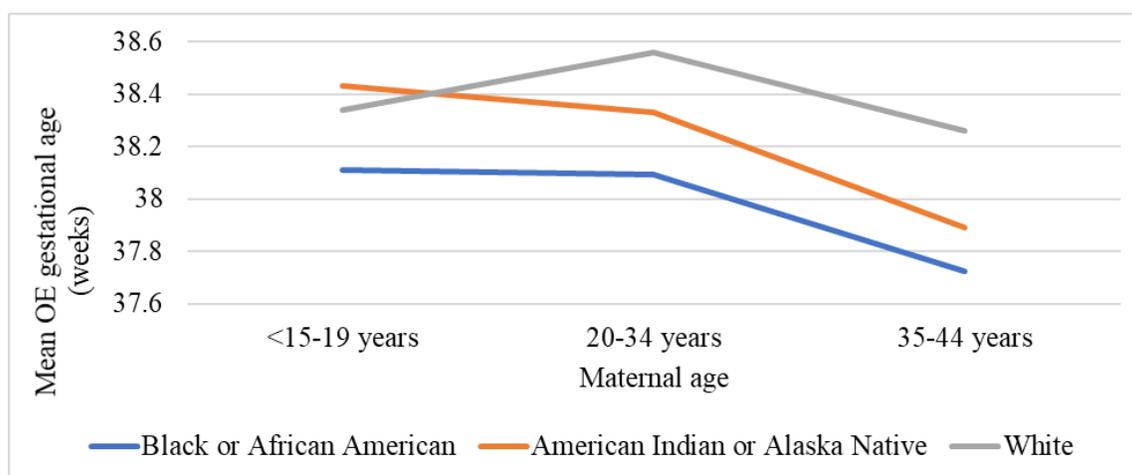


Figure 2. 2018 OE gestational age by maternal age and single race.

Table 3 summarizes mean OE gestational age, mean birth weight, and mean pre-pregnancy BMI in adolescent Black, White, and Indigenous mothers. A BMI 18.5 to 24.9 is considered normal, 25.0 to 29.9 is overweight, and over 30.0 is obese (WHO, 2020d).

Table 3. Summary statistics for mean OE gestational age, mean birth weight and mean pre-pregnancy BMI in Black, White, and Indigenous adolescent mothers, aged <15 years and 15–19 years.

	Maternal single rac					
	American Indian or Alaska Native		Black or African American		White	
Maternal age (years)	< 15	15–19	< 15	15–19	< 15	15–19
Sample size (n)	30	3,299	600	41,524	995	124,443
Mean OE gestational age (weeks)	38.30	38.56	38.02	38.20	38.17	38.51
<i>Standard deviation</i>	2.31	2.07	2.83	2.61	2.51	2.15
Mean birth weight (grams)	3211.67	3254.33	2980.76	2997.12	3090.72	3194.36
<i>Standard deviation</i>	560.83	565.44	602.73	596.02	571.43	557.62
Mean pre-pregnancy BMI	24.79	25.80	24.63	25.72	23.53	25.32
<i>Standard deviation</i>	4.10	5.85	5.19	6.39	4.42	5.96

An ANOVA demonstrates significant differences among adolescents < 15 years between racial groups for mean birth weight ($F = 7.80, p < 0.001, df = 2$), and mean pre-pregnancy BMI ($F = 10.7, p < 0.000, df = 2$), and among adolescents 15–19 years for mean OE gestational age ($F = 295, p = 0.000, df = 2$), mean birth weight ($F = 1941, p < 0.000, df = 2$), and mean pre-pregnancy BMI ($F = 74.0, p < 0.000, df = 2$). ANOVA results demonstrate differences that are not statistically significant among adolescents < 15 years between racial groups for mean OE

gestational age ($F = 0.683, p = 0.505, df = 2$). The post-hoc analyses (Table 4) show that for the < 15 years group, only Black and White adolescents differ for OE gestational age, birth weight, and pre-pregnancy BMI. In the 15–19 years group, gestational age differs between all groups except Indigenous and White adolescents. Birth weight differs between all groups, and for pre-pregnancy weight, differences are found between all groups except Indigenous and Black adolescents.

Table 4. Tukey HSD post-hoc test p-values and 95% confidence intervals (CI) for mean OE gestational age, mean birth weight, and mean pre-pregnancy BMI in adolescents by age and racial group.

		Groups for comparison					
		Native American or Alaska Native vs. Black or African American		Native American or Alaska Native vs. White		Black or African American vs. White	
Maternal age (years)		< 15	15–19	< 15	15–19	< 15	15–19
Mean OE gestational age	p-value	0.837	<0.000	0.962	0.425	0.512	<0.000
	95% CI	– 1.43 0.874	– 0.456 0.264	– 1.27 1.01	– 0.144 0.044	– 0.169 0.469	0.280 0.340
Mean birth weight	p-value	0.087	<0.000	0.502	<0.000	<0.001	<0.000
	95% CI	– 487 24.9	– 281 – 233	– 374 132	– 83.4 – 36.5	39.3 181	190 205
Mean pre-pregnancy BMI	p-value	0.982	0.746	0.319	<0.000	<0.000	<0.000
	95% CI	– 2.23 1.91	– 0.337 0.177	– 3.31 0.788	– 0.731 – 0.229	– 1.67 – 0.529	– 0.481 – 0.320

Black and Indigenous Adolescent Experiences with Pregnancy

Adolescent pregnancy in the U.S. is often associated with high levels of stress around acceptance and disclosure of pregnancy. Emotion and stress can shape labour outcomes and thus put young girls at greater risk of morbidity and caesarean section (Rutherford et al., 2019). Understanding Black and Indigenous adolescents’ experiences with pregnancy and the health care system can contribute to our understanding of increased risk associated with early pregnancies. Literature on adolescent pregnancies in the U.S. has tended to focus on Black females, but recent research shows that Indigenous females have similar experiences with early pregnancy. While most causes of maternal morbidity and mortality in adolescent populations are preventable (Daley et al., 2017), rates of regular checkups and preventative health care visits in adolescents are below 50% in the U.S., with teens from low-income families and those who are uninsured being the least likely to have annual wellness visits or checkups (Irwin et al., 2009, as cited in Daley et al., 2017, p. 71). An ethnographic account of Black teen experiences with health care in Eastern North Carolina emphasized the need to provide “culturally sensitive and competent care” (Dienes et al., 2004, p. 346), especially in cases of teens seeking help with sexual health.

Oxley and Weekes’ (1997) ethnographic accounts of Black adolescent pregnancies in the U.S. reveal difficulties in disclosing pregnancy status to significant people in their lives and experiencing pregnancy in addition to everyday stressors and activities. Confusion, worry, and fear of rejection by family and friends were all associated with the initial acceptance and disclosure of pregnancy (Oxley & Weekes, 1997). Pregnant adolescents reported different experiences of pregnancy: For some, it was viewed as a step toward having a more mature role in life, which brought greater levels of satisfaction; for others, attempting to handle normal adolescent societal roles as well as a new

pregnant and maternal role caused feelings of distress (Oxley & Weekes, 1997). Similarly, an ethnographic account in New Mexico and Arizona (Liu et al., 1994) found that Indigenous adolescents experienced uncertainty and fear of disclosure in pregnancy. Pregnancies were generally unplanned and tended to cause distress for adolescents, as well as high rates of suicidal thoughts (Liu et al., 1994). Many Indigenous adolescents experienced challenges accessing care due to various barriers, including transportation, family problems, missing school, and stress, resulting in inadequate or merely intermediate prenatal care (Liu et al., 1994). Although childbearing among Southwestern American Indigenous adolescents is fairly “common and generally accepted by adult family members,” reports of distress and suicidal thoughts are concerning, especially where suicidal thoughts may lead to dangerous behaviour (Liu et al., 1994, p. 340).

The associated stress of adolescent pregnancy compounds other sociocultural and biological risks, making childbearing a dangerous endeavour for youth in the U.S. Receiving adequate health care and support tends to be difficult for pregnant individuals due to various physical and social barriers. Pregnant adolescents are vulnerable and in need of adequate care, supporting the claim that appropriate health care is required to mitigate risks in pregnancy.

Discussion

Racial and Age-Based Disparities in Health Care and Pregnancy Outcomes

Racial and age-based disparities in health care and pregnancy outcomes are related to reproductive justice: who is socially empowered vs. who is devalued and stigmatized in reproduction (SisterSong, 2020). In the U.S., non-Hispanic White adult women are valued in reproduction while Black and Indigenous women and adolescents are stigmatized (Barcelos, 2014). Social, political, economic, and environmental factors and conditions compound racial disparities in health care (Vilda et al., 2019). For example, maternal mortality and morbidity are elevated among Indigenous females in general, but the greatest health care disparities exist in rural areas (Kozhimannil, 2020).

Obstetric racism may affect any racial group, but Black and Indigenous individuals are particularly targeted in the U.S., while obstetric violence targets adolescents, obese individuals and certain racialized identities (Brunnersum, 2019; Davis, 2018; Jardim & Modena, 2018; Puhl & Heuer, 2010). Although maternal mortality ratios have decreased elsewhere in the world, rates in the U.S. have climbed in recent years, despite it being an affluent nation (CDC, 2019c). Racial disparities in pregnancy outcomes persist even in states with the lowest maternal mortality rates and among individuals with higher levels of education (Peterson et al., 2019). In one study, Black women who had completed college-level education or higher still had a maternal mortality ratio 1.6 times that of White females with an education level below a high school diploma (Peterson et al., 2019). According to McLemore (2019), “factors that typically protect people during pregnancy,” such as power, high levels of education, financial stability, public attention, high-quality health care, and access to services, “are not protective for Black [or Indigenous individuals]” (para. 1).

Adolescent pregnancy is a global issue affecting nearly 13 million girls each year (WHO, 2020c), with the U.S. being one of the seven leading countries in adolescent pregnancy rates (UNFPA, 2015). Education is an age-based disparity affecting adolescents in reproductive health care. While a lower level of education is associated with increased rates of adolescent pregnancy, education specifically related to contraception and reproduction is also very important. For example, in some parts of the U.S., abstinence-only sexual education is taught to adolescents, thereby leaving vulnerable individuals with no knowledge of keeping themselves safe in sex practices (Stanger-Hall & Hall, 2011). Practicing abstinence or proper use of contraceptive methods are the only ways to prevent adolescent pregnancy (UNFPA, 2015). Going forward, I emphasize the need for meeting adolescent

contraceptive needs in the U.S. and providing access to adequate education around safe sex practices and the use of contraception. Adolescent pregnancy is a prevalent issue in the U.S. which requires further attention and resources.

Adverse Outcomes in Adolescent Pregnancy are not Reducible to Pelvic Immaturity Alone

This examination of the literature and data draws five points: (1) severe maternal morbidity and mortality in adolescent pregnancy are largely caused by preventable factors and complications other than obstructed labour; (2) young adolescents (< 15 years) face high risk of adverse outcomes in pregnancy and childbirth, which may be due in part to pelvic immaturity and associated complications; (3) adolescent obesity increases risk associated with pregnancy and childbirth; (4) in the U.S., Black and Indigenous adolescents experience disproportionate rates of pregnancy and obesity and thus are at a higher risk for adverse outcomes in pregnancy; and (5) sociocultural factors contributing to increased risk of adolescent pregnancy and obesity compound biological immaturities and health conditions that place adolescents at greater risk for adverse outcomes in pregnancy and childbirth. While biological immaturities, such as pelvic immaturity, contribute to adverse outcomes, adolescent pregnancy and the associated racial disparities in health care in the U.S. are “complex national [problems]” (CDC, 2019c, para. 3). To improve issues of adolescent pregnancy, obesity and racial disparities in health care and pregnancy outcomes, we must “stop blaming [females] for their own deaths [or adverse outcomes],” and instead acknowledge the underlying contributing factors (McLemore, 2019, para. 2).

In other parts of the world, particularly the Global South, pelvic immaturity may be a more prevalent concern in adolescent pregnancy, whereas obesity is more problematic in the Global North (WHO, 2004). Although a later age at menarche is common in the Global South, if first pregnancy occurs shortly after menarche takes place, girls’ pelvic bones would likely be quite immature, and their risk of cephalopelvic disproportion or obstructed labour increased (WHO, 2004). This would result in young adolescents experiencing high rates of obstructed labour or cephalopelvic disproportion, but this hypothesis cannot be verified as existing reports on labour and childbirth outcomes do not include information on the timing of menarche (WHO, 2004). Collecting data on age at menarche would be helpful in determining gynaecological age (i.e., “the interval between menarche and first pregnancy”) in order to address this question (WHO, 2004, p. 30).

Discrepancies and Opportunities for Further Research

This research has some discrepancies which require addressing. The quantitative data do not represent the ideal study variables (i.e., pelvic size, preterm delivery, obesity, other morbidities or specific pregnancy rates in Black and Indigenous adolescents), nor do the data demonstrate obesity, low birth weight infants or very early (preterm) deliveries. Pelvic size, the primary research question, is not directly addressed in these data. Instead I have used other studies to address the role of pelvic immaturity in adolescent pregnancy. Additionally, the available data do not allow for the isolation of age 16 (i.e., the age of pelvic maturity). The qualitative data are also older than the quantitative data, due to limited availability of ethnographic accounts of Black and Indigenous adolescent pregnancies in the U.S. Lastly, asking why Black and Indigenous youth are at increased risk for both pregnancy and obesity could be addressed in two separate studies. For the level of depth of this research, addressing both questions was feasible. However, future, more specific studies could examine these issues individually. I have used an integrative approach and a variety of data sources to overcome these challenges, but these discrepancies could be addressed and factored into future studies to strengthen this field of research.

Although Canada is often viewed as a prime example of social equality, with high-quality, accessible health care and low levels of health care disparities, this is not the case. Because of its exterior image of multiculturalism, Canada does not record racialized identities in public health as extensively as does the U.S., therefore masking racial disparities in health care (Rodney & Copeland, 2009). In contrast, the U.S. extensively records racialized identities on a national level, thus clearly highlighting health care disparities. Minorities, such as Black and Indigenous Canadians, likely suffer health care disparities comparable to those seen in the U.S., and further disaggregation by racial or ethnic categories is needed to understand racial disparities in Canadian health care (Rodney & Copeland, 2009).

Life history theory explains the “variation in timing of fertility, growth, developmental rates, and death of living organisms” by focusing on how the body maximizes reproductive success through energetic trade-offs from birth to death (Hill, 1993, p. 78). A life history approach would be beneficial in understanding maternal energy investments throughout life and in pregnancy, thereby explaining some health conditions and outcomes in childbirth (Wells, 2017). Studying life stages, such as puberty, can provide a better understanding of maternal health as life history theory involves both extrinsic (environmental) and intrinsic (energetic trade-offs) factors that impact the timing and duration of each stage, which evidently impact health outcomes throughout life (Ellis & Essex, 2007). This approach could explain earlier or later menarche in girls and occurrences of obesity and pregnancy outcomes in adolescents.

Lastly, an initiative that may help decrease rates of adolescent obesity in the U.S. is to start discussions of obesity early in life. The American College of Obstetricians and Gynecologists (2017) suggests that discussions and counselling about obesity begin in adolescence to provide “critical information about active lifestyles and healthy caloric intake” to adolescent patients and their parents (para. 4). This is an important initiative that could positively impact adolescent health care and pregnancy outcomes in the U.S.

Conclusion

Adolescent pregnancy is a complex issue in the U.S. High rates of complications in adolescent pregnancy are in part explained by pelvic capacity in immature individuals, but many other biological and sociocultural factors compound the associated risks of childbirth and pregnancy in adolescence. High rates of adolescent pregnancy and obesity compromise adolescent health and contribute to adverse outcomes in pregnancy and childbirth. Racial disparities in pregnancy outcomes are the root of serious health consequences in childbirth, with Black and Indigenous individuals being two of the most affected racialized groups. Reproductive justice calls for equality among reproducing females to reduce racial disparities in reproductive health care. A biocultural anthropological perspective can help recognize and improve racial disparities in adolescent pregnancy and obesity in the U.S. Hopefully, this perspective has provided a clearer understanding of how racial and health care disparities are formed, as well as the compounding sociocultural and biological risks associated with adolescent pregnancy and obesity. Further research on adolescent pregnancy and obesity in other countries and racialized groups is needed to provide a better understanding of racial disparities in reproductive health care and biocultural factors that contribute to adolescent pregnancy occurrences and adverse outcomes.

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