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Stefanie Kot Date

Adverse Childhood Experiences, Adolescent Unintended Pregnancy, and Perceived Stress Levels in Adolescence

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An abstract of
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Abstract

Adverse Childhood Experiences, Adolescent Unintended Pregnancy, and Perceived Stress Levels in Adolescence
By Stefanie Kot

Background: Stress is a serious public health issue that can result in severe health consequences. Potential precursors to stress include social stressors and stressful life events. One such social stressor, adverse childhood experiences, has primarily been examined as a specific type of abuse or neglect without considering the effect of more than one type, of abuse and neglect intensity, or of the number of types of abuse and neglect experienced. We examined all of these classifications and hypothesized that 1) adverse childhood experiences increase perceived stress levels in adolescence, 2) adverse childhood experiences are associated with adolescent unintended pregnancy, and 3) an adolescent unintended pregnancy increases perceived stress levels in adolescence.

Methods: The parent study consisted of a convenience sample of 199 young women aged 15-24 living in the metro-Atlanta area. Young women were interviewed between February and December 2017 regarding their personal and health history. 146 young women from this study were included in the final analytic sample. We conducted multivariable logistic and linear regression to address the three hypotheses of the study.

Results: In total, ninety-two (63.0%) young women reported having ever been victim to an adverse childhood event and thirty-three (22.6%) women reported a history of adolescent unintended pregnancy. Average perceived stress scores were highest among women victim to an adverse childhood experience (mean 24.7, SD 8.1) and among those with a history of adolescent unintended pregnancy (mean 24.7, SD 9.2). Through multivariable linear regression, we found modest evidence that an increase in the number and severity of adverse childhood experiences was associated with an increase in perceived stress score. We observed a slightly protective, though non-significant, effect or adverse childhood experience on adolescent unintended pregnancy and of adolescent unintended pregnancy on perceived stress level.

Conclusions: Results suggest a dose-response relationship between adverse childhood events and level of perceived stress in adolescence. The high level of educational attainment in our sample, possibly due to oversampling in areas frequented by university and college students, may help explain paradoxical findings between adverse childhood experiences and adolescent unintended pregnancy as well as adolescent unintended pregnancy and perceived stress level.

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INTRODUCTION

Adolescence as a Critical Developmental Period

Public health scholars have proposed the term "emerging adulthood" to refer to individuals in their late teens and early twenties (Arnett, 2007). This is a time when individuals are grappling with their sense of self and has been considered an "age of instability" (Arnett, 2007). This critical period in the life course is of specific interest to public health and medical practitioners. It is important to examine and better understand the health behaviors and outcomes of individuals during this period, as they are passing through an important stage that could have serious implications for their future health (Arnett, 2007). During this stage, identity formation, behaviors, and outlooks are solidified, and individuals are more sensitive to social influences, precipitating future health implications (Somerville, 2013). This critical stage in development is an important period in which to study stress generation, which has both immediate and long-term effects on mental and physical health. Stress is an important mental health topic within public health, disproportionately affecting adolescents and influencing various aspects of their overall health (Cohen, Kamarck & Mermelstein, 1983; USDHHS, 2001).

Stress Definitions and Measurements

Stress is the body's physical, emotional, and biological response to various factors and can be a component in disease causation ("Stress," 2017). Two primary approaches to stress exist, and they are defined in terms of environment threats (stressors) and the body's response (stress): (1) approaches to stress based in physiology and psychobiology in which a stressor leads to a three-stage bodily response (alarm, resistance, and

exhaustion) in which stress levels are determined through biological assessment (Selya, 1976) and (2) approaches to stress based in psychology in which stress is determined through an individual's appraisal of the stressor and the adequacy of coping mechanisms available to deal with the event (Lazarus, 1966; Lazarus & Folkman, 1984).

Stress manifests itself both psychologically and physiologically, and epidemiological researchers have employed different measures to provide information on these manifestations. To assess stress physiologically, researchers measure biomarkers of stress, such as the stress-indicating hormones cortisol and corticotrophin-releasing hormone (CRH). Measurements such as these attempt to assess the body's biological response to stressors. This biological response has primarily been measured in laboratory studies in which participants are exposed to stressors meant to mimic those they may encounter in daily life. Following the exposure to stressors, participants' physiological reaction is measured and assessed (Cohen, Giarnaros & Manuck, 2016).

To measure stress psychologically, researchers employ tested and validated scales, such as the Perceived Stress Scale and The Holmes and Rahe Stress Scale. These scales aim to understand an individual's appraisal of stress, based on the degree of threat of the event(s) as well as the availability of resources needed to cope with the event(s) (Lazarus, 1966; Lazarus & Folkman, 1984).

For the purposes of this study, stress will refer to the second approach to stress, in which the psychological manifestation of stress is defined as "a particular relationship between the person and the environment that is appraised by the person as taxing or exceeding his or her resources and endangering his or her well-being" (Lazarus and Folkman 1984, p.19). This approach posits stress as a three part 'transaction' beginning

with an excess of environmental demands (threat), followed by an individual's appraisal of this threat, and concluding with his or her response to the threat (Lazarus, 1966). Most measurements of psychological stress incorporate at least one of the three steps of the 'transaction': stressor, appraisal, and/or response (Harville et al., 2009).

The Effect of Stress on Mental & Physical Health

There are three central components in an individual's experience of stress: the degree to which someone feels as though their life is (1) unstable, (2) unmanageable, or (3) burdensome (Cohen, Kamarck, & Mermelstein, 1983). Previous research has demonstrated that perceived stress is a serious risk factor for various negative psychological health outcomes including depression and anxiety (Bergdahl & Bergdahl, 2002), physical outcomes such as ulcers and muscle weakness (Benham, 2006), and poorer health-related quality of life (Golden-Kreutz et al., 2005). Mental health issues such as stress may also negatively affect cognitive ability and decision-making, including the ability to assess risks and the costs and/or benefits of decisions (Hall et al., 2014; Yuen & Lee, 2003). Research has found that elevated stress levels increase the risk for other health issues, indicating that stress plays an important role in overall health status (Hall et al., 2014; USDHHS, 2001; Romeo, 2013; Larzelere & Jones, 2008).

Perceived Stress as a Public Health Issue

An individual's perception of stress is the product of previous, daily, and future life stressors that can affect all aspects of an individual's mental, physical, and behavioral health. The effects of this major public health issue are widespread, and stress affects

individuals from all walks of life, although disproportionately affecting adolescents (USDHHS, 2001). Examining perceived stress as an outcome can help us to better understand an individual's ability to cope with life events and opens the door to better understanding his or her overall health (Cohen, Kamarck, & Mermelstein, 1983; USDHHS, 2001). Correlations between perceived stress and a diverse range of physical and psychological health issues demonstrate how mental health affects other areas of health. Our examination of perceived stress is especially important in research of women's mental health. We attempt to identify potential precursors to stress and consider how reproductive and social factors may influence long-term perceived stress levels, possibly altering a woman's overall health status.

The Role of Adverse Childhood Experiences as Social Stressors

Adverse childhood experiences refer to the social context of stress and serve as social exposures that shape the psychological and biological experience of stress. As defined by the Childhood Trauma Questionnaire, adverse childhood experiences refer to five main categories of maltreatment in childhood: physical abuse, sexual abuse, emotional abuse, physical neglect, and emotional neglect (Bernstein et al., 2003). These events have both short- and long-term health consequences for the victims and are strongly correlated with morbidity and mortality in the United States (Felitti et al., 1998; Bernstein et al., 2003). Studies have shown that major life events, such as childhood abuse and/or neglect, have a more serious impact on the health of an individual than daily life stressors, especially when more than one occurs around the same time (Schetter et al., 2013). Few studies have investigated the long-term health effects of more than one type

of adverse childhood experience, focusing primarily on single events, such as sexual abuse. (Felitti et al., 1998; Moeller, Bachmann & Moeller, 1993; Briere & Runtz, 1989). Individuals who have been subjected to one adverse childhood experience are likely to have experienced at least one other event. It is common for multiple types of abuse to occur within the same family, calling for further study into the cumulative effects of multiple and different types of events and their long-term health implications (Felitti et al., 1998).

The influence of adverse childhood experiences on later health is substantial and cumulative, as the number of these events is directly related to the long-term health of the individual (Moeller, Bachmann & Moeller, 1993; Felitti et al., 1998). These events have been linked with psychosocial issues later in life, increasing an individual's stress level and psychological "wear and tear" which can carry on long after an event and serve as a potential precursor to elevated stress levels in adulthood (Hall et al, 2017; Mollborn & Morningstar, 2009; Briere & Runtz, 1990; Chapman et al., 2004).

In addition to affecting an individual's long-term mental health, adverse childhood experiences may lead to other serious health risk factors into adolescence and adulthood (Felitti et al., 1998). A strong relationship has been found between these events and an individual's risk for depression, smoking, alcoholism, suicide attempts, and drug use (Felitti et al., 1998). Adverse childhood experiences have also been linked to risky sexual behaviors. An increase in the number of adverse childhood experiences increases a woman's risk for having more than 50 sexual partners in her lifetime, and increased stress and depression levels may lead to an increased risk for inconsistent use of contraceptive methods (Hall et al., 2013; Briere & Runtz, 1990). Women may use sex

as a coping mechanism in the face of stressors, and research has found that heightened sexual behaviors are among the main outcomes associated with adverse childhood experiences (Felitti et al., 1998). The relationship between adverse childhood experiences and risky sexual behavior could have a serious impact on a woman's risk of unintended pregnancy. It is reasonable to hypothesize that, because adverse childhood experiences may lead to risky sexual behaviors such as inconsistent contraceptive use and a high number of sexual partners, women victim to these events are at an increased risk for having an unintended pregnancy.

The Role Unintended Pregnancy as a Potential Unique Stressor

Unique, stressful life events throughout the life course may contribute to an individual's current perception of stress (McEwen & Stellar, 1993). The effects and number of these events have been found to influence women's health throughout their lives, including a host of serious health risk factors and psychosocial issues such as depression and anxiety (Moeller, Bachmann & Moeller, 1993; Felitti et al., 1998; Bernstein et al., 2003; Briere & Runtz, 1990; Chapman et al., 2004). Unintended pregnancy may serve as one of these potentially unique, stressful life event that influence a woman's mental health and psychological stress level, although it has not been fully conceptualized or studied in that way in prior reproductive health research. Unintended pregnancy refers to when a woman experiences a pregnancy that is either mistimed or unwanted ("Unintended Pregnancy," 2016). Mistimed pregnancies, which occur when a woman wanted to get pregnant but not until some point in the future, account for 27 percent of all pregnancies in the United States ("Unintended Pregnancy," 2016).

Unwanted pregnancies, which occur when a woman did not want to get pregnant, at that time or any time in the future, account for 18 percent of pregnancies in the United States ("Unintended Pregnancy," 2016). The most recent data from 2011 shows that approximately 45 percent of all pregnancies for women of reproductive age (15–44) in the United States were unintended, a decline from 51 percent in 2008 (Finer & Zolna, 2016). While the percentages are still high in southern states such as Georgia (60 percent), the unintended pregnancy rate across the United States overall has been steadily decreasing (Kost, 2015; Finer & Zolna, 2016).

Adolescents (aged 18–24), racial minorities, and economically disadvantaged women experience the highest rates of unintended pregnancy (Hall et al., 2015; Finer & Henshaw, 2006; Mosher, Jones & Abma, 2012; Kost & Henshaw, 2013). Adolescent women experience an unintended pregnancy rate that is almost twice that of women overall (Finer & Zolna, 2016; Finer & Henshaw, 2006). Further subsetting by age, the highest rate of unintended pregnancy is among young women aged 20–24, at 81 per 1,000 pregnancies (Finer & Zolna, 2016). Poverty also serves as a driving factor in a woman's risk of having an unintended pregnancy (Finer & Zolna, 2016). In 2011, women living below the federal poverty level were more than five times as likely (112 in 1,000 pregnancies) as women living 200 percent or more above the poverty level (20 in 1,000 pregnancies) to have an unintended pregnancy (Finer & Zolna, 2016). The rate of unintended pregnancy also varies greatly by race ("Unintended Pregnancy," 2016). In 2011, the rate of unintended pregnancy among non-Hispanic black women was more than double that of non-Hispanic white women, at 79 per 1,000 pregnancies compared to 33 per 1,000 pregnancies (Finer & Zolna, 2016). This vast variation in unintended

pregnancy rate underscores the dramatic impact that age, income, and race have on a woman's risk of unintended pregnancy (Finer & Henshaw, 2006).

Adolescent unintended pregnancy, and its associated health and social consequences, may be felt as a stressful life event, although this consideration has not been extensively investigated. Previous research has identified a strong association between adolescent unintended childbearing and psychosocial stress, suggesting a similarly strong association between adolescent unintended pregnancy (including live birth, stillbirth, miscarriage, and abortion) and psychosocial stress (Mollborn & Morningstar, 2009). Adolescent unintended pregnancies give rise to a host of economic, medical, and social consequences that have serious, long-term, negative effects for not only the young woman but also her family and society at large (Mollborn & Morningstar, 2009). For example, an adolescent unintended pregnancy may result in social stigmatization and disapproval from peers (Wooten, 2006; Hall et al., 2015; Mollborn & Morningstar, 2009). Because they do not expect to become pregnant, women who have unintended pregnancies may be less likely to seek prenatal care or make the behavioral changes necessary when pregnant, such as quitting smoking or improving nutrition (Mosher, Jones & Abma, 2012). These pregnancies adversely affect mother and baby, increasing the risk of preterm birth, antenatal and postpartum depression, low educational attainment, and extensive health care costs, with the effects trickling down to affect the woman's family as well as the overall health system (Mollborn & Morningstar, 2009). Underestimating pregnancy risk is strongly associated with a woman's lack of contraceptive use, calling for further education and dissemination of information

regarding the adverse health and economic effects of unintended pregnancy on mother, baby, and society (Mosher, Jones & Abma, 2012).

Childbearing is a significant event in a woman's life, and it is one that can affect her long-term physical and psychological health. It is difficult to measure the exact rates of unintended pregnancy by state, race/ethnicity, or socioeconomic status, because pregnancy outcomes such as abortion and miscarriage may result in underreporting. Nevertheless, the economic, social, and health implications resulting from unintended pregnancies reveal the critical need to continue attempting to measure and prevent unintended pregnancies and to further understand the driving factors and long-term health effects of these pregnancies (Finer & Henshaw, 2006).

While unintended pregnancies affect the health and economic well-being of women of all ages, an unintended pregnancy during adolescence may lead to additional social consequences for a young woman that may be appraised as stressful. The life course perspective proposed by Elder and Shanahan emphasizes the importance of studying individuals' development and lives by incorporating information relevant to their biographical, historical, ecological, and social contexts (2006). Elder and Shanahan posit that the violation of social norms results in a variety of consequences in the individual's social environment (2006). This suggests that an unintended pregnancy during adolescence may lead to a number of social consequences for young women, including social stigmatization, discrimination, isolation, and disapproval from peers, as well as a lack of support at an institutional level, such as not receiving maternity leave from school (Wooten, 2006; Hall et al., 2015; Mollborn & Morningstar, 2009). Violating social norms and becoming pregnant during adolescence may lead to poorer short- and

long-term mental health for the young woman (Wooten, 2006; Mollborn & Morningstar, 2009).

Adverse Childhood Experiences, Unintended Pregnancy, and Adolescent Stress Perception

In the present study, psychological stress is measured as an individual's perception of stress with particular attention to the nature of the stressor. Adverse childhood experiences are principally investigated as adverse social exposures that shape the physiological and psychological experience of stress. Unintended pregnancy is investigated as a potential severe stressor and adverse exposure, occurring during adolescence. Both experiences occur during pivotal developmental periods of a woman's life and can impact future health outcomes. The influence of these events on perceived stress in adolescence are examined individually and with unintended pregnancy serving as a mediator in the relationship between adverse childhood experiences and adolescent psychological stress levels.

Importance and Implications

Researchers should consider the complexity of a woman's health over her life course and explore the roles that social context and reproductive health play in mental health. The present study seeks to assess how different aspects of a young woman's social context, reproductive, and mental health are intertwined - specifically the impact of adverse childhood experiences and unintended pregnancy on perceived stress levels.

Such relationships likely have implications for health and wellbeing across the life course.

Indeed, there is a need to identify, address, and, if possible, prevent adverse childhood experiences, as they can lead to elevated stress levels and other health issues that continue later in life. The long-term health implications of adverse childhood experiences on health status, disease, and health risk factors call for increased attention and research into these exposures. There is currently a paucity in research on how the cumulative severity and multiple types of adverse childhood experiences affect an individual's perception of stress in adolescence. Both the severity and number of adverse childhood experiences are influential in affecting an individual's long-term health, calling for the need to further investigate how both of these exposures affect adolescents' perception of stress (Moeller, Bachmann & Moeller, 1993; Felitti et al., 1998).

Previous research has primarily focused on stress levels preceding an unintended pregnancy, but it has not thoroughly examined the long-term negative mental health consequences that may be attributed to the experience of an unintended pregnancy during adolescence as a unique, stressful life event (Hall et al., 2014, 2015; Steinberg et al., 2013). Research to date has seldom considered the different dimensions of a woman's life, especially stress, in investigations regarding the consequences of unintended pregnancy (Hall et al., 2017). Examining unintended pregnancies that occur during adolescence and the resulting perceived stress levels could help public health practitioners understand the mental health implications of experiencing an unintended pregnancy during one of the most critical periods of a woman's life.

By better understanding the relationships between adverse childhood experiences, unintended pregnancy, and perceived stress, researchers can better understand how a woman's health is a product of her lived experience, affected and mediated by events occurring throughout her lifetime. Previous research has established the need to address the long-term health effects of adverse childhood experiences and unintended pregnancy and their possible effect on future negative health outcomes. This study is the first to look at adverse childhood experiences, unintended pregnancy, and resulting psychological stress levels as parts of a woman's multifaceted lived experience and as significant contributors to her overall health.

Specific aims of the study were to determine: 1) how different types of adverse childhood experiences and the intensity and number of these experiences influence an adolescent's current perception of stress, 2) how these classifications of adverse childhood experiences relate to a woman's likelihood of having an adolescent unintended pregnancy, and 3) how a history of adolescent unintended pregnancy affects an adolescent's perception of stress. It is important to examine these relationships, as social context and reproductive health may relate to each other in a way that mediates the relationship with perceived stress later in life.

BACKGROUND

Adolescence is a formative period in the life course and a time when identity, behaviors, and outlooks are solidified. It is important to examine and better understand the health behaviors and outcomes of individuals during this period as these behaviors and outcomes could have serious future health implications (Arnett, 2007). Adolescents are disproportionately affected by elevated stress levels, influencing their overall mental, physical, and emotional health (Cohen, Kamarck & Mermelstein, 1983; USDHHS, 2001). Stressful life events and social context throughout the life course contribute to an individual's experience and perception of stress (McEwen & Stellar, 1993). Adverse childhood experiences contribute to an individual's social context of stress, and unintended pregnancy may serve as a type of unique, stressful life event. These experiences and events are possible precursors to elevated perceived stress levels in adolescence.

Stress is the body's physical, emotional, and biological response to various life events and factors ("Stress", 2017). There are two primary approaches to measuring and conceptualizing stress in epidemiology, (1) approaches to stress based in physiology and psychobiology measured through biological testing (Selya, 1976) and (2) approaches to stress based in psychology measured through tested and validated scales (Lazarus, 1966; Lazarus & Folkman, 1984). The current study uses the second approach to define and measure perceived stress. For the purposes of this study, stress is defined as an individual's appraisal of an environmental threat (stressor) and the adequacy of available coping mechanisms to deal with that threat.

Elevated levels of perceived stress are indicators for other health issues, such as depression and anxiety (Cohen, Kamarck, & Mermelstein, 1983; Larzelere & Jones, 2008). Correlations between stress and other health issues reveal how mental health affects overall health status and how a measure of perceived stress may indicate mental, physical, or behavioral health issues. Studying stress as an outcome can lead to a better understanding of how various life events and factors affect a woman's mental and overall health status (Cohen, Kamarck, & Mermelstein, 1983; USDHHS, 2001). Studies have shown that major life events have a more serious impact on the health of an individual than daily life stressors, especially when more than one occurs around the same time (Schetter et al., 2013).

Adverse childhood experiences are part of the social context of stress. These experiences serve as adverse social exposures that shape the psychological and biological experiences of stress. Adverse exposures may serve as substantial stressors affecting long-term health outcomes (Felitti et al., 1998). Adverse childhood experiences include instances of childhood abuse and neglect, encompassing physical, emotional and sexual abuse as well as physical and emotional neglect. These experiences result in both short- and long-term negative health outcomes for victims, carrying into adolescence and adulthood, and can lead to serious health risk factors and psychosocial issues (Felitti et al., 1998; Bernstein et al., 2003; Briere & Runtz, 1990; Chapman et al., 2004). The number of adverse childhood experiences may be directly related to the long-term health of the individual, though few studies have looked at the long-term negative health effects of more than one type of adverse childhood experience (Felitti et al., 1998; Moeller & Bachmann, 1993; Briere & Runtz, 1989). These experiences have been linked to

psychosocial issues later in life and increase an individual's psychological stress level. This elevated stress level can carry on long after an event and serve a precursor to elevated perceived stress levels in adolescence and adulthood (Hall, et al, 2017; Mollborn & Morningstar, 2009; Briere & Runtz, 1990; Chapman et al., 2004).

Experiencing an unintended pregnancy during adolescence may serve as a type of significant life event which could lead to long-term mental health consequences for young women, though the consideration of this experience as a unique, stressful life event has not been thoroughly investigated. Age, race, and socioeconomic status play central roles in a woman's risk of experiencing an unintended pregnancy (Hall et al., 2015; Finer & Henshaw, 2006; Mosher, Jones & Abma, 2012; Kost & Henshaw, 2013). In 2011, 45 percent of all pregnancies among women of reproductive age (15–44) in the US were unintended, while the rate for adolescents (aged 18–24) was almost double that of women overall (Finer & Zolna, 2016; Finer & Henshaw, 2006). Unintended pregnancies have been associated with an increased risk of preterm birth, antenatal and postpartum depression, low educational attainment, and considerable healthcare costs (Mollborn & Morningstar, 2009). Adolescence is a critical developmental period and experiencing an unintended pregnancy during this stage may lead to additional negative consequences, such as social stigmatization, discrimination, and lack of support at a societal and institutional level (Wooten, 2006; Hall et al., 2015; Mollborn & Morningstar, 2009). Adolescent unintended pregnancy, and its associated health and social consequences, may be experienced as a stressful life event and lead to elevated perceived stress levels.

Adverse childhood experiences, a component of the social context of stress, and adolescent unintended pregnancy, a unique, stressful life event, may both significantly affect an individual's long-term mental health. Adverse childhood experiences serve as potential precursors to unintended pregnancy and have been linked to risky sexual behaviors in adolescence and adulthood (Briere & Runtz, 1990). Previous research has called for investigation into the multidimensionality of women's health, including her reproductive, mental, and physical health, specifically during adolescence (Hall et al., 2017). The present study seeks to address this gap in the literature by investigating how adverse childhood experiences, through significantly contributing the social context of stress, and unintended pregnancy, a major stressful life event, affect perceived stress levels in adolescence. This study considers the complexity of a woman's life and the influence that stressful life events have on her health from childhood to adolescence. This consideration can help us to better understand how the social context of stress and stressful life events contribute to a woman's perception of stress in adolescence.

METHODS

Study Sample and Design

The present study drew upon baseline data from an ongoing NIH-funded longitudinal study examining how mental health factors impact other health aspects of young women, including their reproductive health. Specifically, the parent study examines how stress and its interactive biological and social processes shape women's risk of unintended pregnancy during adolescence and adulthood. Participants were recruited through study flyers placed in public locations throughout Atlanta, as well as through active recruitment at community sites and events. Many of the public locations included areas surrounding local colleges and universities. Participants were recruited from February 2017-December 2017, with baseline interviews occurring at the same time. Approximately 200 young women were recruited and enrolled.

The sample includes English-speaking young women (aged 15-24) currently residing in metro Atlanta (within a 20-mile radius of Atlanta, GA). Women traveled to the Rollins School of Public Health to complete an in-depth, interviewer-administered psychosocial survey and biological data collection session. Written, informed consent was gained from every participant at the beginning of the study. A parent or guardian gave consent if the participant was under the age of 18. Participants were paid $50 for completing the baseline survey. Emory Institutional Review Board approved this study. The present study is completed by conducting a secondary analysis of baseline data from this parent study.

Measures

Adverse childhood experiences

A validated, shortened form of the Childhood Trauma Questionnaire (CTQ-SF) was used to assess adverse childhood experiences (ACEs). The CTQ-SF is comprised of 28 questions, 25 clinical and 3 validity items. The questionnaire uses five categories to evaluate maltreatment during childhood- physical, sexual, and emotional abuse and physical and emotional neglect. Physical abuse is defined as "bodily assaults on a child by an adult or older person that posed a risk of or resulted in injury." Sexual abuse is defined as "sexual contact or conduct between a child and an adult or older person." Emotional abuse is defined as "verbal assaults on a child's sense of worth or well-being or any humiliating or demeaning behavior directed toward a child by an adult or older person." Physical neglect is defined as "the failure of caretakers to provide for a child's basic physical needs, including food, shelter, clothing, safety, and health care." Emotional neglect is defined as "the failure of caretakers to meet children's basic emotional and psychological needs, including love, belonging, nurturance, and support." The CTQ-SF uses five items to assess each of the five categories, ensuring reliability and adequate coverage of content (Bernstein et al., 2003).

The CTQ-SF asks about events that may have occurred during childhood and participants rate the events on a 5-point Likert Scale ranging from 1("Never True") to 5 ("Very Often True"). Items were scored 1-5 and summed to attain a cumulative score for each of the 5 subscales of abuse or neglect. Positive items were reverse coded. Subscales scores ranged from 5 (no history of abuse or neglect) to 25 (extreme history of abuse or neglect).

Adverse childhood experiences were operationalized for analysis in four distinct ways, consistent with the literature and further explained below (Bernstein & Fink, 1998; Scher et al., 2001): 1. Dichotomous classification of adverse childhood experience indicating presence or absence of any event; 2. Dichotomous classification of adverse childhood experience subtype, indicating presence or absence of specific type of maltreatment (physical, emotional, or sexual abuse and physical or emotional neglect); 3. Continuous classification of severity of overall childhood maltreatment calculated by summing scores from the 25 items (analyzed as quintiles); 4. Categorical breakdown of the number of adverse childhood experiences, comparing having experienced one to five events to having experienced none.

We determined specific types of maltreatment through recommended and validated cut-points for each subscale (Berstein & Fink, 1998). Scores above these cut-points indicated occurrence of childhood abuse or neglect for that subscale. The cut-points are as follows: physical abuse (7), emotional abuse (8), sexual abuse (5), physical neglect (7), and emotional neglect (9) (Bernstein & Fink, 1998). Overall, cumulative ACE scores were analyzed as quintiles after determining that the cumulative measure acts non-linearly in our sample. This consideration allowed us to assess the effect of increasing severity of childhood maltreatment while also allowing for the data to act non-linearly. Categorical breakdown of the number of adverse childhood experiences was determined by summing the number of adverse childhood experience subtypes a participant reported (as determined by cut-points). Any occurrence of adverse childhood experience (considered dichotomously) was determined by whether a participant reported at least one occurrence of childhood abuse or neglect on one or more of the 5 subscales.

The CTQ-SF has reported good internal consistency and test-retest reliability (Bernstein & Fink, 1998). In this sample, the internal consistency coefficient (standardized Cronbach's alpha) for overall childhood maltreatment was 0.81.

Unintended Pregnancy

Unintended pregnancy was determined by using retrospective measures adapted from the Relationship Dynamics and Social Life Study. Participants were asked questions to determine whether pregnancy was mistimed and/or unwanted to determine pregnancy intentions. Participants who responded affirmatively to "Have you ever become pregnant when you did not want to be pregnant" were considered to have had an unintended pregnancy. Those who reported having ever become pregnant and responded to "Would you say that you became pregnant too soon, at about the right time, or later than you wanted" with "too soon" or "later" with regards to any previous pregnancy were also considered to have experienced an unintended pregnancy. Unintended pregnancy was defined as having ever experienced an unplanned or mistimed birth, resulting in a live birth, abortion, miscarriage, or stillbirth, and was coded as 0 for never having experienced an unintended pregnancy or 1 for having experienced an unintended pregnancy.

Psychosocial Stress

Cohen's Perceived Stress Scale (PSS) was employed to assess psychosocial stress levels among the young women. The PSS is a reliable and validated 14-item Likert Scale, in which situations in one's own life are appraised for stress, with higher score indicating

higher levels of stress (Cohen, Kamarck, & Mermelstein, 1983). Questions are asked regarding an individual's experiences with stress over the past month. The PSS has also been correlated with depressive and physical symptoms, use of health services, and social anxiety. The PSS incorporates three central components in an individual's experience of stress- the degree to which someone feels as though their life is "(1) unpredictable, (2) uncontrollable, or (3) overloading." These three issues have repeatedly been found to be central in an individual's experience of stress. Responses range from 0 ("never") to 4 ("very often"). The seven positive items (items 4, 5, 6, 7, 9, 10 and 13) were reverse coded (0=4, 1=3, 2=2, 4=0). Psychosocial stress was ascertained by summing responses to the PSS-14 (with positive items reverse coded) for all 14 items and was analyzed as a continuous variable. Scores could range from 0-56 with higher scores indicated greater stress levels. The PSS-14 has demonstrated good internal consistency and test-retest reliability Cohen, Kamarck, & Mermelstein, 1983). In this sample, the standardized Cronbach's alpha for perceived stress was 0.85.

Background Characteristics

Additional covariates assessed and considered include age, race/ethnicity, socioeconomic status, level of education completed, religious service attendance, and contraceptive behavior. Age was considered on a continuous scale, with ages ranging from 15–24. Race/ethnicity was divided into non-Hispanic White, non-Hispanic Black, Hispanic, and other. Socioeconomic status was assessed using four categories, based on the parental income of the participants (<$15,000; $15,000-44,999; $45,000-74,999; >= $75,000). Years of education completed was considered as a continuous variable, ranging

from having completed 8th grade or less (8 years) to having completed beyond a college degree (17 years). Religion was considered dichotomously by looking at the frequency of attendance at religious services, either less than weekly or weekly or more. Contraceptive behavior was considered as a dichotomous variable (yes/no) in response to the question "Have you ever used anything that can help people avoid becoming pregnant."

Data Analysis

This study examined how important contributors to the social context of stress may serve as a precursor to a reproductive event and how these contributors, along with unique, stressful life events, may influence perceived stress in a sample of adolescent women. Specific aims of the study were to examine 1) whether the specific types of adverse childhood experiences and the intensity and number of these experiences overall influence an adolescent's current perceived stress level, 2) whether these classifications of adverse childhood experiences relate to a woman's likelihood of having an adolescent unintended pregnancy, and 3) whether a history of adolescent unintended pregnancy affects the adolescent's perceived stress level (Figure 1). After excluding women without a history of vaginal sexual intercourse, 146 women were eligible for analysis. The amount of missing data for the Perceived Stress Scale and Childhood Trauma Questionnaire were minimal, totaling 1.37% (2) for the PSS-14 and 4.79% (7) for the CTQ-SF. Data analysis techniques included running bivariate and multivariable models. Frequencies and descriptive statistics were determined to summarize the sample. Correlation analyses tested bivariate relationships and were used to determine which variables to include in multivariable regression models. Multivariable regression models

were used to test for significant predictors of perceived stress and were adjusted accordingly to test the primary study aims.

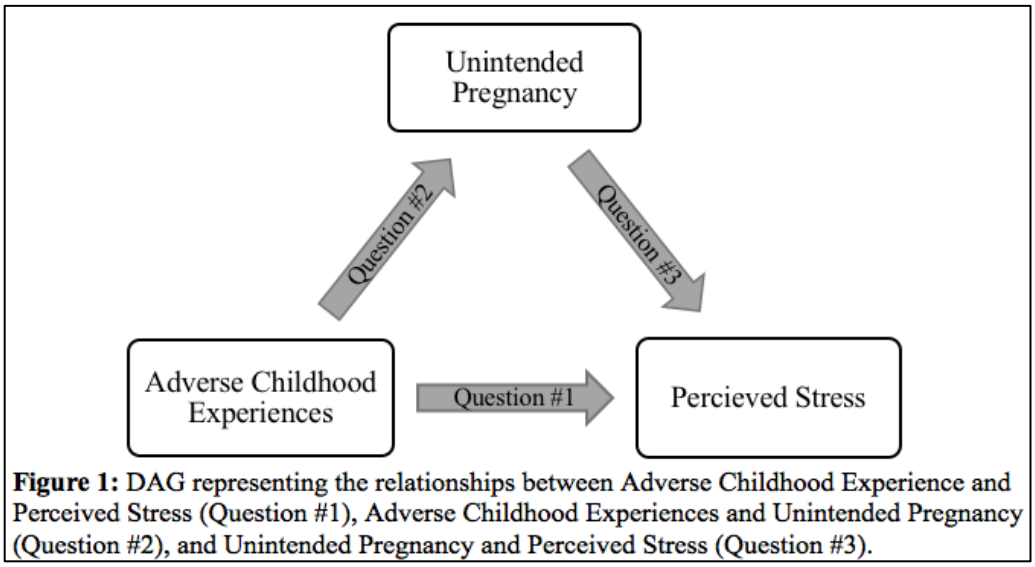

Figure 1: DAG representing the relationships between Adverse Childhood Experience and Perceived Stress (Question #1), Adverse Childhood Experiences and Unintended Pregnancy (Question #2), and Unintended Pregnancy and Perceived Stress (Question #3).

Descriptive Statistics

Descriptive statistics were employed to better describe and understand the sample. We described young women's history of unintended pregnancy overall and by sociodemographic characteristics using frequencies with percentages (%) or ranges with means and standard deviations (SD). We then conducted chi-square and t-tests to test for significant relationships between history unintended pregnancy and ACE (occurrence-yes/no and quintiles) and the various sociodemographic characteristics.

We described the dichotomous consideration of ACE overall and by sociodemographic characteristics in the same manner. We also examined ACEs subset by subtype presence (determined by cut-point), overall cumulative intensity score (quintiles), and number of unique events experienced using mean, standard deviation (SD), and frequencies with percentages (%). Chi-square and t-tests were conducted to test

for significant relationships between these classifications of ACEs and history of unintended pregnancy and perceived stress score.

We described PSS scores using frequency, mean, standard deviation, and range for all participants. These descriptive statistics were calculated for the sample as a whole, stratified on history of unintended pregnancy and ACE (occurrence-yes/no and quintiles), and for sociodemographic characteristics. T-tests and one-way analysis of variance (ANOVA) were calculated to test for significant relationships between perceived stress and ACEs (occurrence-yes/no and quintiles), history of unintended pregnancy, and covariates.

Bivariate Analysis

After estimating associations with descriptive statistics, we fit models for bivariate analyses to determine crude associations between ACEs, unintended pregnancy, perceived stress, and the above listed covariates. We used linear regression when perceived stress was the desired outcome, calculating beta-coefficients, standard error, and 95% confidence intervals for history of unintended pregnancy and ACEs (occurrence-yes/no, quintiles, number of events, and five subtypes). We used logistic regression when unintended pregnancy was the desired outcome, calculating odds ratios and 95% confidence intervals for ACEs (dichotomous-yes/no, quintiles, number of events, and five subtypes). Analyses of ACEs as quintiles used quintile one as the comparison group, and analyses of ACEs as number of events used having reported zero events as the comparison group.

Multivariable Analysis

Next, we conducted a confounding assessment using multivariable modeling to determine which covariates were significant predictors to be controlled for in adjusted analyses. The following list of potential confounders were determined a priori based on the literature: age, race/ethnicity, socioeconomic status, level of education completed, religious service attendance, and contraceptive behavior. We considered models with all covariates included, included individually, and each possible combination when considered together. Individual covariates or combinations of covariates that contributed to a change of more than 10% from the measure of affect from the full model were included as significant confounders in the models.

Once significant confounders were determined, we conducted the final adjusted analyses through linear and logistic regression using multivariable models. The effect of adverse childhood events on current levels of perceived stress was assessed by considering ACE quintiles, subtype cut-points (dichotomous yes/no), and number of events (0-5) using linear regression and controlling for significant sociodemographic characteristics in each of the models. All subtypes were included in the model when ACEs were considered as quintiles and number of events. Subtypes were included in the model individually to assess the relationship of a specific type of abuse or neglect with perceived stress. The relationship between ACEs and unintended pregnancy was assessed by operationalizing ACEs in the same ways (occurrence yes/no, quintiles, individual subtypes, and number of events), analyzing the relationship through logistic regression and controlling for appropriate covariates. Linear regression was performed to assess the

effect of unintended pregnancy on perceived stress, considering only significant confounders in the model.

RESULTS

Participant Descriptive Statistics

The sample includes English-speaking young women (aged 15-24) currently residing in Atlanta. The parent study excluded women who were currently pregnant, those with primary amenorrhea, and those with a history of ovarian disease or reproductive cancers (n=199). Fifty-three women were excluded from the present study for not meeting the inclusion criteria of reporting a history of vaginal sexual intercourse. As a result, 146 young women were included in the final analytic sample.

Young women in this analysis mainly identified as non-Hispanic black (41.4%), went to religious services less than weekly (84.9%), reported having used contraception (93.0%), and reported having parents who earned greater than or equal to $75,000 (38.4%). On average, the participants completed 14 years of education (SD 2.1) and were 21 years old (SD 2.4). It is important to note that this high level of educational attainment may have been due to selection bias, resulting in possible selection bias and an overrepresentation of educational resilience among the young women sampled.

In total, 92 (63.0%) young women reported having ever been victim to an adverse childhood experience. In this sample, 32 (21.9%) women reported having experienced childhood physical abuse, 59 (40.4%) emotional abuse, 38 (26.0%) sexual abuse, 33 (22.6%) physical neglect, and 52 (35.6%) emotional neglect. The majority of young women reported having experienced at least one unique adverse childhood experiences (60.9%), with 50 (34.3%) reporting no events and 7 (4.8%) reporting all 5. The overall intensity score of adverse childhood experiences ranged from 25-100 with a mean of 38.2

and standard deviation of 14.0. The five ranges for quintiles scores were less than 26 (20.1%), 27-31 (22.3%), 32-37 (18.7%), 38-48 (20.9%), and greater than 49 (18.0%).

In total, 33 (22.6%) women reported a history of unintended pregnancy, compared with 113 (77.4%) women who reported no history of unintended pregnancy or had never been pregnant. Extended descriptive statistics can be found in Table 1.

Perceived stress scores for the entire sample ranged from 4-45 (mean 24.1, SD 7.8). Perceived stress scores were highest among women who had been victim to an adverse childhood experience (mean 24.7, SD 8.1) and among those who had a history of unintended pregnancy (mean 24.7, SD 9.2). Further summary statistics by perceived stress score are outlined in Table 2.

Covariates

Age, race/ethnicity, parental income, religious service attendance, years of education completed, and contraceptive use were considered as potential covariates in the multivariable models for the associations between adverse childhood experiences, unintended pregnancy, and perceived stress. We used chi-square tests, t-tests, and analysis of variance (ANOVA) to test all covariates for significant associations across levels of ACEs, unintended pregnancy, and perceived stress. At an alpha level of 0.10, these tests revealed evidence of a significant relationship between ACEs, unintended pregnancy, and/or perceived stress and age, race/ethnicity, years of education completed, parental income, and contraceptive use (Table 1). Parental income, race/ethnicity, and religious service attendance were included in unadjusted models for consideration as confounders in the relationship between ACEs and perceived stress and for ACEs and

unintended pregnancy. Parental income, race/ethnicity, religious service attendance, years of education completed, age, and contraceptive use were included in the unadjusted models for consideration as confounders in the relationship between history of unintended pregnancy and perceived stress.

Multicollinearity assessments were conducted for each model of ACEs and perceived stress, for ACEs and unintended pregnancy, and for unintended pregnancy and perceived stress. The model of unintended pregnancy and perceived stress had collinearity between age and years of education completed, resulting in age being dropped from the full model.

Models Considered

We fit models to evaluate the effect of adverse childhood experiences on perceived stress and evaluated two separate paths to consider unintended pregnancy as a potential mediator, as outlined in the DAG in Figure 1. There was no significant total overall association between adverse childhood experiences and perceived stress (question 1) or significant associations among the two legs of the mediation triangle examining the relationship between adverse childhood experiences and adolescent unintended pregnancy and between adolescent unintended pregnancy and perceived stress (questions 2 and 3), so a formal causal mediation analysis was not warranted.

We assessed the relationships between adverse childhood experiences and perceived stress and adverse childhood experiences and adolescent unintended pregnancy by operationalizing ACEs for analysis in four distinct ways: 1) experience of ACE, yes/no, 2) ACE severity quintile score, 3) number of ACEs (0-5), and 4) ACE subtype

(physical, emotional and sexual abuse and physical and emotional neglect). Adolescent unintended pregnancy was considered as a binary yes/no variable and perceived stress score was considered continuously. Specific findings of these relationships are outlined below.

Question 1: Adverse Childhood Experiences and Perceived Stress

First, unadjusted, bivariate analysis of ACE and perceived stress found that, compared to having experienced no ACEs, young women with at least one ACE experienced an increase in perceived stress score, with wide confidence intervals (β 1.55, 95% CI -1.08-4.17). Adjusted analysis controlled for race/ethnicity and parental income, and again found that experience of at least one ACE was associated with an imprecisely estimated increase in perceived stress (β 1.34, 95% CI -1.34-4.03).

Second, we fit models to estimate unadjusted, bivariate relationships between ACE severity quintile score and perceived stress. Findings revealed that, when compared with the lowest quintile, an increase in ACE quintile score was associated with an increase in perceived stress, though this result was only found to be significant at the fourth quintile (β 3.88, 95% CI 0.12-7.64). The final reduced model adjusted for race/ethnicity and parental income, and again found that, when compared with the lowest quintile, an increase in ACE quintile score was associated with an increase in perceived stress, with significant findings only at quintile 4 (β 3.94, 95% CI 0.09-7.79).

Third, unadjusted, bivariate analysis of the number of ACEs reported and perceived stress found that an increase in the number of ACEs was associated with an increase in perceived stress. Beta-coefficients ranged from 0.7 to 3.37 with very large

confidence intervals that crossed the null value of zero. After controlling for race/ethnicity and income, these coefficients ranged from -0.26-2.50, still with very large confidence intervals crossing the null value. Adjusted findings are further described in Table 3.

Fourth, we estimated associations of unadjusted, bivariate models of having experienced of specific ACE subtype, compared with not having experienced that subtype, and perceived stress. Findings revealed that all subtypes were associated with an increase in perceived stress score except for sexual abuse. Compared with no experience of sexual abuse, having experienced sexual abuse was associated with a decrease in perceived stress (β -0.05, 95% CI -2.94-2.84). All findings had very large confidence intervals and were non-significant except for emotional neglect (β 2.84, 95% CI 0.22-5.47). All subtype models were adjusted for race/ethnicity and parental income. The model of physical abuse also adjusted for religious service attendance. All adjusted results were found to be non-significant with very large confidence intervals. Again, experience of the specific subtype, compared with not having experienced that subtype, was consistently associated with an increase in perceived stress, with the exception of sexual abuse (β -0.96, 95% CI -4.01-2.09). Full analysis findings of the adjusted relationship between adverse childhood experience subtype and adolescent's current level of perceived stress are presented in Table 4.

Question 2: Adverse Childhood Experiences and Adolescent Unintended Pregnancy

First, unadjusted, bivariate analysis of the relationship between ACE and history of unintended pregnancy found that, compared with having experienced no ACEs, young

women with at least one ACE experienced no increased likelihood of unintended pregnancy (OR 1.04, 95% CI 0.46-2.32). The final adjusted model with race/ethnicity and parental income included as confounders again found a non-significant and likely null relationship (aOR 0.72, 95% CI 0.29-1.81).

Second, unadjusted, bivariate analysis of the relationship between ACE severity and unintended pregnancy found primarily non-significant results. Compared to the lowest quintile of ACEs, all quintiles were associated with lower odds of a history of unintended pregnancy, with quintile 3 returning the only statistically significant result (OR 0.13, 95% CI 0.03-0.66). The final, adjusted model including race/ethnicity and parental income as potential confounders and found similar results (Table 5). We notice a modest decrease in likelihood of unintended pregnancy with increasing ACE exposure. These confidence intervals are fairly imprecise and largely non-significant except for the third quintile, which had greatest magnitude and most precision (aOR 0.10, 95% CI 0.02-0.58). This suggests ACEs are associated with lower odds of unintended pregnancy when comparing quintiles 2-5 to quintile 1.

Third, unadjusted, bivariate analysis of the relationship between the number of ACEs and history of unintended pregnancy found all non-significant results with fairly large confidence intervals. Compared to having reported no ACEs, having reported one ACE was not associated with unintended pregnancy, two or three was associated with lower likelihood for unintended pregnancy, and four or five was associated with a higher likelihood of unintended pregnancy. After controlling for race/ethnicity and parental income, having reported 1-5 ACEs compared with having reported none were all

associated with a lower likelihood of unintended pregnancy, though all associations were non-significant with wide confidence intervals.

Fourth, unadjusted bivariate analysis of the relationship between specific ACE subtypes and unintended pregnancy found all non-significant associations (Table 6). Having experienced emotional abuse, physical abuse, and/or emotional neglect, compared with not having experienced those subtypes of abuse, were associated with a lower likelihood of unintended pregnancy. Having experienced physical abuse and/or sexual abuse, compared with not having experienced those maltreatments, were associated with a higher likelihood of unintended pregnancy. The final, adjusted analyses included race/ethnicity and parental income in the model and again found the same effects. Experience of emotional abuse, physical abuse, and/or emotional neglect was associated with a lower likelihood of unintended pregnancy. Experience of physical abuse and/or sexual abuse, were associated with a lower likelihood of unintended pregnancy. All findings were non-significant.

Question 3: Adolescent Unintended Pregnancy and Perceived Stress

All analyses for the relationship between adolescent unintended pregnancy and perceived stress were non-significant with very large confidence intervals (Table 7). Unadjusted, bivariate analysis of the relationship between unintended pregnancy and perceived stress found that a history of unintended pregnancy, compared with no history of unintended pregnancy, was associated with an increase in perceived stress (β 0.83, 95% CI -2.19-3.84). The final model controlled for race/ethnicity, parental income,

contraceptive use, and years of education, finding unintended pregnancy to now be associated with a decrease in perceived stress (β -0.31, 95% CI -3.49-2.87).

DISCUSSION

The purpose of our analysis was to determine whether the number and/or severity of adverse childhood experiences are associated with an increase in perceived stress in adolescence and whether this relationship is influenced by a history of unintended pregnancy. While the vast majority of our findings were non-significant, overall, we did find that an increase in the number and severity of adverse childhood experiences are associated with a modest increase in perceived stress in adolescence, though this relationship does not appear to be influenced by an adolescent unintended pregnancy.

Results were largely non-significant at an alpha level of 0.05, possibly due to the small sample size of our sub-study and therefore small sample sizes when subset by unintended pregnancy and different classifications of adverse childhood experiences. Given these small sample sizes, it is important to consider other characteristics of the data that could reveal information about the relationships. There are a few interesting results to note when looking at the magnitude and precision of the measures instead of solely the significance, which largely depends on sample size.

We hypothesized that the various subtypes and an increase in the number and severity of adverse childhood experiences would be correlated with an increase in perceived stress. The majority of classifications of adverse childhood experiences were consistent, in that an increase in number and severity and history of subtype indicated an increased risk of perceived stress in adolescence, but the large confidence intervals and relatively small magnitude of the measures of effect make these results largely inconclusive. However, there may be an interesting effect when examining adverse childhood experiences as quintiles. Perceived stress score increased with increasing

quintiles of adverse childhood experience, although only the fourth quintile was statistically significant. A smaller magnitude and non-significant association in the fifth quintile might represent random variation, or it might suggest a threshold effect beyond which higher adversity does not further increase stress.

We hypothesized that adverse childhood experience subtypes and an increase in number and severity of adverse childhood experiences would also be correlated with an increased likelihood of unintended pregnancy. Results suggested relationships that were contradictory to our hypothesis, with the exception of sexual abuse and physical neglect. These results were largely non-significant, though the magnitude of the measures and precision of the confidence intervals are of interest. While counterintuitive, our results may be attributed to a number of factors. First, the small sample size contributed to reduced statistical power of our model. Second, these findings are consistent with a recent study concluding that adverse pregnancy outcomes may influence maternal self-report of childhood maltreatment history (Cammack et al., 2018). Retrospective reports occurring after an adverse pregnancy outcome may be more vulnerable to bias. Our classification of unintended pregnancy includes stillbirth, miscarriage and abortion, and these adverse pregnancy outcomes may lead to recall bias and differential misclassification of the exposure. Third, this sample included a group of women with an overall average of 14 years of completed education. Recruitment strategy may have produced a selected sample leading to a large number of women with high educational attainment. Many study flyers used for recruitment were placed in public locations close to local colleges and universities, which would be more frequented by women with high level of educational attainment. This over selection of possibly more resilient women

could help explain some of the paradoxical findings relating to adverse childhood events and unintended pregnancy as well as unintended pregnancy and perceived stress.

Strengths

There were a number of strengths of this study, including the use of validated, widely-used, and accepted scales. The CTQ-SF has shown to be a good measure to determine presence and severity of adverse childhood experiences, and the PSS-14 is a widely-used scale to assess perceived stress. Both scales have been shown to have good test-retest reliability. The CTQ-SF and PSS-14 showed good internal consistency in this study, with Cronbach's alphas of 0.81 and 0.85, respectively.

Another strength of the study was the variety of ways we examined adverse childhood experiences. Studies have shown that when multiple major life events, such as childhood abuse and/or neglect, occur around the same time, they have a more serious impact on the health of an individual than daily life stressors (Schetter et al., 2013). Previous research has primarily focused on the impact of one specific type of abuse or neglect, mainly examining sexual abuse, without also considering the number and severity of the events. By examining adverse childhood experiences in multiple ways, we were able to better understand how the number, intensity, and type of experience affects an individual's likelihood of unintended pregnancy and perceived stress in adolescence.

Additionally, our measure of unintended pregnancy included both mistimed and unwanted pregnancies. By assessing both of these elements, we captured a more complete measure of unintended pregnancy in our sample than if considering only mistimed or unwanted pregnancies alone.

Limitations

It is important to note a few limitations. The analysis was done with a fairly small sample size (n=146), limiting the power and generalizability of our results. Our limited sample size meant that the number of individuals in each breakdown of number of adverse childhood experiences and adverse childhood experience subtype was relatively small, limiting our ability to robustly examine the implications of these exposures for unintended pregnancy and perceived stress.

The study relied on retrospective, self-report data, possibly resulting in recall bias. However, the CTQ-SF and PSS-14 are validated scales meant to capture adverse childhood experiences and perceived stress and have shown good test-retest reliability and internal consistency. Our measure of unintended pregnancy was taken from the Relationship Dynamics and Social Life Study, a widely cited study. While the CTQ-SF has shown good reliability and internal consistency, our examination of the effect of adverse childhood experiences on unintended pregnancy may have been affected by differential exposure misclassification. The results from our study were especially susceptible to recall bias as some women were reporting childhood abuse and neglect after an adverse pregnancy outcome. This bias could result in an under-reporting of adverse childhood events and thus a false effect indicating that an increase in severity and/or number of adverse childhood experience decreases a woman's likelihood of unintended pregnancy.

Social desirability bias is a possible issue, as the survey was administered by an interviewer and addressed sensitive topics such as sexual and mental health. In order to

minimize social desirability bias, interviewers were trained in how to administer the survey and the young women's confidentiality was ensured at the beginning and throughout the interview.

Additionally, it is possible that other factors, in addition to adverse childhood experiences and/or unintended pregnancy, contributed to our measure of perceived stress. We were unable to delineate perceived stress from adverse childhood experiences, unintended pregnancy, or stress more generally. It is possible that there were unknown confounders such as individual health problems, social structures, or more recent extreme, stressful life events that contributed to the young women's current perception of stress.

Conclusion

Nonetheless, it is important to note that this work addresses a significant gap in the literature. This study attempts to better understand the multidimensional aspects of women's health by connecting social context, reproductive health, and mental health. To do so, we examined how unique, stressful life experiences in childhood (adverse childhood experiences) and adolescence (unintended pregnancy) affect young women's current perception of stress. Understanding a woman's perception of stress can help to better understand her overall health status as stress perception is correlated with a wide range of health issues (Cohen, Kamarck & Mermelstein, 1983; USDHHS, 2001).

A prospective, longitudinal study with a more robust sample size is necessary to better understand perceived stress in adolescence, capturing adverse childhood experiences and pregnancies at the time they occur and identifying any additional,

significant stressors that may be occurring throughout adolescence. The parent study captured biological data on stress, but samples were not ready for study when this analysis was conducted. Future studies should employ both biological and psychosocial measures to capture stress from a physiological and psychological standpoint. Capturing both physiological and psychological stress would give a more holistic view of how adverse childhood experiences and unintended pregnancy affect stress levels in adolescence.

IMPORTANCE AND IMPLICATIONS

Extended Results and Discussion

Importance of Studying Adolescence

Adolescence is a major transitionary period for women and an important stage at which to study stress perception. The current study contributes to our understanding of adverse childhood experiences and the resulting health consequences during adolescence. Our results suggest that victims of childhood maltreatment feel elevated perceived stress levels in adolescence, and interventions aimed at helping victims cope with their experiences early on may reduce these effects. These findings add to our understanding of contributors to perceived stress during adolescence by focusing on young women during an important period in the life course.

Prevalence of Adverse Childhood Experiences

Adverse childhood experiences in the United States are extremely prevalent, lending even more weight to the importance of preventing these experiences and mitigating their harmful effects on the victims (The ACE Study Survey Data, 2016). A study conducted by the Centers for Disease Control and Prevention and Kaiser Permanente found that nearly two-thirds of their study sample had reported at least one adverse childhood experience, with more than twenty percent of individuals reporting three or more experiences. Our study found a similar prevalence of adverse childhood experiences, with sixty-four percent reporting at least one adverse childhood experience and approximately twenty-five percent reporting three or more experiences. This extremely high prevalence of adverse childhood experiences further indicates the public

health importance of identifying, preventing, and mitigating the effects of these adverse experiences.

Inverse Relationship between Adverse Childhood Experiences and Unintended Pregnancy

Contrary to our predictions, almost all of our considerations of adverse childhood experiences were inversely related to a history of unintended pregnancy. These findings remained after controlling for race/ethnicity and parental income but were consistently associated with non-significant results and small measures of magnitude. This result was not what we predicted and, at first glance, appears to contradict our theory that an increase in the number and severity of adverse childhood experiences is associated with a decreased risk of unintended pregnancy. While falsification of our hypothesis is certainly one explanation, these findings may alternatively be attributed to three different factors: 1) small sample size, 2) differential recall bias, and 3) educational resilience among young women in the sample.

The overall small sample size and therefore small number of unintended pregnancies when subset into different classifications of adverse childhood experiences lead to reduced statistical power in our study. For example, the only significant association found between overall severity of adverse childhood experiences (quintile score) and history of unintended pregnancy was at the third quintile, where only two young women reported an unintended pregnancy. This underscores the effect that small sample size may have had on our results.

Recall bias may also explain the inverse relationship found between adverse childhood experiences and unintended pregnancy. Adverse pregnancy outcomes may influence mood state which in turn influences memory and recall (Buckwalter, Buckwalter, Bluestein, & Stanczyk, 2001). For the purposes of this study, we examined unintended pregnancies based on pregnancy intentions, and our definition included not only women who experienced a live birth, but also those having experienced a miscarriage, stillbirth, and/or abortion. These adverse pregnancy events may be associated with recall bias of adverse childhood experiences, compared with women whose unintended pregnancy ended in a live birth or who did not experience an unintended pregnancy at all. Due to our classification and overall small sample size, we were not able to further examine how adverse pregnancy events may have affected women's recall of adverse childhood experiences. However, it is reasonable to assume that, because these adverse events were included in our measure of unintended pregnancy, recall bias could have led to differential exposure misclassification and affected our results (Cammack et al., 2018).

It is also important to note the demographics of our sample and consider the possibility of educational resilience among the young women. Due to the possible oversampling of women from a university area, the sample was composed of young women with a very high level of educational attainment. At the time of interview, young women in this study had completed an average of 14 years of education, with those reporting a history of unintended pregnancy having completed an average of 13.4 years. Higher rates of school engagement may be associated with increased resilience and help reduce the negative impacts associated with adverse childhood experiences (Bethell et al.,

2014). Therefore, the high level of educational attainment of young women in our study could have resulted in high educational resilience among those sampled.

Resilience refers to the ability of an individual to positively adapt despite substantial adversity or adverse environmental experiences (Smith et al., 2013). Previous studies have shown that some individuals exposed to serious stressors during childhood continue to prosper and succeed despite these events. This success may be due to certain protective factors and mechanisms that mitigate and compensate for the risks resulting from adversity and adverse experiences. One such protective factor is educational attainment (McGloin & Widom, 2001). Traditionally, researchers and clinicians expect poorer health outcomes for individuals exposed to adverse childhood experiences compared with individuals not exposed to those adverse experiences. However, educational resilience may help protect against these poorer health outcomes. This resilience would help explain the protective relationships we see between adverse childhood experiences and history of unintended pregnancy. Additionally, while education might provide a source of resilience, selecting young women who have successfully attained a high level of education might also mean selecting young women who have other unmeasured sources of resilience. This would permit them to attain higher levels of education despite trauma from adverse childhood experiences. Selection bias may have occurred in our study as this unmeasured resilience could have led to educational attainment which in turn increased the likelihood that these young women would be exposed to study fliers.

The possible combination of small sample size, recall bias, and educational resilience may have led to the confusing associations found between adverse childhood experiences

and history of unintended pregnancy. Future research should recruit a larger, more educationally representative sample of young women and evaluate recall of adverse childhood experience(s) before reproductive events occur to avoid recall bias resulting from adverse pregnancy events.

Previous research may help explain why only sexual abuse and physical neglect were associated with an increased risk in history of unintended pregnancy in our sample. The literature indicates that the various subtypes of adverse childhood experiences are each associated with their own specific health consequences, with sexual abuse affecting sexual and reproductive functioning (Lang et al., 2006; Runtz, 2002). Additionally, physical neglect may be more susceptible to differential recall among women experiencing an adverse pregnancy event than the other abuse and neglect subtypes (Cammack et al., 2018). These subtype-specific effects may help explain the positive association found between sexual abuse and physical neglect and history of unintended pregnancy, but not the other subtypes.

Adverse Childhood Experiences and Perceived Stress in Adolescence

The results from this study highlight the important role that adverse childhood experiences play in adolescents' current perception of stress. We found a moderate amount of evidence supporting the hypothesis that an increase in the number and severity of adverse childhood experiences is associated with increased levels of perceived stress in adolescent women. This result has important public health implications, as it indicates not only poorer health outcomes for victims of adverse childhood experiences but also increased healthcare costs for the individual and society. Our results are consistent with

previous studies that have identified perceived stress as a consequence of adverse childhood experiences, with women victim to these experiences being more likely to report greater perceived stress in adolescence (Hager & Runtz, 2012; Bell & Belicki, 1998; Hyman et al., 2007)

Public Health Implications:

Costs to the Individual and Society

The long-term health effects of adverse childhood experiences are important concerns for survivors as well as society. Adverse childhood experiences may make survivors more likely to overuse the healthcare system, leading to higher costs for these individuals as well as the healthcare system as a whole (Walker et al., 1999; Brown, Fang, & Florence, 2011). A recent meta-analysis of peer-reviewed literature on the medical costs of adverse childhood experiences found that these experiences are associated with a significant increase in healthcare costs in both childhood and adulthood when considering mental healthcare and/or multiple provider settings (Brown, Fang, & Florence, 2011). Costs include both direct and indirect medical costs in the form of hospital admissions, medications, and time lost from work. These findings point to interventions being not only cost-effective but also possibly cost saving and demonstrate the importance of developing interventions specifically for young women who were victim to childhood abuse and/or neglect (Walker et al., 1999).

Public Health Surveillance of Adverse Childhood Experiences

The present study adds to the body of evidence supporting a need to accurately report on and study adverse childhood experiences. The extreme prevalence of adverse childhood experiences and their association with other public health issues underscores the importance of building a global surveillance framework of their prevalence and impact. The exact definition of what characterizes an adverse childhood experience varies widely and researchers have not determined one, single definition for global use and surveillance. However, the social and health consequences that result from adverse childhood experiences call for a focus on sound epidemiological methods and reporting to track the global burden of this exposure (Anda et al., 2010). Increased efforts in developing surveillance of adverse childhood experiences would help us to better understand the myriad of health consequences that result as a product of these experiences and better advocate for interventions to reduce the harmful effects.

The Impact of Stress on Health and Health Behavior

Perceived stress can lead to physiological, psychological, and behavioral changes which affect an individual's overall health, especially during critical developmental periods such as adolescence. Previous literature has found associations between perceived stress and negative physical and mental health outcomes as well as negative health behaviors.

On a physical level, elevated stress levels can affect the endocrine, gastrointestinal, immune, cardiovascular, and musculoskeletal system, among others (Larzelere & Jones, 2008; Østerås, Sigmundsson, & Haga, 2015). High perceived stress

levels may elevate glucocorticoid levels in the body which can lead to catabolic effects, such as decreased lean body mass and an increased resistance to insulin (Larzelere & Jones, 2008). Elevated perceived stress can also increase an individual's risk of gastrointestinal issues such as peptic ulcers, irritable bowel syndrome, and exacerbation of ulcerative colitis (Larzelere & Jones, 2008). Stress can also suppress the immune system, putting the individual at a greater risk for developing infections and increasing the severity and/or duration of current infections (Larzelere & Jones, 2008). The cardiovascular system is also affected, as elevated stress levels have been linked to an increased risk of hypertension and cardiovascular disease (Larzelere & Jones, 2008; Kashani, Eliasson, & Vernalis, 2012). Finally, elevated perceived stress levels in adolescence are associated with longer pain duration and increased intensity. Sites affected include the neck and shoulder area, back, extremities, and head (Østerås, Sigmundsson, & Haga, 2015).

High perceived stress levels also put individuals at an increased risk for a variety of mental health issues. Among these issues are clinically diagnosed conditions such as anxiety and depression as well as social issues such as social impairment and decreased interest in activities (Larzelere & Jones, 2008). These issues affect all aspects of an individual's life and can cause lower self-esteem and feelings of control, decreased activity, and increased sleep (Larzelere & Jones, 2008; Kashani, Eliasson, & Vernalis, 2012)

Elevated perceived stress levels also influence an individual’s health behavior. Stress puts individuals at a higher risk for substance abuse, poor eating behaviors, and altered activity levels (Larzelere & Jones, 2008; Kashani, Eliasson, & Vernalis, 2012;

Richardson et al., 2015). Studies have found that an increase in stress level may increase an individual's frequency and quantity of substance abuse and may be a predictor of relapse (Larzelere & Jones, 2008). Stress can also lead to an increase in food intake and increased consumption of poor quality foods, such as those that are high-fat, high-sugar, and high-salt (Larzelere & Jones, 2008; Richardson et al., 2015). Individuals who report high levels of perceived stress are also more likely to engage in risky sexual behaviors and less likely to exercise or adhere to medical regimens (Larzelere & Jones, 2008; Richardson et al., 2015).

High levels of perceived stress are associated with an increased risk for negative health outcomes and behaviors, raising concern regarding the hazardous effects of elevated stress on the body. The associations between elevated levels of perceived stress and morbidity point to the need for public health interventions to identify possible causes of elevated stress levels, such as adverse childhood experiences, and alleviate the negative health consequences.

Future Directions:

Raising Awareness of Adverse Childhood Experiences:

It is important to raise awareness and education regarding the effects and amazingly high prevalence of childhood abuse and neglect and to intervene early to minimize these effects. When confiding their abuse to families and professionals, the majority of women have been met with disbelief (Moeller & Bachmann, 1993). Victims of childhood abuse tend to have fewer close friends and family members with whom they can confide (Moeller & Bachmann, 1993). Raising public awareness may be particularly

effective and beneficial for individuals with a history of adverse childhood experience(s). Raising awareness specifically among primary care providers of the link between adverse childhood experiences and increased levels of stress in adolescence would better sensitize providers to inquire about past histories of maltreatment. Building a trusting relationship with victims of childhood maltreatment would allow these providers to better support the young women and help them receive access to services and interventions to ease their experiences of stress.

Clinical Interventions for Victims of Adverse Childhood Experiences

The effects of adverse childhood experiences are a major concern to primary care providers, and the primary care setting offers a unique opportunity to recognize and address the effects of these experiences early on. Early interventions by practitioners working with survivors of adverse childhood experiences and targeting stress management could conceivably offset perception of stress in adolescence, allowing young women to more effectively manage existing levels of stress. Opportunities for clinical interventions to mitigate long-term elevated stress levels include stress management, stress desensitization, and adaptive coping skills.

Elevated stress levels among women with a history of adverse childhood experiences demonstrates the need for not only early intervention and support for these women in primary care settings but also a coordinated effort across all levels of healthcare. While primary prevention of child abuse and neglect may prove difficult and require larger societal changes, mediating the effects of these events through the integration of our healthcare systems would better address the resulting stress levels.

Primary care providers should engage with healthcare professionals across disciplines such as public health, social work, and emergency medicine in order to better understand and address the various contexts and factors that affect women's health. Researchers, medical practitioners, policy makers, and program planners should focus not only on preventing abuse and neglect but on bettering the health outcomes that arise as a result of these childhood experiences (Felitti et al., 1998).

The present study demonstrated the need to identify, address, and, if possible, prevent adverse childhood experiences, as they can lead to elevated stress levels and other health issues that continue later in life. This research provides background for policy makers, health practitioners, and researchers to examine women's health over the life course, incorporating the social context of stress, stressful life events, and mental health into policy, practice, and research. Women's health is a product of her lived experience, affected and mediated by events occurring throughout her lifetime and addressed only when our healthcare system communicates and integrates to identify health risks as they arise.

Future Research

Previous research has established the need to better study and understand adverse childhood experiences, unintended pregnancy, and perceived stress. This is the first study to look at all three as connected parts of a woman's lived experience and as significant contributors to overall health. Future research should continue working to understand the effect that adverse childhood experiences have on perceived stress, and to examine whether an unintended pregnancy plays a part in mediating an adolescent's current

perception of stress. Recommendations for future studies include recruiting a larger and more educationally diverse sample of young women. An ideal study of these associations would prospectively follow individuals from childhood through adolescence. This would allow researchers to gain information on adverse childhood experiences closer to the time of occurrence, record pregnancy intentions prior to and following an unintended pregnancy, and measure resulting stress levels in adolescence.

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TABLES:

Table 1. Characteristics of a Cohort of Metro Atlanta, Young Women (aged 15-24) by Adverse Childhood Event Experience and Unintended Pregnancy[a,b]

	Eligble Women (n=146)		Adverse Childhood Experience (n=92)		No Adverse Childhood Experience (n=54)				History of Unintended Pregnancy (n=33)				No History of Unintended Pregnancy (n=113)			
	No. or Range	% or Mean with SD	No. or Range	% or Mean with SD	No. or Range	% or Mean with SD	Chi-Square or f-statistic	p-value	No. or Range	% or Mean with SD	Chi-Square or f-statistic	p-value	No. or Range	% or Mean with SD	Chi-Square or f-statistic	p-value
History of Unintended Pregnancy							0.01	0.933								
Yes	33	22.60	21	22.83	12	22.22										
No	113	77.40	71	77.17	42	77.78										
Adverse Childhood Experience															0.01	0.933
Yes	92	63.01							21	63.64	71	62.83				
No[c]	54	36.99							12	36.36	42	37.17				
Adverse Childhood Experience, Severity (by Quintile Range)															9.55	0.049**
≤26	28	20.14							11	34.38	17	15.89				
27-31	31	22.30							6	18.75	25	23.36				
32-37	26	18.71							2	6.25	24	22.43				
38-48	29	20.86							5	15.63	24	22.43				
≥49	25	17.99							8	25.00	17	15.89				
Adverse Childhood Experience, Number of Events															2.77	0.734
0	50	35.97							12	37.50	38	35.51				
1	35	25.18							9	28.13	26	24.30				
2	18	12.95							2	6.25	16	14.95				
3	13	9.35							2	6.25	11	10.28				
4	16	11.51							5	15.63	11	10.28				
5	7	5.04							2	6.25	5	4.67				
Adverse Childhood Experience, Subtype[d]							3.73	0.155							1.30	0.523
Emotional Abuse (C = 8)	59	40.41							11	33.33	48	42.48			0.96	0.328
Physical Abuse (C = 7)	32	21.92							5	15.15	27	23.89			1.19	0.276
Sexual Abuse (C = 5)	38	26.03							13	39.39	25	22.12			3.73	0.054*
Emotional Neglect (C = 9)	52	35.62							11	33.33	41	36.28			0.14	0.705
Physical Neglect (C = 7)	33	22.60							10	30.30	23	20.35			1.68	0.194
Age, years [categorical]							1.76	0.081*							-2.17	0.032**
15-18	20	13.70	16	17.39	4	7.41			3	9.09	17	15.04			7.90	0.048**
19-21	49	33.56	32	34.78	17	31.48			10	30.30	39	34.51				
22-24	77	52.74	44	47.83	33	61.11			20	60.61	57	50.44				
Age, years [continuous]	15-24	M 21.2, SD 2.4	15-24	M 20.9, SD 2.5	16-24	M 21.6, SD 2.0	5.85	0.119	17-24	M 21.9, SD 2.2	15-24	M 20.9, SD 2.4				
Race/ethnicity							9.44	0.051*							15.16	0.004**
Non-Hispanic, White	41	28.08	22	23.91	19	35.19			3	9.09	38	33.63				
Non-Hispanic, Black	60	41.40	41	44.57	19	35.19			18	54.55	42	37.17				
Hispanic	17	11.64	8	8.70	9	16.67			5	15.15	12	10.62				
Other	28	19.18	21	22.83	7	12.96			7	21.21	21	18.58				
Parental Income							0.30	0.586							0.32	0.570
<$15,000	12	8.22	7	7.61	5	9.26			6	18.18	6	5.31				
$15,000-44,999	25	17.12	19	20.65	6	11.11			8	24.24	17	15.04				
$45,000-74,999	27	18.49	20	21.74	7	12.96			8	24.24	19	16.81				
>=$75,000	56	38.36	27	29.35	29	53.70			4	12.12	52	46.02				
Don't Know	25	17.12	18	19.57	7	12.96			7	21.21	18	15.93				
Missing	1	0.68	1	1.09	0	0.00			0	0.00	1	0.88				
Religious Service Attendance							2.71	0.008**							2.09	0.039**
Less than weekly	124	84.93	77	83.70	47	87.04			27	81.82	97	85.84				
Weekly or more	22	15.07	15	16.30	7	12.96			6	18.18	16	14.16				
Years of Education Completed	8-17	M 14.0, SD 2.1	8-17	M 13.7, SD 2.2	11-17	M 14.6, SD 1.8			10-17	M 13.4, SD 1.8	8-17	M 14.2, SD 2.1				

[a]Adverse Childhood Event determined by responses to shortened form of Childhood Trauma Questionnaire (CTQ-SF)
[b]Unintended Pregnancy defined as any unplanned or mistimed birth, resulting in a live birth, abortion, miscarriage, or stillbirth
[c]No Adverse Childhood Event refers to respondents who reported no or low severity of event
[d]Subtype determined by cutoff and compared to having not reported exposure to that subtype
*Significant at an alpha level of 0.10
**Significant at an alpha level of 0.05

Table 2. Summary Statistics of Perceived Stress Score for All Eligible Women[a]

	No.	Mean	SD	Min	Max	[b]t- or F-Statistic	p-value
All	144	24.09	7.80	5	45		
History of Unintended Pregnancy						-0.53	0.595
Yes[d]	33	24.73	9.20	5	45		
No	111	23.90	7.37	8	44		
Adverse Childhood Experience						-1.15	0.253
Yes[c]	91	24.66	8.05	6	45		
No	53	23.11	7.33	5	38		
Adverse Childhood Experience, Severity (by Quintile Range)						0.61	0.656
≤26	28	23.14	7.41	5	38		
27-31	30	24.47	7.29	8	38		
32-37	25	24.80	7.93	11	40		
38-48	29	25.79	7.13	17	44		
≥49	25	25.20	9.00	11	45		
Adverse Childhood Experience, Subtype[d]							
Emotional Abuse (C = 8)	58	24.8	7.5	11	45	-0.73	0.464
Physical Abuse (C = 7)	32	24.6	7.3	11	40	-0.39	0.700
Sexual Abuse (C = 5)	38	24.1	9.3	6	45	0.03	0.973
Emotional Neglect (C = 9)	52	25.9	7.8	11	45	-2.11	0.037**
Physical Neglect (C = 7)	33	25.6	9.0	9	44	-1.21	0.227
Age, years						2.55	0.081*
15-18	20	27.60	7.74	14	40		
19-21	49	24.00	7.60	8	44		
22-24	75	23.21	7.79	5	45		
Race/ethnicity						0.82	0.488
Non-Hispanic, White	41	22.49	7.71	8	44		
Non-Hispanic, Black	59	24.83	8.33	5	45		
Hispanic	17	24.76	7.60	9	38		
Other	27	24.48	6.87	11	40		
Parental Income						1.25	0.294
<$15,000	12	27.42	7.44	15	40		
$15,000-44,999	25	25.68	7.66	11	45		
$45,000-74,999	26	22.73	7.59	6	37		
>=$75,000	55	23.11	8.00	8	44		
Don't Know	25	24.60	7.85	5	40		
Religious Service Attendance						0.06	0.953
Less than weekly	122	24.11	7.91	5	45		
Weekly or more	22	24.00	7.33	6	37		
Contraceptive Use						-1.95	0.053*
Yes	133	23.74	7.85	5	45		
No	10	28.70	6.25	17	38		

[a]Only youg women without a previous history of primary amenorrhea, ovarian disease, or reproductive cancers and those who were not currently pregnant were eligible

[b]ANOVA conducted for age, race/thnicity, parental income; T-Test conducted for adverse childhood experience, history of unintended pregnancy, religious service attendance, contraceptive use, and gravidity

[c]Adverse Childhood Event determined by responses to shortened form of Childhood Trauma Questionnaire (CTQ-

[d]Unintended Pregnancy defined as any unplanned or mistimed birth, resulting in a live birth, abortion, miscarriage, or stillbirth

*Significant at an alpha level of 0.10

**Significant at an alpha level of 0.05

Table 3. Effect of Adverse Childhood Experience(s) on Young Women's Perceived Stress[a]

		Severity (by Quintile Range)				Number Reported				Yes/No			
				95% Confidence				95% Confidence				95% Confidence	
		β	Standard Error	lower limit	upper limit	β	Standard Error	lower limit	upper limit	β	Standard Error	lower limit	upper limit
Adverse Childhood Experience													
Event													
Yes										1.34	1.37	-1.34	4.03
No										0.00			
Quintile Range	Number Reported												
≤26	0	0.00				0.00							
27-31	1	2.17	1.95	-1.64	5.99	0.79	1.71	-2.57	4.15				
32-37	2	3.31	1.98	-0.57	7.20	1.59	2.12	-2.56	5.73				
38-48	3	3.94	1.96	0.09	7.79	1.45	2.40	-3.25	6.15				
≥49	4	3.06	2.04	-0.95	7.06	-0.26	2.33	-4.31	4.84				
	5					2.50	3.11	-3.59	8.60				
Background Characteristics													
Race/ethnicity													
Non-Hispanic, White		0.00				0.00				0.00			
Non-Hispanic, Black		2.22	1.66	-1.04	5.48	2.26	1.67	-1.02	5.54	1.71	1.65	-1.51	4.94
Hispanic		2.24	2.28	-2.24	6.71	1.62	2.32	-2.92	6.17	1.58	2.28	-2.90	6.06
Other		1.44	1.93	-2.34	5.23	1.38	1.97	-2.47	5.24	1.41	1.96	-2.44	5.26
Parental Income													
<$15,000		4.28	2.66	-0.92	9.49	3.67	2.73	-1.69	9.02	4.79	2.67	-0.45	10.03
$15,000-44,999		2.41	2.14	-1.79	6.61	2.02	2.20	-2.30	6.33	2.87	2.11	-1.27	7.00
$45,000-74,999		0.00				0.00				0.00			
>=$75,000		0.99	1.88	-2.70	4.67	0.70	1.94	-3.11	4.50	1.26	1.87	-2.39	4.92
Don't Know		1.48	2.19	-2.82	5.78	0.84	2.22	-3.51	5.15	1.96	2.11	-2.18	6.09

[a]Adverse Childhood Event determined by responses to shortened form of Childhood Trauma Questionnaire (CTQ-SF)

Table 4 Effect of Adverse Childhood Experience Subtype on Young Women's Perceived Stress[a]

	Emotional Abuse				Physical Abuse				Sexual Abuse				Emotional Neglect				Physical Neglect			
			95% Confidence Interval				95% Confidence Interval				95% Confidence Interval				95% Confidence Interval				95% Confidence Interval	
	β	Standard Error	lower limit	upper limit	β	Standard Error	lower limit	upper limit	β	Standard Error	lower limit	upper limit	β	Standard Error	lower limit	upper limit	β	Standard Error	lower limit	upper limit
Adverse Childhood Experience																				
Event																				
Yes	1.05	1.35	-1.59	3.69	0.18	1.60	-2.96	3.32	-0.96	1.55	-4.01	2.09	2.42	1.39	-0.30	5.13	1.49	1.54	-1.52	4.51
No	0.00				0.00				0.00				0.00				0.00			
Background Characteristics																				
Race/ethnicity																				
Non-Hispanic, White	0.00				0.00				0.00				0.00				0.00			
Non-Hispanic, Black	2.26	1.65	-0.98	5.50	1.89	1.69	-1.43	5.20	1.73	1.67	-1.55	5.01	1.56	1.65	-1.68	4.80	2.07	1.62	-1.11	5.25
Hispanic	1.91	2.31	-2.63	6.44	1.42	2.30	-3.08	5.92	1.04	2.32	-3.50	5.58	1.70	2.29	-2.79	6.19	1.43	2.24	-2.97	5.83
Other	1.74	1.94	-2.07	5.54	1.59	1.97	-2.27	5.45	1.49	1.97	-2.36	5.35	1.17	1.96	-2.67	5.02	1.70	1.93	-2.07	5.48
Parental Income																				
<$15,000	4.72	2.65	-0.49	9.92	4.55	2.71	-0.76	9.85	4.81	2.71	-0.50	10.11	4.14	2.68	-1.11	9.39	4.07	2.64	-1.11	9.25
$15,000-44,999	2.64	2.11	-1.50	6.78	2.89	2.13	-1.27	7.06	3.04	2.15	-1.18	7.26	2.15	2.18	-2.13	6.42	2.05	2.10	-2.07	6.17
$45,000-74,999	0.00				0.00				0.00				0.00				0.00			
>=$75,000	1.39	1.84	-2.22	5.00	0.92	1.89	-2.78	4.62	0.91	1.89	-2.79	4.61	0.82	1.84	-2.79	4.44	0.65	1.86	-2.99	4.30
Don't Know	1.88	2.10	-2.23	6.00	1.87	2.19	-2.42	6.16	1.87	2.14	-2.33	6.07	1.77	2.11	-2.36	5.90	1.37	2.10	-2.75	5.49
Religious Service Attendance																				
Less than weekly					0.00															
Weekly or more					-0.55	1.93	-4.35	3.24												

[a]Adverse Childhood Event determined by responses to shortened form of Childhood Trauma Questionnaire (CTQ-SF)

Table 5. Effect of Adverse Childhood Experience(s) on Young Woman's Unintended Pregnancy

		Severity (by Quintile Range)			Number Reported			Yes/No		
			95% Confidence			95% Confidence			95% Confidence	
		aOR	lower limit	upper limit	aOR	lower limit	upper limit	aOR	lower limit	upper limit
Adverse Childhood Experience										
Event										
Yes								0.72	0.29	1.81
No								1.00		
Quintile Range	Number Reported									
≤26	0	1.00			1.00					
27-31	1	0.54	0.14	2.07	0.89	0.29	2.68			
32-37	2	0.10	0.02	0.58	0.35	0.06	2.04			
38-48	3	0.31	0.08	1.25	0.35	0.06	2.08			
≥49	4	0.51	0.14	1.88	0.78	0.19	3.14			
	5				0.77	0.11	5.53			
Background Characteristics										
Race/ethnicity										
Non-Hispanic, White		1.00			1.00			1.00		
Non-Hispanic, Black		2.99	0.72	12.44	3.08	0.78	12.28	3.13	0.80	12.28
Hispanic		1.89	0.31	11.31	2.04	0.36	11.67	2.56	0.47	13.98
Other		2.36	0.49	11.23	2.52	0.54	11.74	2.71	0.59	12.48
Parental Income										
<$15,000		2.42	0.50	11.63	2.94	0.62	14.01	2.22	0.52	9.45
$15,000-44,999		1.13	0.30	4.29	1.36	0.38	4.90	1.08	0.33	3.58
$45,000-74,999		1.00			1.00			1.00		
>=$75,000		0.22	0.05	0.94	0.28	0.07	1.15	0.22	0.06	0.87
Don't Know		0.98	0.24	4.00	1.34	0.36	5.05	0.94	0.28	3.19

[a]Adverse Childhood Event determined by responses to shortened form of Childhood Trauma Questionnaire (CTQ-SF)

[b]Unintended Pregnancy defined as any unplanned or mistimed birth, resulting in a live birth, abortion, miscarriage, or stillbirth

Table 6. Effect of Adverse Childhood Experience Subtype on Young Woman's Unintended Pregnancy Experience[a,b]

		Emotional Abuse			Physical Abuse			Sexual Abuse			Emotional Neglect			Physical Neglect		
			95% Confidence Interval			95% Confidence Interval			95% Confidence Interval			95% Confidence Interval			95% Confidence Interval	
		aOR	lower limit	upper limit	aOR	lower limit	upper limit	aOR	lower limit	upper limit	aOR	lower limit	upper limit	aOR	lower limit	upper limit
Adverse Childhood Experience																
Event																
Yes		0.59	0.23	1.48	0.35	0.11	1.10	1.52	0.60	3.84	0.65	0.26	1.65	1.32	0.51	3.41
No		1.00			1.00			1.00			1.00			1.00		
Quintile Range	Number Reported															
≤26	0															
27-31	1															
32-37	2															
38-48	3															
≥49	4															
	5															
Background Characteristics																
Race/ethnicity																
Non-Hispanic, White		1.00			1.00			1.00			1.00			1.00		
Non-Hispanic, Black		2.98	0.75	11.80	3.37	0.84	13.49	3.04	0.77	11.93	3.14	0.80	12.35	2.99	0.76	11.85
Hispanic		2.22	0.40	12.44	2.41	0.44	13.34	3.00	0.55	16.29	2.43	0.44	13.31	2.77	0.52	14.88
Other		2.63	0.57	12.07	3.00	0.65	13.97	2.49	0.54	11.50	2.62	0.57	12.08	2.73	0.59	12.68
Parental Income																
<$15,000		2.22	0.52	9.56	2.46	0.56	10.73	2.02	0.47	8.70	2.54	0.58	11.04	2.67	0.62	11.56
$15,000-44,999		1.20	0.36	4.05	1.17	0.35	3.97	0.96	0.29	3.21	1.35	0.39	4.71	1.21	0.36	4.13
$45,000-74,999		1.00			1.00			1.00			1.00			1.00		
>=$75,000		0.23	0.06	0.91	0.21	0.05	0.83	0.24	0.06	0.95	0.25	0.07	0.96	0.29	0.07	1.17
Don't Know		0.97	0.29	3.33	0.97	0.28	3.39	0.92	0.27	3.15	0.98	0.29	3.33	1.11	0.32	3.88

[a]Adverse Childhood Event determined by responses to shortened form of Childhood Trauma Questionnaire (CTQ-SF)
[b]Unintended Pregnancy defined as any unplanned or mistimed birth, resulting in a live birth, abortion, miscarriage, or stillbirth

Table 7. Effect of Unintended Pregnancy Experience on Young Woman's Perceived Stress Level[a,b]

	Bivariate Model				Full Model				Final Model			
			95% Confidence Interval				95% Confidence Interval				95% Confidence Interval	
	β	Standard Error	lower limit	upper limit	β	Standard Error	lower limit	upper limit	β	Standard Error	lower limit	upper limit
History of Unintended Pregnancy												
Yes	0.83	1.54	-2.19	3.84	-0.15	1.78	-3.64	3.33	-0.31	1.62	-3.49	2.87
No	0.00				0.00							
Background Characteristics					0.00							
Age, years					-0.09	0.46	-0.99	0.80				
Race/ethnicity												
Non-Hispanic, White					0.00				0.00			
Non-Hispanic, Black					1.41	1.74	-1.99	4.82	1.32	1.72	-2.05	4.69
Hispanic					1.07	2.30	-3.43	5.56	1.08	2.30	-3.42	5.58
Other					1.42	1.98	-2.47	5.31	1.46	1.98	-2.42	5.35
Parental Income												
<$15,000					2.17	2.93	-3.57	7.91	2.31	2.90	-3.38	8.00
$15,000-44,999					2.37	2.16	-1.87	6.60	2.32	2.16	-1.91	6.55
$45,000-74,999					0.00				0.00			
>=$75,000					0.64	1.88	-3.05	4.33	0.74	1.86	-2.90	4.39
Don't Know					1.02	2.18	-3.26	5.30	1.18	2.14	-3.01	5.37
Religious Service Attendance												
Less than weekly					0.00							
Weekly or more					-0.70	1.90	-4.42	3.03				
Contraceptive Use												
Yes					0.00				0.00			
No					-3.25	2.73	-8.60	2.09	-3.14	2.71	-8.46	2.17
Years of Education Completed					-0.42	0.54	-1.47	0.63	-0.42	0.54	-1.47	0.63

[a]Adverse Childhood Event determined by responses to shortened form of Childhood Trauma Questionnaire (CTQ-SF)
[b]Unintended Pregnancy defined as any unplanned or mistimed birth, resulting in a live birth, abortion, miscarriage, or stillbirth