Published in final edited form as:
*Adv Child Dev Behav*. 2012 ; 42: 113–152.

# Some (But Not Much) Progress Toward Understanding Teenage Childbearing: A Review of Research From the Past Decade

**Claire A. Coyne**[1,2] and **Brian M. D'Onofrio**[1]
[1]Department of Psychological and Brain Sciences, Indiana University

## Abstract

In the decade and a half since Coley & Chase-Lansdale's (1998) review of teenage childbearing there have been a number of studies investigating teenage childbearing from a developmental psychological perspective. Many of these studies have focused primarily on identifying individual, familial, and socioeconomic risk factors in childhood and adolescence that are highly correlated with teenage sexual behavior and teenage childbearing. We have an emerging understanding of teenage childbearing as the culmination of a complex cascade of experiences and decisions that overlap greatly with the risks for antisocial behavior. Much of this research, however, is limited by its reliance on correlational and cross-sectional research designs, which are not able to rigorously test causal inferences or to identify mechanisms associated with teenage childbearing. Innovative studies using large, nationally representative samples with quasi-experimental and longitudinal designs can expand on such descriptive studies. In particular, quasi-experimental studies can help answer questions about which risk factors are causally associated with teenage childbearing and suggest potential mechanisms that can explain how teenage childbearing is associated with poor outcomes. Future studies also will need to incorporate more precise measures of developmental processes and explore heterogeneity among adolescent mothers. Although advances have been made in the psychological study of teenage childbearing, more research is needed in order to answer important questions about which psychological processes are causally related to teenage childbearing and how teenage childbearing is associated with poor outcomes for young mothers and their offspring.

## 1. INTRODUCTION

### 1.1. Teenage childbearing as a public health issue

Teenage childbearing is internationally recognized as a public health problem associated with a range of risks for both young mothers and their children (Alan Guttmacher Institute, 2010; Centers for Disease Control and Prevention, April 2011). Adolescence is a transitional period marked by social, psychological and biological changes, and childbearing during this period interferes with normative developmental processes. Teen childbirth often disrupts young mothers' educational achievement and limits employment opportunities (Fergusson & Woodward, 1999), and women who begin childbearing as teenagers are at increased risk for substance abuse, mental health problems, and criminal convictions later in life (Coley & Chase-Lansdale, 1998). Teenage childbearing is also associated with poor developmental outcomes for offspring of young mothers, including low birth weight, pre-term delivery, and behavioral and developmental problems (Chen et al., 2007; D'Onofrio et al., 2009). Its association with poor economic, physical, and mental health outcomes for the mothers and

[2]All correspondence should be sent to: Brian M. D'Onofrio, Department of Psychological and Brain Sciences, Indiana University, 1101 E. 10th St., Bloomington, IN 47405. Phone: 812-856-0843. Fax: 812-856-4544. bmdonofr@indiana.edu.

their offspring, therefore, makes teenage childbearing an important target for public health prevention and intervention efforts.

The influence of teenage childbearing can be felt beyond the life experiences of young mothers and their families. There are huge economic costs related to teenage childbearing paid for by the government and health-care service-providers (Centers for Disease Control and Prevention, April 2011). In economic terms, teen childbearing is associated with $6 billion in lost tax revenue and $3 billion in public expenses in the United States per year (Hoffman, 2006). Decreases in teen birth rates in turn save taxpayers billions of dollars. In 2004, decreases in the U.S. teen birth rate were estimated to have saved taxpayers $6.7 billion in costs in that year alone (Hoffman, 2006). The obvious economic costs of teenage childbearing have motivated economists to conduct research exploring the causes and consequences of teenage childbearing.

The negative behavioral and psychological risk factors of teenage childbearing are well documented. Until recently, however, the majority of research on this subject came from economic, epidemiological, and public health perspectives rather than from developmental psychology (Coley & Chase-Lansdale, 1998). A widely cited review article by Coley and Chase-Lansdale (1998), published over a decade ago, identified key risk factors and processes associated with teenage parenthood and offered suggestions for future directions given the research findings at the time. The authors reviewed basic and applied research on teenage childbearing across a variety of disciplines (e.g., economics, sociology, and program and policy evaluation). They concluded that a developmental psychological perspective was lacking in the study of teenage childbearing. Their review revealed that the common approach to understanding teenage pregnancy and childbearing relied on economic models emphasizing financial explanations for why teenagers become pregnant and give birth. These approaches, though, did not adequately account for the psychological and behavioral processes causally related to teenage childbearing. As a result, Coley & Chase-Lansdale (1998) explicitly called for psychological research focusing on the important developmental and psychological factors that influence teenage pregnancy and childbirth. They also highlighted the need for studies using innovative comparison groups and statistical analyses that can differentiate between confounding risk factors and causal associations.

In the current chapter, we will first review rates of teenage pregnancy and birth across the past decade, both internationally and within the United States. Second, we will review recent studies that have focused on the risk factors for teenage childbearing and developmental theories often used to explain teenage childbearing. Third, we will review recent studies that have explored the consequences of teenage childbearing for young mothers and their offspring, as well as the developmental theories that have been used to explain outcomes for young mothers and their children. Finally, we will discuss directions for future research. In particular, research is still needed in order to: (1) identify which risk factors are causally and specifically associated with teenage childbearing and which factors are broadly associated with problems during adolescence (e.g., delinquency); (2) clarify whether poor maternal outcomes and offspring outcomes are due to disruptions caused by early childbearing or whether they are due to common selection factors associated with both teenage childbearing and poor outcomes; and (3) understand heterogeneity in risk factors associated with teenage childbearing.

## 2. INTERNATIONAL DIFFERENCES IN TEEN PREGNANCY AND CHILDBIRTH

### 2.1. Teen pregnancy

Pregnancy rates among teenage women in the United States have decreased steadily since the 1990s (Alan Guttmacher Institute, 2010). The pregnancy rate for women 15–19 years old was 71.5 pregnancies per 1000 women in 2006, as compared to 84.0 pregnancies per 1000 women in the 1990s (Centers for Disease Control and Prevention, April 2011; Darroch et al., 2001). It is difficult to measure pregnancy intentions at a national level, but retrospective measures are used in national surveys to determine if the pregnancy is unintended, meaning the pregnancy is mistimed or unwanted (Finer & Zolna, in press). In the United States, roughly half (49%) of all pregnancies for women between age 15–44 are unintended (Finer & Zolna, in press). This rate remains higher than the rate of unintended pregnancies in other developed nations. Within the United States, there are also considerable disparities in unintended pregnancy rates across different age cohorts and socioeconomic classes. Since 2001 the percentage of pregnancies that are unintended has declined for women 15–17 years old (from 89% to 79%); however, the proportion has increased among women 18–19 years old (from 79% to 83%). A similar pattern is seen for unintended birth rates and abortion rates for unintended pregnancies. Since 2001, the unintended birth rate for women 15–17 years old has decreased (from 21 to 16 per 1000 women 15–17 years old) but increased for women 18–19 years old (from 54 to 57 per 1000 women 18–19 years old). The proportion of unintended pregnancies ending in abortion increased for women 15–17 years old (from 37% to 41%) but decreased for women 18–19 years old (40% to 35%) (Finer & Zolna, in press). Across all ages, African-American women have the highest percentage of unintended pregnancy (67%) when compared to Caucasian non-Hispanic women (40%) and Hispanic women (53%).

Although the national average rate of unintended pregnancies has increased, the rate of unintended pregnancies among the youngest cohort of childbearing women (i.e., 15–17 year olds) has decreased. A decline in the rate of unintended pregnancy among the youngest group of teenage women is notable. Clearly, shifts in the unintended pregnancy rates have implications for changes in teen birth rates, but research is needed to determine whether there are unique processes associated with changes in teen childbirth that are not accounted for by decreases in the teen pregnancy rates. There is some evidence that changes in contraceptive use, in particular condom use, are associated with changes in teen pregnancy rates both in the United States and internationally (Darroch et al., 2001; Santelli et al., 2009; Santelli et al., 2008), but more research is necessary.

### 2.2. Teen childbirth

Internationally, across developed nations, there has been a general decline in teenage birth rates over the past three decades. From 1991 to 2009, the birth rate for teenagers (i.e., women aged 15–19) in the United States dropped 37% from a peak of 61.8 births to 39.1 births per 1,000 women. The decline is attributed, in part, to reduced sexual activity and increased contraceptive use among teenagers (Santelli & Kirby, 2010). In recent years, this overall decline has fluctuated, with increases in the teen birth rate between 2005 and 2008 (Alan Guttmacher Institute, 2010) attributed, in part, to teenagers being less likely to use effective methods of contraception (Brown & Suellentrop, 2009). Although the teen birth rate declined between 2008 and 2009 from 42 to 39 per 1,000 women, it is still unclear whether these fluctuations are short-term changes or if the teenage birth rate will continue to decline or stabilize in future years (Kost et al., 2010). Overall, changes in access to federally funded family-planning services (i.e., contraceptive and abortion services) and sex education programs were found to be associated with the recent fluctuations in U.S. teenage birth rates

(Yang & Gaydos, 2010). At the state level, access to Medicaid family planning waivers were associated with reduced teen birth rates for all teenagers, and abstinence-only education programs were associated with higher teen birth rates for black and white teenagers (Yang & Gaydos, 2010).

Despite the recent decline, the teen birth rate in the United States continues to be one of the highest in the developed world. As of January 2011, ten percent of all births in the United States are to girls age 19 or younger (Alan Guttmacher Institute, 2010; Hamilton et al., 2010). In the United States, the teen birth rate is about 1.5 times higher than the teen birth rate in the United Kingdom, more than twice as high as rates in Canada, and six to nine time higher than birth rates in Denmark, the Netherlands, Sweden and Switzerland (Centers for Disease Control and Prevention, April 2011; Kost et al., 2010). Lower rates of teen pregnancy and teen childbirth in other developed nations are generally attributed to the availability and use of contraceptives among teenagers in these nations (Darroch et al., 2001)—although there are similar rates of sexual activity across all of these countries, the rates of contraceptive use vary (Darroch et al., 2001). Among sexually active teenagers in the United States, 20% did not use any method of contraception the last time they had intercourse, compared to only 5% of sexually active teenagers in Great Britain and 4% of sexually active teenagers in Sweden (Darroch et al., 2001).

### 2.3. Summary

In general, rates of teenage pregnancy and childbearing have decreased over the past two decades. Although current rates of sexual activity are similar across developed nations, rates of teenage childbirth vary widely, with the United States having the highest rate of teen childbirth and lowest rate of contraceptive use. Recent fluctuations in teen childbirth are a reminder that more research is needed to better identify the risk factors (e.g., family, school or neighborhood contexts) that predict teenage childbearing and the factors that account for the observed decreases in teen childbirth rates.

## 3. RISK FACTORS FOR TEENAGE CHILDBEARING

The risk factors associated with teenage childbearing may be distal (i.e., childhood conduct problems) or more proximal to the actual childbirth (i.e., decision to keep the baby influenced by religious beliefs). In their review Coley and Chase-Lansdale (1998) identified a variety of individual, family and environmental factors associated with teenage childbearing. In short, they found that teenage girls with poor academic achievement, raised in single-parent homes in poor neighborhoods were at increased risk of becoming teenage mothers. Since their review, there have been studies both replicating previous findings and extending the scope of inquiry to include other psychological and social risk factors. This chapter reviews studies that have been published in the past decade and a half that focused on sociodemographic, family-level and/or individual-level risk factors associated with teenage childbearing. The review is meant to be comprehensive but not exhaustive.

### 3.1. Sociodemographic risk factors

**3.1.1. Socioeconomic status and education—**Teenage childbearing is associated with a constellation of sociodemographic risk factors, and these risk factors are also associated with teenage delinquency and antisocial behavior (Coley & Chase-Lansdale, 1998; Woodward et al., 2001; Xie et al., 2001). A longitudinal study of a predominantly African-American middle-school students (grades 7–12) found that low family socioeconomic status (SES) was a strong predictor of teenage motherhood (Xie et al., 2001). Another longitudinal study of low-income, minority, school-aged children found that maternal educational achievement and family SES were associated with teenage

childbearing—young women whose family was receiving public assistance and whose mothers had not completed high school were more likely to become teenage mothers (Mersky & Reynolds, 2007). Family SES is a measure of the psychosocial context in which individuals develop, and the effect of some individual-level risk factors (e.g., self-esteem) on risky sexual behavior, teenage pregnancy and childbearing may be weaker than expected after accounting for the influence of family SES. In a longitudinal study using a representative cohort of children born in New Zealand, Boden & Horwood (2006) found that the relationship between low self-esteem and teenage pregnancy disappeared after accounting for broader contextual factors, such as family SES, maternal educational achievement, and family functioning. The psychosocial context in which children develop, therefore, seems to be especially important for predicting teenage pregnancy.

In addition to family SES, neighborhood context also influences the risk for teenage childbirth. Young women chronically exposed to poor neighborhoods throughout childhood were more likely to give birth during adolescence without being married (South & Crowder, 2010). Differences in the timing of exposure to neighborhood poverty may also influence the risk of childbearing. In particular, exposure to high levels of neighborhood poverty during early childbearing years may be an important predictor of teenage childbearing (South & Crowder, 2010).

Disruptions in family structure have also been identified as risk factors for teenage pregnancy. Young women who give birth as teenagers are more likely to be raised in single-parent homes in neighborhoods with high rates of poverty (Fergusson & Woodward, 1999; Hockaday et al., 2000). Studies have found that father absence also predicted risky sexual behavior and teen pregnancy (Ellis et al., 2003). In particular, young women whose fathers were absent from the home early in their childhood had the highest rates of early sexual activity (Ellis et al., 2003). A cross-national comparison of young women in the U.S. and New Zealand found father absence independently contributed to teenage pregnancy, after accounting for daughters' early conduct problems and other familial stressors (Ellis et al., 2003). Recent research, however, suggests that the association between father absence and offspring sexual practices, including age at first intercourse, may not be causal (Mendle et al., 2009). Rather, father-absence may be a marker for other family-level factors, such as low parental monitoring, that influence the risk of teenage pregnancy.

**3.1.2. Race and ethnicity—**In the United States, teenage pregnancy and maternal outcomes associated with teenage childbearing vary by race and ethnicity. There are higher rates of teenage childbirth among African-American and Latina women (Alan Guttmacher Institute, 2010), and efforts to explain higher rates of teen pregnancy and childbearing often focus on how socioeconomic disadvantage influences decision-making about teenage childbearing. Geronimus (2003) theorized that decision-making and consequences related to teenage childbearing may differ for African-American teenage women compared to other racial/ethnic groups. Early childbearing may be adaptive for African Americans in high-poverty urban areas due to limited educational and job opportunities, social inequality, and structural factors that shorten life expectancy and quality of life for African-American females (Colen et al., 2006; Geronimus, 2003). Geronimus (2003; 1999) suggests that teen childbearing among African-American women may be a way to minimize negative health outcomes for teenage mothers and their children and to maximize support from intergenerational networks of family support. In contrast, teen sexual behavior and childbearing among Caucasian women is more closely associated with deviance and challenging conventional expectations of adolescent behavior (Lauritsen, 1994). Unconventional psychosocial behavior (e.g., delinquent behavior, marijuana and alcohol, and poor school performance) has been found to predict sexual behavior for Caucasian teens but not African-American teens (Costa et al., 1995). Therefore, teen childbearing may be the

result of different psychosocial processes for teenage women of different races and ethnicities.

Colen et al. (2006) hypothesized that teenage childbirth rates among African-American teens may be sensitive to changes in unemployment rates. During times of economic expansion, African-American teenage women may delay childbearing to take advantage of improved educational or job opportunities. Because African-American women are more likely to be the head of household compared to Caucasian women, the African-American teen birthrate may be more sensitive to shifts in the unemployment rate. Colen et al. (2006) found that decreases in unemployment were associated with decreases in teenage childbirth for African-American teenagers but not for Caucasian teenagers. The authors interpreted these findings as evidence that macroeconomic changes in the availability of employment influence teen fertility differently for African-American and Caucasian teenagers. This study highlights the importance of considering race and cultural context as factors effecting the developmental processes associated with teenage childbearing (Geronimus, 2003). However, more studies are needed to test this theory, and, if the findings are replicated, additional research will be needed to determine why African-American women are at increased risk for early childbearing and what processes associated with race and/or ethnicity predict teenage childbearing.

### 3.2. Family-level risk factors

**3.2.1. Maternal teen motherhood—**Some studies have found that maternal teen motherhood is associated with increased risk of teenage childbearing among offspring, a process referred to as the intergenerational transmission of teenage childbearing (Jaffee et al., 2001; Meade et al., 2008). In the United States, national statistics indicate that daughters of adolescent mothers are more likely than daughters born to older mothers to become teen mothers themselves (Huffman & Flanigan, 2004). Approximately one-third of the daughters of young teen mothers had their first child as a teenager, compared to 11 percent of those whose mothers had a first birth at age 20–21 (Hoffman, 2006).

There is some evidence that the transmission of age at first birth is accounted for by characteristics of the family in which offspring are raised rather than by the timing of childbirth itself. Although Barber (2001) found an association between mother's age at first birth and offspring's age at first birth the results suggested the association may be explained by the characteristics of the family in which the offspring are raised. Barber (2001) found that family background factors such as familial Catholic religious affiliation, family size, maternal education, maternal divorce, early family income, and grandfather's occupation explained the association between mother's age at first birth and daughter's age at first birth. The sample in this study included mother-child pairs from a longitudinal study of Caucasian, married women who gave birth to a child in July 1961 (Barber, 2001). Consequently, there are limitations as to the generalizability of these findings. First, the sample did not include unmarried women in the mother generation. Single parenthood has been identified as a sociodemographic risk factor for teenage childbearing (Woodward et al., 2001), and there may be different patterns of intergenerational transmission of teenage childbearing for never-married mothers and their daughters. Second, the sample did not include families from non-Caucasian ethnic or racial backgrounds. Given the pronounced differences in ethnic and racial differences in teenage childbearing (Alan Guttmacher Institute, 2010) the findings from this study may not accurately describe the intergenerational transmission of teenage childbearing in different ethnic or racial populations. A longitudinal study of low-income, minority school-children initially enrolled in early education programs, however, did find a similar pattern. Mersky and Reynolds (2007) found that the association between maternal age at first birth and a daughter's likelihood of becoming a teen mother was

accounted for by sociodemographic factors (e.g., maternal low educational attainment and poverty) (Mersky & Reynolds, 2007). Offspring were at increased risk of teenage childbearing if their mothers had not completed high school at time of their birth and if their mothers received public assistance during their early childhood. However, offspring born to teenage mothers were not more likely to become teenage mothers themselves. The results from these two studies (Barber, 2001; Mersky & Reynolds, 2007) suggest that sociodemographic factors may confound the association between maternal age at childbearing across generations.

Although accounting for sociodemographic, individual, family, and peer influences on teen motherhood may attenuate the risk of teen childbearing among daughters of teen mothers, there also is evidence that the intergenerational transmission persists independently of correlated risk factors. Using longitudinal data from a nationally representative sample, Meade et al. (2008) found that teen mothers share a number of sociodemographic risk factors (e.g., poor school performance, single-parent families, and greater number of children in the home) regardless of whether or not their mothers had been teen mothers. The authors also identified risks unique to daughters of teenage mothers—daughters of teenage mothers who gave birth as teens reported lower levels of parental monitoring, more deviant peer norms, and higher levels of poverty than teen mothers who were daughters of mothers who gave birth as adults (Meade et al., 2008). Overall, daughters of teen mothers are exposed to a greater number of risk factors commonly associated with teenage childbearing relative to daughters of non-teen mothers, and the greater overall risk experienced by daughters born to teenage mothers may account for the intergenerational transmission of teenage childbearing (Meade et al., 2008). These findings suggest that being raised by a mother who began childbearing as a teenager may confer unique risk above and beyond the influence of sociodemographic factors. Clearly, future research needs to identify the mechanisms that account for the intergenerational transmission of teenage childbearing.

**3.2.2. Family functioning—**Aside from family structure, some studies have looked at aspects of family functioning that may predict teenage childbearing. Studies that have explored family religiosity have found that family cohesiveness, positive family processes and like-minded peer networks mediate the relationship between religious beliefs and risky sexual behavior among adolescents (Manlove et al., 2008). The preventative mechanism through which religiosity influences offspring teenage childbearing may be through warm, positive parenting and supportive peer-networks in religious families (Manlove et al., 2008). Young women raised in positive home environments and with supportive peer networks are less likely to engage in risky sexual behavior (Manlove et al., 2008). It may be that supportive relationships with parents and peers are protective factors that reduce the likelihood of teenage childbearing.

### 3.3. Individual-level correlates

**3.3.1. Psychological correlates—**The risk factors commonly associated with teenage childbearing overlap with risk factors widely associated with adolescent antisocial behavior. Longitudinal studies have found higher rates of teen pregnancy among young women with early conduct problems, which may be explained by both their disadvantaged family backgrounds and their tendency to engage in risk-taking behaviors (Woodward & Fergusson, 1999; Woodward et al., 2001). Woodward et al. (2001) found that after controlling for possible psychosocial confounds (e.g., low family SES, lower levels of maternal education, early punitive parenting, and family instability), conduct disorder was still an independent predictor of teenage pregnancy. Risk-taking behaviors, such as early sexual intercourse, multiple sexual partners, and affiliation with deviant peers were identified as mediators of the association between conduct disorder and teenage pregnancy

(Woodward et al., 2001). Among girls with conduct disorder, the decision to have children as a teenager may reflect deficits in self-control and planning that manifest as a failure to plan for using birth control (Zoccolillo et al., 2004).

Teenage childbirth is also influenced by earlier developmental factors, such as childhood experiences and adjustment (Woodward & Fergusson, 1999). A cross-sectional study exploring the relationship between a history of childhood maltreatment and teenage pregnancy identified two classes of pregnant teenagers. The first group represented a majority of the pregnant teenagers with no reported history of maltreatment, and a second, smaller, multiple-risk group of pregnant teenagers who had experienced multiple types of maltreatment (e.g., emotional neglect, physical abuse, sexual abuses). The multiple-risk group of pregnant teenagers who were exposed to maltreatment in childhood also displayed a pattern of conduct disorder behaviors (Romano et al., 2006). Similarly, a prospective study using at nationally representative sample of teenagers found that conduct problems (e.g., delinquent activity, alcohol use) preceded teen pregnancy (Hockaday et al., 2000). These studies provide evidence that conduct problems may precede or co-occur with teenage pregnancy and childbirth, suggesting that some young women who become teen mothers may be at higher risk for problem behaviors during adolescence.

Normative developmental psychological processes associated with risk assessment and decision-making during adolescence may increase the likelihood of teenage childbearing. A longitudinal study of teenage women recruited from STD and general medical clinics found that sexually active teenage women with inconsistent pregnancy intentions (i.e., they reported they were not planning to become pregnant but also reported that they were likely to become pregnant) also reported more suspected pregnancies than sexually active teenage women with consistent plans and intentions to avoid becoming pregnant (Rosengard et al., 2004). The inconsistency between plans and expectations may reflect ambivalence about childbearing, difficulty in planning contraceptive use, or a perception that external factors beyond their control will influence the likelihood of pregnancy regardless of their planning efforts (Rosengard et al., 2004). It is also possible that teenagers may be capable of logical reasoning when it comes to making decisions about avoiding unintended pregnancy, but they may lack the socioemotional maturity (e.g.,, impulse control, emotion regulation, or resistance to peer influence) needed to make effective decisions about engaging in sexual risk behaviors that increase their likelihood of becoming pregnant (Steinberg, 2008).

**3.3.2. Sibling effects—**Exposure to siblings who have become parents as teenagers is also associated with increased risk of teenage childbearing. Exposure to an older sister who is sexually active or has given birth as a teenager may influence younger sisters' permissiveness in sexual attitudes and behaviors (East et al., 1993). Studies have found that young women with both a mother and a sister who began childbearing as teens are more likely to give birth as teens (East et al., 2007), with the risk of teenage pregnancy increasing incrementally as the number of sisters in a family who have given birth as teens increases (East & Kiernan, 2001). The increased risk of teen childbirth may be related to more permissive attitudes about sexual behavior and childbearing among younger sisters who are living with two or more sisters who are raising children as teenagers (East & Kiernan, 2001).

More research is needed in order to identify the mechanism that accounts for the association between mothers' and daughter's teenage childbearing. Studies have shown that younger sisters of teen parents have more accepting attitudes toward early sex and teenage pregnancy regardless of their siblings gender (Huffman & Flanigan, 2004), but there may be family-level factors (i.e., maternal low education) that precede teen childbearing for all sisters in the family, increasing risk of teenage childbearing among all sisters in a family.

In addition to family-wide effects, there are likely sister-specific effects related to firsthand exposure to a sister's teenage childbirth. Some studies have shown that conflict with an older sister who had a teen childbirth marginally decreases odds of teen childbirth, which suggests that the effects of an older sister's teenage motherhood may be moderated by the quality of the relationship between sisters (East & Kiernan, 2001). In a study of the younger sisters of teenage mothers, East and colleagues (2009) found that younger sisters who performed poorly in school, did perceive early parenting as being a hardship, and who also wanted to have a baby, were more likely to give birth as teenagers. The cross-sectional nature of the data did not allow the authors to test whether the younger sisters were more likely to want to have children and give birth prior to the exposure to their sister's pregnancy and child rearing, or if exposure to teenage parenting was causally associated with their own teenage childbearing. The study also found important moderating factors that influence decreased risk for teenage childbearing. Exposure to a sister who gave birth as a teenager deterred younger sisters from childbearing in different ways. For some younger women, their sister's teenage childbirth served to increase their awareness of the challenges of early parenting, while other young women experienced more explicit conversations with their mothers dissuading them from teenage childbirth (East et al., 2009).

**3.3.3. School and related risk factors—**School is an important social context for adolescent development, and research has continued to find that school-related factors predicted increased likelihood of teenage childbearing. In a longitudinal study of low-income, minority children attending early education programs in the Chicago Public School system, Mersky & Reynolds (2007) found that behavior problems and poor reading ability predicted increased likelihood of teenage childbearing. Other longitudinal studies have found that high levels of aggression and low academic competence (Xie et al., 2001), as well as low educational expectations (Hockaday et al., 2000), are strong predictors of teenage pregnancy and motherhood. These results suggest that both academic success and behavioral problems may influence processes associated with teenage childbearing.

Peer relationships are particularly important during adolescence. It is not surprising, then, that peer characteristics are particularly important determinants of teenage motherhood. Beyond an individual's own aggressive behavior, affiliation with aggressive peers with low academic competence was associated with increased risk of teenage childbearing (Xie et al., 2001). Similarly, affiliation with peers who share values about abstaining from sex and who engage in prosocial behaviors was associated with lower levels of risky sexual behavior (Manlove et al., 2008). These studies provide evidence that peer influence, in school and elsewhere, may be associated with processes that increase risk for teenage childbearing.

### 3.4. Developmental explanations of teenage childbearing

**3.4.1. Problem-behavior Theory—**Growing up within a high-risk context of a single-parent home with high levels of poverty and family chaos or poor school performance may set the ground work for teenage childbearing by increasing a teenage girl's exposure to deviant peer behavior. Problem-behavior theory provides a framework for understanding the multiple psychosocial risks for engagement in problem behaviors (Jessor & Jessor, 1977). Problem-behavior theory specifies that the likelihood of engaging in problem behavior depends on interrelated domains of influence including personality characteristics, social environmental factors and involvement with conventional values or institutions (Costa et al., 1995; Jessor, 1992). Engagement in problem behavior is seen as the result of the interaction of both individual personality characteristics and the environment (Jessor & Jessor, 1977).

The tremendous overlap in risk factors shared by teenage childbearing and adolescent antisocial behavior suggests that etiological models used to explain the development of

adolescent antisocial behavior may also explain teenage childbearing (Fergusson & Horwood, 2002; Fergusson & Woodward, 1999; Woodward & Fergusson, 1999; Woodward et al., 2001; Zoccolillo et al., 2004; Zoccolillo et al., 2005). The social and emotional changes characteristic of early adolescence also occur within the larger context of biological changes associated with pubertal maturation. The association between pubertal maturation and antisocial behavior is supported by a number of studies (Caspi et al., 1993; Ge, 1996; Moffitt & Caspi, 2001; Nichols et al., 2006), with early maturing girls showing higher levels of antisocial behavior. The common explanation for this association is that girls who develop early tend to seek out older peers, and, because older peer groups tend to fall within the mid-adolescent age range (when antisocial behavior is at its peak), these girls are exposed to and engage in more antisocial behavior with these older peers. In the home, changes in parental monitoring (i.e., decreases in supervision as children become adolescents) are associated with delinquency in adolescence (Lahey et al., 2008; Patterson & Yoerger, 1997), as well as teenage childbearing (Meade et al., 2008; Woodward et al., 2001).

Teenage childbearing may be another "problem behavior" associated with developmental trajectories of antisocial behavior. One widely accepted developmental model presupposes two trajectories of antisocial behavior: the life-course persistent (LCP) and adolescent-limited (AL) (Moffitt, 1993, 2003) pathways. The LCP pathway is marked by an early-childhood onset of behavior problems attributable to family, social, and neurodevelopmental deficits. The AL pathway is less persistent and represents the more common profile of antisocial behaviors that emerge in early adolescence as a product of the maturity gap—the mismatch between biological maturation and rights to adult privileges and responsibilities. Antisocial behavior is a way to relieve the dysphoria caused by the mismatch between adolescents' developmental stage and their social environment and to assert autonomy (Moffitt, 2007). Peer relationships and peer-group dynamics provide a context in which adolescents can engage in antisocial behaviors that assert their autonomy. Social interactions with peers provide opportunities to learn and practice antisocial behaviors together. For adolescent girls, romantic and sexual relationships are thought to be of particular importance in the development of antisocial behavior. Older boyfriends draw adolescent girls into more advanced and deviant peer groups, contributing to the girls' own antisocial behavior (Kerr et al., 2007; Stattin et al., 2005).Therefore, teenage pregnancy and childbearing may be the consequence of engaging in risky sexual behavior, substance use, and other antisocial behaviors with deviant peers, and teenage childbirth may represent a female-specific manifestation of adolescent antisocial behavior.

Problem-behavior theory (Costa et al., 1995; Jessor & Jessor, 1977) suggests that engaging in one problem behavior (e.g., problem drinking, substance use, deviant behavior, risky driving) increases the likelihood of involvement in other problem behaviors (e.g., risky sexual behavior). Therefore, early antisocial behavior—perhaps affiliation with deviant peers—may lead to early and risky sexual behavior, which is necessary in order for teenage childbearing to occur. A certain level of antisocial behavior during adolescence may be normative (Lahey et al., 2003) and in some situations associated with higher social status (Bukowski et al., 2007; Mayeux & Cillessen, 2007). Teenage sexual behavior, therefore, may fall in the normative range of antisocial behavior, although the increased likelihood of risky sexual behavior during adolescence may increase the likelihood of teenage childbearing as an unintended consequence (Costa et al., 1995).

Although problem-behavior theory can explain why a young woman might become pregnant after engaging in risky sexual behavior, it does not completely explain why a young woman would chose to give birth to the child. Problem behaviors are identified as problematic relative to age-related norms and expectations (e.g., underage drinking) (Jessor, 1992) and

serve as signs to other members of the peer group that a teenager is independent from conventional norms or parental control (Jessor & Jessor, 1977; Jessor et al., 1998). Therefore, teenage childbearing is problematic because it occurs earlier in development than expected, and teen mothers are underprepared to cope with the consequences of early motherhood. However, it is also possible that teenage childbearing is problematic because of individual-level and family-level characteristics that themselves increase the likelihood of teenage childbearing and also make teen mothers particularly ill-equipped to parent. Perhaps deciding to give birth to the child may reflect a desire to prove independence from parents and conventional expectations of adolescent behavior. Overall, it is likely that there are multiple developmental processes—both normative and impairing/pathological— that are associated with antisocial behavior that also influence teenage childbearing.

**3.4.2. Epidemic Modeling of the Onset of Social Activities (EMOSA)—**Additional research on teenage sexual behavior has borrowed from the epidemiology literature by framing teenage sexual behavior and pregnancy as an epidemic. The epidemic framework extends the idea of disease transmission to social behaviors—over time, behaviors spread among networks of peers. Rodgers and Rowe (1993) introduced the social contagion theory of adolescent sexual behavior as a probabilistic model in which transmission of the behavior (i.e., sexual intercourse) depends on features of adolescent dyads, including adolescents' status with regards to the behavior (i.e., virgin) and their pubertal development (Rodgers, 1996). Transition rates can vary by gender and for different types of behaviors (Rodgers et al., 1998). This model conceptualizes adolescent sexual behavior as a marker of transition between adolescence and adulthood that encompasses a variety of attitudes and behaviors that develop gradually, rather than as a single act (Rodgers, 1996). The spread of behavior occurs through interacting social networks of adolescents, such peers and family members, especially siblings. Social influence passes from the adolescent who has performed the behavior to those adolescents who have not performed the behavior. Initially, few adolescents have engaged in sexual behavior, but, over time, sexual behavior spreads, and the spread occurs in tandem with other relevant transition behaviors, such as delinquency, drinking, and smoking (Rodgers, 2003; Rodgers et al., 1998). Attitudes and decisions about sexual behavior and the consequences of sexual behavior are therefore shaped within the context of peer relationships.

Rodgers and Rowe (1998) used a non-linear EMOSA model to reflect the process by which teenage girls get pregnant and the relationship between sexual behavior and pregnancy. The estimated pregnancy probabilities for girls of different ages and different virginity statuses are similar across both age and time-since-virginity, suggesting that younger and older girls are equally likely to get pregnant regardless of how much time has passed since becoming sexually active. These results suggest a model in which sexual behavior is transmitted from adolescents who have had sex to those who have not, and as this transmission occurs, some girls become pregnant (Rodgers et al., 1998). Again, although social contagion theory can help us understand the spread of teenage sexual behaviors and pregnancy, there may be different factors and processes involved in teenagers' decisions to actually give birth to a child after becoming pregnant. The EMOSA model would need to be extended to predict the probabilities of teenage childbirth to determine whether age, time-since-virginity, and other factors (e.g., family background characteristics) differentially influence the probability of teenage childbirth.

### 3.5. Summary

Teenage childbearing is influenced by risk factors from a variety of contexts. A number of studies have identified sociodemographic risk factors, such as low family SES, maternal low educational achievement, and single-parent family structure that are associated with

increased likelihood of teenage childbearing. There is some evidence to suggest that intergenerational transmission of teenage childbearing occurs between teen mothers and their daughters. Similarly, older sisters' childbearing behavior likely influences younger sisters' attitudes and behaviors associated with childbearing in ways that may make younger sisters more likely to become pregnant and give birth. A number of studies also suggest that teenage childbearing is associated with childhood conduct problems and adolescent antisocial behavior, perhaps due to shared early childhood risk factors. Although there is evidence of shared risks experienced by all young women who become teenage mothers, there is also evidence of unique differences in risks based on race and ethnicity, suggesting that teenage mothers are not a homogenous group (Geronimus, 2003; Wakschlag & Hans, 2000).

Studying teenage childbirth as an outcome related to the accumulation and interaction of childhood and adolescent risk factors allows researchers to better predict which young women are at highest risk for teenage pregnancy and childbirth with the ultimate goal of creating more effective interventions to reduce these outcomes. There have been a number of well-designed studies evaluating the developmental risk factors associated with teenage childbearing. The use of longitudinal studies with repeated measures at multiple time points and representative samples help to reduce problems associated with retrospective recall of behaviors, increase confidence about the temporal ordering of risks in order to test causal relationships, and expand the generalizability of the findings. Although these studies reviewed earlier have identified many important risk factors for teenage pregnancy and childbearing, it is not clear whether the associations between these risk factors and teenage pregnancy and childbearing are actually causal in nature. Most of the studies reviewed earlier did not use advanced designs, such as the innovative comparison groups suggested by Coley and Chase-Lansdale (1998). Studies are still needed that can rule out unmeasured confounds, and test competing hypotheses—specifically, the disentangling of selection factors from causal factors (Rutter et al., 2001). In summary, longitudinal studies have identified risk factors associated with teenage childbearing, but few have explored heterogeneity among teenage mothers, and none have used quasi-experimental designs to test for causal associations. Theoretical models of teenage childbearing are becoming more integrated and have begun to incorporate developmental psychological perspectives, as called for by Coley and Lansdale (1998); however, more research is needed to develop an integrated theory based on greater knowledge of causal risk factors that can account for heterogeneity in the risk factors and outcomes associated with teenage childbearing.

## 4. OUTCOMES FOR TEENAGE MOTHERS AND THEIR OFFSPRING

### 4.1. Outcomes for teenage mothers

**4.1.1. Socioeconomic outcomes—**There are both short- and long-term consequences associated with teenage childbearing. Cross-nationally, educational outcomes for teenage mothers are mixed. A study of teen mothers in Austria found that teen mothers were more likely to have poor academic performance than their peers prior to giving birth; however, 2–5 years after giving birth, teen mothers had achieved higher levels of education than their peers who were not parents (Zeck et al., 2007). In Sweden, teen mothers are at increased risk of socioeconomic (SES) disadvantage in adulthood compared to women who give birth at 20–24 years old, and their risk was elevated regardless of their parents' SES and educational level (Olausson et al., 2001). Similarly, in the United States, teen childbirth increases the likelihood of poor educational attainment and the use of public assistance (Casares et al., 2010). In the long run in the United States, teenage childbirth is associated with higher rates of lifetime poverty and lower educational attainment. Over the course of their lifetime, teenage mothers have larger families, with less time between pregnancies, and are less likely

to marry or stay married than women who give birth as adults (Borkowski et al., 2007; Whitman et al., 2001).

**4.1.2. Psychological and health outcomes—**Teenage childbearing is also associated with negative psychological and physical health outcomes, perhaps due in part to the increased psychosocial stressors (e.g., poverty) experienced by teenage mothers. A sample of mothers from national registries in Sweden found that teenage mothers face an increased risk of premature death due to cervical cancer, heart disease, suicide, and inflicted violence that is independent of their socioeconomic background (Olausson et al., 2004).

There are few studies that have evaluated short-term changes in substance use and other antisocial behavior among teenage mothers following childbirth. A small study of substance use among African-American and Latina teen mothers found these young women tend to return to their pre-pregnancy drug use (e.g., alcohol, tobacco, and marijuana use) (Spears et al., 2010). The postpartum use is often lower than pre-pregnancy levels, but some teen mothers increase their usage throughout the pregnancy and postpartum period. The strongest predictors of drug use in the postpartum period are history of substance use prior to giving birth and partner's current substance use (Spears et al., 2010). In contrast, other studies have found that teenage childbirth can function as social control on delinquent behavior and substance use and that young women who become mothers have similar rates of delinquency as their never-pregnant counterparts (Hope et al., 2003). Studies are needed to identify what factors account for the heterogeneity in substance use and criminal outcomes.

### 4.2. Outcomes for offspring of teenage mothers

In their review, Coley and Chase-Lansdale (1998) stated that less attention had been given to evaluating the outcomes of children born to teenage mothers. In recent years, however, there have been a number of recent studies exploring childhood, adolescent, and young-adult outcomes for offspring born to teenage mothers.

**4.2.1. Childhood outcomes—**Offspring born to teenage mothers are more likely to be raised in larger families in low SES home environments with multiple caretaker and residence changes (Pogarsky et al., 2006). These offspring are more likely to be exposed to inconsistent, harsh discipline and deviant mother-child interactions and their teenage mothers are more likely to have low IQ and a criminal history (Dahinten et al., 2007; Jaffee et al., 2001; Nagin et al., 1997; Pogarsky et al., 2003; Pogarsky et al., 2006). These family and maternal background characteristics have been identified as risk factors associated with the development of many problems during childhood and adolescence, including antisocial behavior (Lahey et al., 2003; Pogarsky et al., 2003).

There have been a number of studies testing the association between teenage childbearing and early childhood outcomes for offspring. Recent quasi-experimental studies have attempted to differentiate between the specific effects of maternal age at childbearing and the influence of family background characteristics by using sibling– and cousin-comparison analyses. Geronimus et al. (1994) conducted a landmark study using a nationally representative sample to compare children born to teenage mothers with their later-born cousins. Cousin-comparisons contrast differentially exposed offspring (i.e., children born to teenage mothers are compared to their cousins who were born to older mothers). These comparisons control for unmeasured, family-level genetic and environmental factors that make cousins similar (D'Onofrio et al., 2005). The study found no differences between children born to teenage mothers and those born to older mothers with regard to test scores on standardized tests of achievement, and in some cases, children born to teenage mothers performed better (Geronimus et al., 1994). This study, therefore, suggested that the

differences in offspring achievement were not caused by being born to young mothers; rather, the results suggest that unmeasured factors that make cousins similar account for the increased risk of achievement problems observed among offspring born to teenage mothers. Similarly, Turley (2003) used cousin comparisons to test whether there was a causal association between teenage childbearing and offspring scores on standardized tests of achievement and behavior problems. These results also did not find support for a causal association between early maternal age at childbearing and offspring educational achievement and behavior problems. The studies, therefore, suggest that maternal age at birth is not causally associated with poor offspring achievement scores and behavior problems; instead, differences in family background accounted for increased risk among children born to teen mothers compared to children born to older mothers.

More recently, however, a study using sibling comparisons found that maternal age was independently associated with offspring childhood behavior problems (D'Onofrio et al., 2009), which supports a causal association. The discordant-sibling design used in this study compared outcomes for earlier and later-born offspring, who were born when their mother was no longer a teenager. Sibling comparisons control for unmeasured environmental and genetic factors that are shared by siblings in a family in order to test causal hypotheses about environmental effects of teenage childbearing (Lahey & D'Onofrio, 2010). D'Onofrio et al. (2009) found evidence that supported a causal association between maternal age at childbearing and offspring behavior problems, with early age at childbearing associated with increased risk for offspring behavior problems. The study also found the association was moderated by birth order—the association between maternal age at childbearing and childhood behavior problems was stronger for second and third-born offspring (D'Onofrio et al., 2009).

**4.2.2. Adolescent and young adult outcomes—**Longitudinal and cross-sectional studies have found that, offspring born to teen mothers are more likely to have conduct problems, contact with the criminal justice system, or be convicted of a crime during adolescence (Dahinten et al., 2007; Jaffee et al., 2001; Nagin et al., 1997). Longitudinal studies have found that children from large families born to teenage mothers were at increased risk for criminal conviction (Jaffee et al., 2001; Nagin et al., 1997; Pogarsky et al., 2003; Pogarsky et al., 2006). The association may be due to poor parental monitoring, family poverty, physical neglect, parental psychopathology, and parental criminal history (Nagin et al., 1997).

Other studies have found that being born to a teenage mother is associated with adolescent problems across multiple domains. Shaw et al. (2006) found that adolescents born to teen mothers showed increased psychological distress, poorer school performance, poorer reading ability, greater contact with the criminal justice system, and increased use of alcohol/cigarettes when they were 14 years old. Accounting for maternal characteristics (e.g., SES, family structure, maternal depression and maternal smoking) attenuated the associations only slightly, suggesting that being born to a teenage mother has negative effects on offspring adolescent development (Shaw et al., 2006). Similarly, a longitudinal study of Canadian youths found that early maternal age was related to lower standardized math scores and more externalizing and internalizing problems for offspring between the ages of 10 and 15 years old, even after accounting for family functioning and family SES (Dahinten et al., 2007). Pogarsky and colleagues (2006) also found elevated risk of drug use, gang membership, unemployment, school dropout, early childbearing and depressive symptoms for young adults born to mothers who began childbearing before age 19. In general, longitudinal studies suggest that offspring born to teenage mothers exhibit a variety of deficits and problems behaviors during adolescence.

Few studies have attempted to test causal inferences regarding adolescent and adult outcomes for offspring with quasi-experimental designs. A study using children-of-twin comparisons found that the association of teen motherhood with offspring behavior problems and substance use was partially confound by family background factors that influence both generations. In the children-of-twins design, differentially exposed offspring of dizygotic (DZ) twins are compared to each other. These cousins share approximately 12.5% of their genetic makeup. The differentially exposed offspring of monozygotic (MZ) twins, or cousins who are genetically like half-siblings sharing 25% of their genes, are also compared. Contrasting the offspring of DZ and MZ twins provides information about possible genetic factors that confound the association between adolescent childbearing and offspring criminal convictions (D'Onofrio et al., 2009; D'Onofrio et al., 2005). The results of the Harden et al. (2007) study were consistent with a causal association between teen motherhood and offspring mental health problems--the association between teenage childbearing and offspring behavior and substance use problems remained even when controlling for genetic factors passed down from the twins to their offspring and environmental factors shared by cousins (Harden et al., 2007).

### 4.3. Developmental explanations for offspring outcomes

**4.3.1. Social influence—**The social-influence hypothesis presumes that negative outcomes associated with teenage childbearing are due to the specific effects of teenage childbearing. The social-influence hypothesis focuses on how teenage childbearing disrupts the developmental trajectory of young mothers, introducing social and economic stressors that constrain their ability to parent effectively (Jaffee et al., 2001). As a consequence of early childbearing, teen mothers have lower educational achievement, which may constrain employment opportunities (see Section 4.1.1). Additionally, teen mothers are more likely to be single parents. The combination of these factors increases the likelihood that teenage mothers will be raising their children in a sociodemographic profile marked by poverty and low maternal education attainment that is associated with poor outcomes. Therefore, the social-influence hypothesis posits that it is the developmentally disruptive effect of the timing of teenage childbirth that produces poor outcomes for teenage mothers and their children.

**4.3.2. Social selection—**The social selection hypothesis is another hypothesis used to explain why teenage mothers and their offspring are at increased risk for poor outcomes. Social selection presumes there are psychosocial factors that both (a) place certain women at higher risk for teen childbirth and (b) are associated with the way in which teenage mothers raise their children (Jaffee et al., 2001). For example, antisocial behavior may increase the likelihood that a young woman gives birth as a teenager and also influence the way she parents her child. The early timing of childbirth is associated with the same risk factor (e.g., antisocial behavior) that would influence how the teen mother raises her child. Poor offspring outcomes, thus, may be due to maternal selection factors that influence both the likelihood that a young woman becomes a teen mother and the likelihood that her children experience poor outcomes.

These selection factors could be environmental and/or genetic. The possibility of *genetic* selection factors stems from a phenomenon referred to as gene-environment correlation (e.g., Scarr & McCartney, 1983). Genetic and environmental factors are interrelated, and genetic factors can influence exposure to different environments (Kendler & Baker, 2007; Plomin et al., 1977). Gene-environment correlation occurs when environmental risks, such as maternal teenage childbearing, are correlated with genetic risks. In this case, genetic factors associated with teenage childbirth may also be associated risks for poor maternal and offspring outcomes. There is evidence from behavior genetics studies that age at first

childbearing is heritable, which suggests that genetic factors may be associated with teenage childbirth (Rodgers et al., 2007). There are different types of gene-environment correlation that may confound the association between teenage childbirth and maternal and offspring outcomes. *Active* gene-environment correlation occurs when genetic factors influence individuals' behavior and the environments they select for themselves (Jaffee, 2011; Rutter, 2007). For example, genetic factors may influence the likelihood that a young woman becomes a teenage mother (e.g., genetic factors associated with impulsivity that would impact sexual decision-making) and these factors may also influence environmental experiences (e.g., genetic factors associated impulsivity that would impact academic achievement) associated with poor maternal outcomes. *Evocative* gene-environment correlation occurs when genetic factors influence individuals' behaviors and subsequently evoke particular environmental experiences and responses. For example, genetic factors may influence the likelihood that a young woman becomes a teenage mother (e.g., genetic factors associated with impulsivity that would influence sexual decision-making) and these factors may evoke environmental responses (e.g., negative responses from social supports like parents and friends) that influence poor maternal outcomes. Active and evocative gene-environment correlation can influence maternal outcomes but not offspring outcomes; genetic influences on offspring behaviors cannot influence their earlier exposure to environmental risk (i.e., the age at which their mother gave birth). Instead, poor offspring outcomes may be due to genetic confounding due to *passive* gene-environment correlation, which occurs because teen mothers provide both the genes and environment for their children (Rutter, 2007). Future studies must account for the possibility that shared genetic liability (the same genetic factors influencing maternal teenage childbearing and offspring development due to passive gene-environment correlation) when studying the putative environmental risks associated with teenage childbearing (Lahey & D'Onofrio, 2010).

### 4.4. Summary

In summary, most studies have found that teenage childbearing is associated with poorer outcomes for teenage mothers and their children. Teenage mothers are more likely to experience socioeconomic disadvantage, mental and physical health problems than women who give birth as adults; however, the studies reviewed in this section were not able to rigorously test whether the association is due to teenage childbearing or selection factors that preceded teenage childbearing. For example, the increased risk of low SES or premature death could be causal or due to selection factors that influence both the likelihood of teenage childbearing and low SES or premature death.

The findings for the offspring of teenage mothers are mixed. Across numerous developmental areas, offspring born to teenage mothers are at greater risk for poor outcomes during childhood and adolescence than offspring born to adult mothers. Cousin-comparison studies of offspring antisocial behavior found that cousins whose mothers were discordant for adolescent childbearing had equally high ratings of externalizing problems, suggesting that maternal age at childbirth is not causally associated with offspring externalizing problems (Geronimus et al., 1994; Turley, 2003). More recently, two studies using sibling comparisons and a children-of-twins design found that maternal age was independently associated with offspring conduct problems (D'Onofrio et al., 2009) and adolescent externalizing problems (Harden et al., 2007), supporting a causal inference. Given the mixed findings from existing quasi-experimental studies, more research and studies utilizing designs that control for measured and unmeasured factors are needed in order to identify the underlying mechanisms that account for the association between adolescent childbearing and offspring childhood and adolescent outcomes.

## 5. FUTURE DIRECTIONS

In the decade and a half since Coley & Chase-Lansdale (1998) published their review, there has been a dramatic increase in the number of studies evaluating teenage childbirth from a developmental psychological perspective. We now have an emerging understanding of teenage childbearing as the culmination of a complex cascade of experiences and decisions shaped by individual, familial, and socioeconomic factors. There are consecutive steps that lead to childbirth: (1) initiation of sexual activities, (2) ineffective contraceptive use, and (3) the decision to carry the pregnancy to term. Different factors may influence decision-making at each step in the sequence leading from sexual activity to childbirth, highlighting the critical need for developmental research on teenage childbearing. Future research will need to integrate information from several fields of research, including intervention studies, epidemiological research, and developmental psychology and psychopathology research in order to (1) identify which risk factors are causally and specifically associated with teenage childbearing and which factors are broadly associated with problems during adolescence (e.g., delinquency); (2) clarify whether poor maternal outcomes and offspring outcomes are due to disruptions caused by early childbearing or whether they are due to common selection factors associated with both teenage childbearing and poor outcomes; and (3) understand heterogeneity in risk factors associated with teenage childbearing. The following section describes several methodological approaches that will be important in future research designed to answer questions about the causes and consequences of teenage childbirth.

### 5.1. Quasi-experimental studies

There is a growing consensus in numerous fields, including sociology (Freese, 2008), family studies (D'Onofrio & Lahey, 2010), psychology (Rutter et al., 2001; Shadish et al., 2002) and medicine (Academy of Medical Science Working Group, 2007) for researchers to use quasi-experimental design. In studies of teenage childbearing, quasi-experimental comparisons of discordant siblings, cousins, and children-of-twins have been used (although there is only a handful of studies) to control for varying degrees of shared environmental and genetic confounds that could account for the associations between teenage childbearing and poor maternal and offspring outcomes.

We, therefore, reiterate the call by Coley and Chase Lansdale (1998) for researchers to utilize quasi-experimental designs to rigorously test causal inferences regarding teenage childbearing. Discordant-sibling, cousin and twin comparisons, and other genetically-informed designs provide a way to approximate a true experiment using observational data (Rutter et al., 2001). Using sibling discordance in exposure to risk (i.e., siblings were differentially exposed to maternal teenage childbearing) is a way to test if exposure is causal. There are many advantages, such that these designs provides rigorous ways to identify the underlying mechanisms through which a risk factor (e.g., teenage childbearing) influences offspring outcomes (e.g., childhood behavior problems). In particular, the design tests whether the associations are due to "selection bias" or are consistent with a causal association. Studies to test whether teenage childbearing is causally associated with offspring outcomes also can compare cousins "differentially exposed" to teenage motherhood. The approach would account for all factors that make cousins similar, including genetic factors (they share roughly 12.5% of their genetic makeup) and some environmental factors.

Combining multiple quasi-experimental approaches also can help to identify whether the confounding factors are genetic or environmental in nature. Combining within-family comparisons of siblings and cousins with different levels of relatedness (i.e., half and full siblings and cousins, as well as children of dizygotic and monozygotic twin sisters) can disentangle the confounding environmental and genetic effects on offspring outcomes. The

systematic variation in genetic relatedness between half-cousins, full-cousins, children of DZ twins (genetically equivalent to full cousins) and children of MZ twins (genetically equivalent to full siblings) allows us to separate genetic and environmental effects on a given outcome, such as offspring behavior problems (D'Onofrio et al., 2010; D'Onofrio et al., 2003; Neale & Cardon, 1992). For example, if the magnitude of the association between teenage childbearing and offspring childhood behavior problems decreases as the magnitude of genetic similarity increases across comparison groups (e.g., smaller association in differentially exposed offspring of MZ twins than in differentially exposed DZ twins) then the results imply genetic factors account for the risk of offspring criminal conviction associated with adolescent childbearing (D'Onofrio et al., 2005). On the other hand, if the association is smaller in all related groups (half- and full-siblings, cousins, children of twin sisters) when compared to unrelated groups, regardless of level of relatedness, there is evidence of environmental confounds. In sum, the designs can rigorously test causal inferences *and* help researcher identify the true causal mechanisms if familial confounding accounts for the associations seen in populations.

It is quite important to note, however, that there are assumptions and limitations inherent to all quasi-experimental designs, including sibling, cousin and children-of-twin approaches, that need to be considered when using these designs to study the causes and consequences of teenage childbearing (East & Jacobson, 2000; Lahey & D'Onofrio, 2010). First, there is the assumption in sibling comparison studies that sisters share similar home, school and peer environments (within-family homogeneity), as well as sharing some of the genetic risk associated with teenage childbearing. The sibling comparison design cannot account for environmental confounds (i.e., parenting) that differentially influence the siblings. Therefore, studies using discordant sibling comparisons should include measurement of potential environmental confounds that vary among siblings in a family and are correlated with both the risk factor the outcome of interest (Lahey & D'Onofrio, 2010). Potential confounds might include environmental factors that can vary over time, such as family structure or family hardship, or across siblings, such as parenting.

Second, discordant sibling comparison designs assume that one sibling's exposure to the environmental risk does not influence the unexposed sibling (Lahey & D'Onofrio, 2010). Sibling comparisons overlook the unique characteristics of sisters of teenage mothers--experiencing a sister's teenage childbearing might influence their decision to delay or encourage earlier childbearing (East & Jacobson, 2000). Studies have shown there are possible sibling effects associated with teenage childbearing—younger sisters of teenage mothers may become more aware of the hardships associated with parenting, or their parents may more actively dissuade them from childbearing (East & Kiernan, 2001; East et al., 2009). Future studies should include measures that assess environmental factors (e.g., changes in parenting or attitudes about childbirth) that might influence the likelihood one sister would give birth earlier than the other and subsequently influence her offspring.

Third, sibling comparisons overlook differences in sisters' outcomes that may be due to birth order and differences in age. There are, however, study designs that can specifically test birth-order effects in sibling comparisons using both within- and between-family comparisons (Donovan & Susser, 2011) by including birth order as a covariate or by more explicitly testing birth-order effects (D'Onofrio et al., 2009). If changes within the family environment associated with birth order (e.g., changes in family hardship or parental competence with the addition of siblings) differentially influence the risk of teenage childbirth between sisters, then more refined measures of these outcomes should be included in future studies.

Donovan & Susser (2011) suggest variations on sibling comparisons that take advantage of the dynamic changes that can occur in families over time. The "older sibling/younger sibling design" is a method that is still being developed to test age-specific effects of family, social, and peer environments on sibling outcomes (Donovan & Susser, 2011). The design requires identifying the younger sibling of an older sibling who has experienced the risk outcome (e.g., the younger sister of a young woman who began childbearing as a teenager) and assumes that the older sibling is considered a marker of increased risk for teenage childbearing for the younger sister. The older/younger sibling comparison may provide a way to study social and environmental processes that influence the likelihood of outcomes such as teenage childbearing among a high-risk group of adolescents (e.g., younger sisters of teenage mothers) (Donovan & Susser, 2011).

Despite the limitations and assumptions related to sibling and cousin comparisons, they are still powerful techniques that can be used to disentangle selection effects from causal associations (Rutter et al., 2001). Discordant sibling and cousin comparisons can be used to test causal hypotheses about risk factors associated with teenage childbearing. For example, cousin-comparison studies that focus on the effects of sociodemographic factors or the putative intergenerational transmission of teenage childbearing can determine if there are causal associations. Despite the limitations and assumptions related to sibling and cousin comparisons, they are still powerful techniques that can be used to disentangle selection effects from causal associations (Rutter et al., 2001).

Discordant sibling and cousin comparisons can be used to test causal hypotheses about risk factors that are associated with teenage childbearing. The validity of these comparisons is contingent, in part, on developing alternative hypotheses that reflect plausible developmental processes related to teenage childbearing. For example, the association between teenage childbearing and offspring outcomes could be due to social-selection effects (i.e., teenage childbearing is a marker for sociodemographic risk associated with both the outcome and the likelihood of teenage childbearing). Alternatively, the association between teenage childbearing and offspring outcomes could be causal (i.e., the early timing of teenage childbirth increases the risk of offspring poor outcomes). Comparing siblings differentially exposed to teenage childbearing (i.e., a sibling born when the mother was a teenager and a later-born sibling) controls for some of the genetic risk and all of the sociodemographic risk shared by siblings in a family. If the sibling exposed to teenage childbearing shows poorer outcomes relative to the later born sibling the results support a causal association between teenage childbearing and offspring poor outcomes. If there is no difference in the outcome measure between differentially exposed siblings the results suggest the poor outcome is not causally related to the specific timing of childbirth; instead, the association appears to be accounted for by sociodemographic risk shared by all siblings in the family. In such cases, we encourage researchers to further explore maternal age at first childbearing (using a differentially exposed cousin or offspring of twins design), as age at first childbearing may be a risk factor that influences all siblings.

Before using the designs, though, researchers must clearly identify the developmental mechanisms they want to explore. For example, do the researchers believe that focal maternal age at childbearing is the most important factor or is the mother's first age at childbearing the most important? Such theoretical understanding will guide the design and implementation of the appropriate quasi-experimental approach.

Researchers may be reluctant to use quasi-experimental designs to answer questions about the causes and consequences of teenage childbirth for a few reasons. First, large samples are needed to achieve the statistical power necessary to detect effects using these designs. In the United States, some longitudinal, nationally-representative data sets, such as the National

Longitudinal Survey of Youth (NLSY), are open to the public. Other national data sets and registries may be less easy to access and may require consent from the institutions and researchers responsible for maintaining them. Second, researchers may be unfamiliar with the analytic techniques used to compare siblings and cousins, and additional training may be necessary. Both of these obstacles can be addressed by encouraging collaboration between researchers with an interest in the developmental processes associated with the causes and consequences of teenage childbirth and those researchers with the analytic expertise and access to data sets. It is also important to note that quasi-experimental designs represent one important part of interdisciplinary efforts to understand teenage childbirth. There are other types of studies and approaches that are necessary to advance our understanding of how risk factors are associated with poor outcomes for teenage mothers and their offspring (Rutter et al., 2010).

### 5.2. Population-based samples and cross-national comparisons

Population-based samples and cross-national comparisons provide a way to generate generalizable results. The low base rate of teenage childbearing (4% in the U.S.) (Alan Guttmacher Institute, 2010) highlights the importance of using large population-based samples for analysis. Many studies have been conducted using smaller samples of at-risk individuals, which limits the generalizability of findings. Large nationally-representative datasets and national registries containing information about genetic relatedness can be used to test causal hypotheses.

Additionally, cross-national comparisons can identify differences in the sexual behavior of teenagers and highlight potential structural factors (e.g., access to contraceptives, sexual education, availability of adolescent health services, or national policies) that influence adolescent sexual behavior (Santelli, Sandfort, & Orr, 2008). More distal factors such as a nation's social norms regarding adolescent sexual behavior, religious values, and economic development may influence sexual behavior differently across nations (Santelli, Sandfort & Orr, 2008). In some nations, such as the Netherlands or Sweden, there are fewer serious short-term and long-term health-compromising consequences of teenage childbearing. Therefore, cross-national comparisons can provide ways to explore multifinality in outcomes associated with teenage sexual behavior and childbearing and provide information about mechanisms that account for heterogeneity in these outcomes.

### 5.3. Qualitative and quantitative research

Quantitative and qualitative studies can be used in combination in order to identify relevant risk factors and better understand their effects. Smaller, more-detailed qualitative studies are needed that help researchers focus on hypotheses that should be tested and how to interpret findings (Breheny & Stephens, 2007; East et al., 2009; Rolfe, 2008). For example, qualitative research that identifies how siblings respond to their older sister's teenage childbirth can provide researchers with plausible explanations for empirical findings and help them to identify what important factors should be studied next (East et al., 2009). Used in conjunction with quantitative studies, qualitative studies can describe the processes that link risk factors and outcomes and construct theoretical frameworks for understanding the processes (Shadish et al., 2002). Qualitative studies can also guide the interpretation of ambiguous or confusing findings generated by quantitative studies (Shadish et al., 2002).

Additionally, findings from smaller qualitative studies can inform the design of larger longitudinal studies with the appropriate design and sample size to test for causal associations. Longitudinal studies with detailed multi-level measurement of risk factors and outcomes allow for within-individual change over time. These studies can show whether maternal and offspring outcomes are better or worse after exposure to a particular risk factor

or event (e.g., teenage childbearing). Longitudinal studies that combine measures of sociodemographic factors with measures of family functioning (e.g., parenting measures, parent-child relationship quality), peer relationships and individuals psychological risk factors are need to identify if there are different developmental trajectories associated with teenage pregnancy and childbearing (see Section 5.5). Studies with repeated measures across childhood and adolescent developmental periods would also improve our understanding of which factors are related to the sexual decision-making leading up to teenage childbirth.

### 5.4. Intervention studies

There has been an increased emphasis on evidence-based approaches to teen pregnancy prevention in recent years, and researchers are drawing attention to interdisciplinary work that builds on results from different areas of study in an effort to strengthen prevention policies and improve health outcomes (Santelli & Kirby, 2010).

Intervention studies can contribute to our understanding of the underlying mechanisms that lead to teenage childbirth and lead to the negative outcomes for teenage mothers and their children. Longitudinal studies can be used to follow what happens when an intervention is implemented or a risk factor is removed or remedied (Santelli & Kirby, 2010). Studies designed to target outcomes that are not directly related to teenage childbearing have been found to unintentionally decrease teenage childbearing. For example, the Multidimensional Treatment Foster Care (MTFC) behavioral intervention used to treat juvenile delinquency also decreased pregnancy rates among girls in the delinquency and foster care system (Chamberlain & Smith, 2005; Kerr et al., 2009). The authors hypothesize that the MTFC targeted processes such as parental monitoring and support for academic achievement that impacted deviant peer involvement and school engagement, perhaps resulting in less unprotected sex.

### 5.5. Studies of heterogeneity in risks and outcomes

A comprehensive etiological model of teenage childbearing needs to be able to explain heterogeneity in risk factors and outcomes, both in terms of predicting teenage childbearing itself and predicting the consequences of teenage childbearing for both teen mothers and their children. Not all young women who become teenage mothers engage in antisocial or delinquent behavior, and it would be incorrect to pathologize all teenage mothers. Therefore, research is needed to identify whether there are different developmental trajectories that lead to teenage childbirth and which risk and protective factors account for the associations.

Given the theoretical and preliminary findings regarding differences among teenage mothers, we recommend using longitudinal and cross-sectional studies to specifically test for heterogeneity in the prediction and consequences of teenage childbearing. There are advanced statistical tools (e.g., Muthen, 2004) that can specifically examine heterogeneity statistically rather than relying on post-hoc categorizations. Research using growth mixture models can identify these different groups and model change over time to help identify which risk factors are associated with better or worse outcomes (Muthen, 2004). Researchers should design their studies and use the appropriate statistical approaches to better understand the differences among teenage mothers and their offspring.

Intervention studies can also be used to address heterogeneity in risk factors and outcomes associated with teenage childbearing. Determining which populations respond better to different interventions can help identify both risk and protective factors that may differ among populations of young women (Jessor et al., 1998). Wakschlag and Hans (2000) identified two populations of teenage mothers that would require qualitatively different types of interventions: teen mothers for whom teenage childbearing was an adaptive life

choice and teenage mothers for whom childbearing was related to other adolescent problem behaviors. Additionally, a growing body of neurobiological research suggests that attention needs to be paid to the psychobiological, social, and emotional processes that make teenage mothers different from adult mothers (Mileva-Seitz & Fleming, 2011). There may be ways in which early adversity influences the psychobiological processes associated with mothering, especially in high-risk populations such women who become teenage mothers. Research is needed to determine which physiological and psychological mechanisms might mediate the relationship between early adversity and teenage mothering (Mileva-Seitz & Fleming, 2011).

## 6. CONCLUSION

In the decade and a half since Coley & Chase-Lansdale's (1998) review there have been a number of studies investigating teenage childbearing from a developmental psychological perspective. Some studies have explored family functioning, childhood and adolescent psychopathology, parental-functioning, and socioeconomic factors as risk associated with adolescent childbearing (Jaffee et al., 2001; Nagin et al., 1997; Woodward & Fergusson, 1999; Zoccolillo et al., 2004). Many of these studies have focused primarily on the identifying factors that are highly correlated with teenage sexual behavior and teenage childbearing (East & Kiernan, 2001; Jaffee et al., 2001; Mersky & Reynolds, 2007; Pogarsky et al., 2006; Woodward et al., 2001). Developmental psychologists have used a number of existing longitudinal studies to explore how risk factors related to other developmental problems may be associated with teenage childbearing (e.g., Woodward et al., 2001). Studies have applied a theory-driven approach to analyzing longitudinal and cross-sectional data from national surveys, elaborating on what we know about teenage sexual behavior and childbearing.

The current review is somewhat pessimistic, though, because much of this research relies on correlational and cross-sectional research designs that are limited in their ability to answer questions of causality or to identify mechanisms associated with teenage childbearing. Innovative studies using large, nationally representative samples and quasi-experimental and longitudinal designs can move beyond descriptive studies to identify the underlying mechanisms that explain how risk factors from a variety of domains influence teenage sexual behavior and childbearing. Quasi-experimental studies can help answer questions about which risk factors are causally associated with teenage childbearing and suggest potential mechanisms that can explain how teenage childbearing is associated with poor outcomes (D'Onofrio et al., 2009; Geronimus et al., 1994; Harden et al., 2007; Lahey & D'Onofrio, 2010; Shadish et al., 2002; Turley, 2003). Although advances have been made in the psychological study of teenage childbearing, more research is needed to answer important questions about which psychological processes are causally related to teenage childbearing and how teenage childbearing is associated with poor outcomes for young mothers and their offspring. Studies using quasi-experimental design and longitudinal design are needed to test causal associations between risk factors associated with teenage childbearing and maternal and offspring outcomes. Additionally, longitudinal studies that incorporate quantitative and qualitative measures are also essential for studying heterogeneity in the risk factors and outcomes associated with teenage childbearing. The use of more advanced designs as described earlier will be enable policymakers to identify the best targets for cost-effective public health interventions (Rutter et al., 2010).

## References


Academy of Medical Science Working Group. Identifying the Environmental Causes of Disease: How Should We Decide What to Believe and When to Take Action?. London: Academy of Medical Sciences; 2007.

Alan Guttmacher Institute. U.S. teenage pregnancy statistics: National and state trends and trends by race and ethnicity. New York: Author; 2010.

Barber JS. The intergenerational transmission of age at first birth among married and unmarried men and women. Social Science Research. 2001; 30:219–247.

Boden JM, Horwood LJ. Self-esteem, risky sexual behavior, and pregnancy in a New Zealand birth cohort. Archives of Sexual Behavior. 2006; 35(5):549–560. [PubMed: 17053998]

Borkowski, JG.; Whitman, TL.; Farris, JR. Adolescent mothers and their children: Risks, resilience, and development. In: Borkowski, JG.; Farris, JR.; Whitman, TL.; Carothers, SS.; Weed, K., editors. Risk and resilience: Adolescent mothers and their children grow up. Mahwah, NJ, US: Lawrence Erlbaum Associates Publishers; 2007. p. 1-34.

Breheny M, Stephens C. Individual responsibility and the social constraint: The construction of adolescent motherhood in social scientific research. Culture, Health & Sexuality. 2007; 9(4):333–346.

Brown SS, Suellentrop K. What is to be done about the rise in teen childbearing? Journal of Adolescent Health. 2009; 45:1–2. [PubMed: 19541241]

Bukowski, WM.; Brendgen, M.; Vitaro, F. Handbook of socialization: Theory and research. (PP. 2355–2381). New York, NY, US: Guilford Press; 2007. Peers and Socialization: Effects on Externalizing and Internalizing *Problems Grusec, Joan E.; Hastings, Paul D* (pp. (2007); p. xvp. 2720

Casares WN, Lahiff M, Eskenazi B, Halpern-Felsher BL. Unpredicted trajectories: The relationship between race/ethnicity, pregnancy during adolescence and young women's outcomes. Journal of Adolescent Health. 2010; 47:143–150. [PubMed: 20638006]

Caspi A, Lynam D, Moffitt TE, Silva PA. Unraveling girls' delinquency: Biological, dispositional, and contextual contributions to adolescent misbehavior. Developmental Psychology. 1993; 29(1):19–30.

Centers for Disease Control and Prevention. Preventing Teen Pregnancy in the US. Atlanta: 2011 Apr. Retrieved from http://www.cdc.gov/VitalSigns/pdf/2011-04-vitalsigns.pdf.

Chamberlain, P.; Smith, DK. Multidimensional Treatment Foster Care: A Community Solution for Boys and Girls Referred From Juvenile Justice. In: Hibbs, ED.; Jensen, PS., editors. Psychosocial treatments for child and adolescent disorders: Empirically based strategies for clinical practice. 2nd ed.. Washington, DC, US: American Psychological Association; 2005. p. 557-573.

Chen X-K, Wen SW, Fleming N, Demissie K, Rhoads GG, Walker M. Teenage pregnancy and adverse birth outcomes: a large population based retrospective cohort study. International Journal of Epidemiology. 2007; 36:368–373. [PubMed: 17213208]

Colen CG, Geronimus AT, Phipps MG. Getting a piece of the pie? The economic boom of the 1990s and declining birth rates in the United States. Social Science & Medicine. 2006; 63:1531–1545. [PubMed: 16753244]

Coley RL, Chase-Lansdale PL. Adolescent pregnancy and parenthood: Recent evidence and future directions. American Psychologist. 1998; 53(2):152–166. [PubMed: 9491745]

Costa FM, Jessor R, Donovan JE, Fortenberry JD. Early initiation of sexual intercourse: The influence of psychosocial unconventionality. Journal of Research on Adolescence. 1995; 5(1) 93-93-121.

D'Onofrio BM, Goodnight JA, Van Hulle CA, Rodgers JL, Rathouz PJ, Waldman ID, Lahey BB. Maternal age at childbirth and offspring disruptive behaviors: Testing the causal hypothesis. Journal of Child Psychology and Psychiatry. 2009; 50(8):1018–1028. [PubMed: 19281603]

D'Onofrio BM, Lahey BB. Biosocial influences on the family: A decade review. Journal of Marriage and Family. 2010; 72:762–782.

D'Onofrio BM, Singh AL, Iliadou A, Lambe M, Hultman CM, Neiderhiser JM, Laangstroem N, Lichtenstein P. A Quasi-Experimental Study of Maternal Smoking During Pregnancy and Offspring Academic Achievement. Child Development. 2010; 81(1) 80-80-100.

D'Onofrio BM, Turkheimer E, Eaves LJ, Corey LA, Berg K, Solaas MH. The role of Children of Twins design in elucidating causal relations between parent characteristics and child outcomes. Journal of Child Psychology and Psychiatry. 2003; 44:1130–1144. [PubMed: 14626455]

D'Onofrio BM, Turkheimer E, Emery RE, Slutske WS, Heath AC, Madden PA, Martin NG. A Genetically Informed Study of Marital Instability and Its Association With Offspring Psychopathology. Journal of Abnormal Psychology. 2005; 114(4):570–586. [PubMed: 16351381]

D'Onofrio BM, Goodnight J, Van Hulle CA, Waldman ID, Rodgers JL, Harden KP, Rathouz PJ, Lahey BB. Maternal age at childbirth and childhood conduct problems: Strengthening the causal inference. Journal of Child Psychology and Psychiatry. 2009; 50(8)

Dahinten VS, Shapka JD, Willms JD. Adolescent children of adolescent mothers: The impact of family functioning on trajectories of development. Journal of Youth and Adolescene. 2007; 36:195–212.

Darroch JE, Singh S, Frost JJ. Differences in teenage pregnancy rates among five developed countries: The roles of sexual activity and contraceptive use. Family Planning Perspectives. 2001; 33(6):244–250. [PubMed: 11804433]

Donovan SJ, Susser E. Commentary: Advent of sibling designs. International Journal of Epidemiology. 2011; 40:345–349. [PubMed: 21450688]

East PL, Felice ME, Morgan MC. Sisters' and girlfriends' sexual and childbearing behavior: Effects on early adolescent girls' sexual outcomes. Journal of Marriage and the Family. 1993; 55:953–963.

East PL, Jacobson LJ. Adolescent childbearing, poverty, and siblings:Taking new directions from the new literature. Family Relations. 2000; 49:287–292.

East PL, Kiernan EA. Risks among youths who have multiple sisters who were adolescent parents. Family Planning Perspectives. 2001; 33(2):75–80. [PubMed: 11330854]

East PL, Reyes BT, Horn EJ. Association between adolescent pregnancy and a family history of teenage births. Perspectives on Sexual and Reproductive Health. 2007; 39(2):108–115. [PubMed: 17565624]

East PL, Slonim A, Horn EJ, Trinh C, Reyes BT. How an adolescent's childbearing affects siblings' pregnancy risk: A qualitative study of Mexican American youths. Perspectives on Sexual and Reproductive Health. 2009; 41(4):210–217. [PubMed: 20444174]

Ellis BJ, Bates JE, Dodge KA, Fergusson DM, Horwood LJ, Petit GS, Woodward L. Does father absence place daughters at special risk for early sexual activity and teenage pregnancy? Child Development. 2003; 74(3):801–821. [PubMed: 12795391]

Fergusson DM, Horwood LJ. Male and female offending trajectories. Development and Psychopathology. 2002; 14:159–177. [PubMed: 11893091]

Fergusson DM, Woodward LJ. Maternal age and educational and psychosocial outcomes in early adulthood. Journal of Child Psychology and Psychiatry and Allied Disciplines. 1999; 40(3):479–489.

Finer LB, Zolna MR. Unintended pregnancy in the United States: incidence and disparities, 2006. Contraception. (in press).

Freese J. Genetics and the Social Science Explanation of Individual Outcomes. American Journal of Sociology. 2008; 114:S1–S35.

Ge X. The developmental interface between nature and nurture: A mutual influence model of child antisocial behavior and parent behaviors. Developmental Psychology. 1996; 32:54–589.

Geronimus AT. Damned if you Do: Culture, identity, privelege, and teenage childbearing in the United States. Social Science and Medicine. 2003; 57(5):881–893. [PubMed: 12850113]

Geronimus AT, Bound J, Waidmann TA. Health inequality and population variation in fertility-timing. Social Science and Medicine. 1999; 49:1623–1636. [PubMed: 10574234]

Geronimus AT, Korenman S, Hillemeier MM. Does young maternal age adversely affect child development? Evidence from cousin comparisons in the United States. Population and Development Review. 1994; 20(3):585–609.

Hamilton B, Martin J, Ventura S. Births: preliminary data for 2008. National Vital Statistics Reports. 2010; Vol. 58

Harden KP, Lynch SK, Turkheimer E, Emery RE, D'Onofrio BM, Slutske WS, Waldron M, Heath A, Statham DJ, Martin NG. A behavior genetic investigation of adolescent motherhood and offspring

mental health problems. Journal of Abnormal Psychology. 2007; 116(4):667–683. [PubMed: 18020715]

Hockaday C, Crase SJ, Shelley MC, Stockdale DF. A prospective study of adolescent pregnancy. Journal of Adolescence. 2000; 23:423–438. [PubMed: 10936015]

Hoffman, S. By the numbers: The public costs of teen childbearing. Washington, D. C.: National Campaign to Prevent Teen Pregnancy; 2006.

Hope TL, Wilder EI, Watt TT. The relationships among adolescent pregnancy, pregnancy resolution and juvenile delinquency. The Sociological Quarterly. 2003; 44(4):555–576.

Huffman, R.; Flanigan, C. Science Says: Younger siblings of teen parents: Increased risk of teen pregnancy?. Washington, D.C.: The National Campaign to Prevent Teen Pregnancy; 2004.

Jaffee, S. Genotype-environment correlations: Definitions, methods of measurement, and implications for research on adolescent psychopathology. In: Kendler, KS.; Jaffee, S.; Romer, D., editors. The Dynamic Gene and Mental Health: The role of genes and environments in youth development. New York: Oxford University Press; 2011.

Jaffee S, Caspi A, Moffitt TE, Belsky J, Silva P. Why are children born to teen mothers at risk for adverse outcomes in young adulthood? Results from a 20-yr longitudinal study. Development and Psychopathology. 2001; 13(2):377–397. [PubMed: 11393652]

Jessor R. Risk behavior in adolescence: A psychosocial framework understanding and action. Developmental Review. 1992; 12:374–390.

Jessor, R.; Jessor, SL. Problem behavior and psychosocial development: A longitudinal study of youth. New York: Academic Press; 1977.

Jessor R, Turbin MS, Costa FM. Risk and protection in successful outcomes among disadvantaged adolescents. Applied Developmental Science. 1998; 2(4):194–208.

Kendler KS, Baker J. Genetic influences on measures of the environment: A systematic review. Psychological Medicine. 2007; 37:615–626. [PubMed: 17176502]

Kerr DCR, Leve LD, Chamberlain P. Pregnancy rates among juvenile justice girls in two randomized control trials of multidimensional treatment foster care. Journal of Consulting and Clinical Psychology. 2009; 77(3):588–593. [PubMed: 19485598]

Kerr, M.; Stattin, H.; Kiesner, J. Peers and problem behavior: Have we missed something?. In: Engels, R.; Kerr, M.; Stattin, H., editors. Friends, Lovers and Groups. West Sussex, England: John Wiley & Sons, Ltd; 2007. p. 125-154.

Kost, K.; Henshaw, S.; Carlin, L. U.S. teenage pregnancies, births and abortions: National and state trends and trends by race and ethnicity. New York: Alan Guttmacher Institute; 2010.

Lahey BB, D'Onofrio BM. All in the family: Comparing siblings to test causal hypotheses regarding environmental influences on behavior. Current Directions in Psychological Science. 2010; 19:319–323.

Lahey, BB.; Moffitt, TE.; Caspi, A. Causes of conduct disorder and juvenile delinquency. New York: Guilford; 2003.

Lahey BB, Van Hulle CA, D'Onofrio BM, Rodgers JL, Waldman ID. Is parental knowledge of their adolescent offspring's whereabouts and peer associations spuriously associated with offspring delinquency? Journal of Abnormal Child Psychology. 2008; 36(6):807–823. [PubMed: 18214666]

Lauritsen JL. Explaining race and gender differences in adolescent sexual behavior. Social Forces. 1994; 72(3) 859-859-883.

Manlove J, Logan C, Moore KA, Ikramullah E. Pathways from family religiosity to adolescent sexual activity and contraceptive use. Perspectives on Sexual and Reproductive Health. 2008; 40(2):105–117. [PubMed: 18577143]

Mayeux, L.; Cillessen, AHN. Peer influence and the development of antisocial behavior. In: Engels, RCME.; Kerr, M.; Stattin, H., editors. Friends, Lovers and Groups. West Sussex, England: John Wiley & Sons, Ltd.; 2007. p. 33-46.

Meade CS, Kernshaw TS, Ickovics JR. The intergenerational cycle of teenage motherhood: An ecological approach. Health Psychology. 2008; 27(4):419–429. [PubMed: 18642999]

Mendle J, Harden KP, Turkheimer E, Van Hulle CA, D'Onofrio BM, Brooks-Gunn J, Rodgers JL, Emery RE, Lahey BB. Associations between father absence and age of first sexual intercourse. Child Development. 2009; 80:1463–1480. [PubMed: 19765012]

Mersky JP, Reynolds AJ. Predictors of early childbearing: Evidence from the Chicago longitudinal study. Children and Youth Services Review. 2007; 29:35–52.

Mileva-Seitz, V.; Fleming, AS. How Mothers Are Born: A Psychobiological Analysis of Mothering Biosocial Foundations of Family Processes. Booth, A.; McHale, SM.; Landale, NS., editors. New York: Springer; 2011. p. 3-34.

Moffitt TE. Adolescence-limited and life-course-persistent antisocial behavior: A developmental taxonomy. Psychological Review. 1993; 100(4):674–701. [PubMed: 8255953]

Moffitt, TE. Life-course-persistent and adolescence-limited antisocial behavior: A 10-year research review and a research agenda. In: Lahey, BB.; Moffitt, T.; Caspi, A., editors. Causes of Conduct Disorder and Juvenile Delinquency. New York: Guilford; 2003. p. 49-75.

Moffitt TE, Caspi A. Childhood predictors differentiate life-course persistent and adolescence-limited antisocial pathways among males and females. Development and Psychopathology. 2001; 13(2): 355–375. [PubMed: 11393651]

Muthen, B., editor. Latent variable analysis: Growth mixture modeling and related techniques for longitudinal data. Newbury Park, CA: Sage; 2004.

Nagin DS, Pogarsky G, Farrington DP. Adolescent mothers and the criminal behavior of their children. Law & Society Review. 1997; 31(1):137–162.

Neale, M.; Cardon, LR. Methodology for genetics studies of twins and families. Kluwer; 1992.

Nichols TR, Graber JA, Brooks-Gunn J, Botvin GJ. Sex differences in overt aggression and delinquency among urban minority middle school students. Journal of Applied Developmental Psychology. 2006; 27(1):78–91.

Olausson PO, Haglund B, Weitoft GR. Teenage childbearing and long-term socioeconomic consequences: A case study in Sweden. Family Planning Perspectives. 2001; 33(2):70–74. [PubMed: 11330853]

Olausson PO, Haglund B, Weitoft GR, Cnattingius S. Premature death among teenage mothers. International Journal of Obstetrics and Gynaecology. 2004; 111:793–799.

Patterson, GR.; Yoerger, K. A developmental model for late-onset delinquency. In: Osgood, D., editor. Motivation and delinquency: Nebraska Symposium on Motivation; University of Nebraska Press; Lincoln, NE, US. 1997. p. 119-177.

Plomin R, DeFries JC, Loehlin JC. Genotype-enivronment interaction and correlation in the analysis of human behavior. Psychological Bulletin. 1977; 84:309–322. [PubMed: 557211]

Pogarsky G, Lizotte AJ, Thornberry TP. The delinquency of children born to young mothers: Results from the Rochester Youth Development Study. Criminology. 2003; 41(4):1249–1286.

Pogarsky G, Thornberry TP, Lizotte AJ. Developmental Outcomes for Children of Young Mothers. Journal of Marriage and Family. 2006; 68(2):332–344.

Rodgers, JL. Sexual transitions in adolescence. In: Graber, JA.; Brooks-Gunn, J.; Petersen, AC., editors. Transitions through adolescence: Interpersonal Domains and Context. Mahwah, New Jersey: Lawrence Erlbaum; 1996.

Rodgers, JL. EMOSA Sexuality Models, Memes and the Tipping Point: Policy and Program Implications. In: Romer, D., editor. Reducing Adolescent Risk: Toward an integrated approach. Sage; 2003.

Rodgers JL, Bard DE, Miller WB. Multivariate Cholesky models of human female fertility patterns in the NLSY. Behavior Genetics. 2007; 37(2):345–361. [PubMed: 17205393]

Rodgers JL, Rowe DC. Social contagion and adolescent sexual behavior: A developmental EMOSA model. Psychological Review. 1993; 100:479–510. [PubMed: 8356187]

Rodgers JL, Rowe DC, Buster M. Social contagion, adolescent sexual behavior, and pregnancy: A nonlinear dynamic EMOSA model. Developmental Psychology. 1998; 34(5):1096–1113. [PubMed: 9779754]

Rolfe A. "You've Got to Grow up When You've Got a Kid": Marginalized Young Women's Accounts of Motherhood. Journal of Community & Applied Social Psychology. 2008; 18:299–314.

Romano E, Zoccolillo M, Paquette D. Histories of child maltreatment and psychiatric disorder in pregnant adolescents. Journal of American Academy of Child and Adolescent Psychiatry. 2006; 45(3):329–336.

Rosengard C, Phipps MG, Adler NE, Ellen JM. Adolescent pregnancy intentions and pregnancy outcomes: A longitudinal examination. Journal of Adolescent Health. 2004; 35:453–461. [PubMed: 15581524]

Rutter, M. Gene-environment interplay and developmental psychopathology. New York, NY: Taylor & Francis Group/Lawrence Erlbaum Associates; 2007.

Rutter, M.; Belsky, J.; Brown, G.; Dunn, J.; D'Onofrio, B.; Eekelaar, J.; Ermisch, J.; Moffitt, T.; Gardner, F.; Weale, A.; Witherspoon, S. Social sciences and family policies. London: British Academy Policy Centre; 2010.

Rutter M, Pickles A, Murray R, Eaves L. Testing hypotheses on specific environmental causal effects on behavior. Psychological Bulletin. 2001; 127(3) 291-291-324.

Santelli JS, Kirby D. State policy effects on teen fertility and evidence-based policies. Journal of Adolescent Health. 2010; 46:515–516. [PubMed: 20472206]

Santelli JS, Orr M, Lindberg LD, Diaz DC. Changing Behavioral Risk for Pregnancy Among High School Students in the United States, 1991–2007. Journal of Adolescent Health. 2009; 45(1):25–32. [PubMed: 19541246]

Santelli JS, Sandfort T, Orr M. Transnational comparisons of adolescent contraceptive use: what can we learn from these comparisons? Archives of Pediatric and Adolescent Medicine. 2008; 162(1): 92–94.

Scarr S, McCartney K. How people make their own environments: A theory of genotype->environment effects. Child Development. 1983; 54:424–435. [PubMed: 6683622]

Shadish, WR.; Cook, TD.; Campbell, DT. Experimental and quasi-experimental designs for generalized causal inference. Belmont, CA: Wadsworth Cenage Learning; 2002.

Shaw M, Lawlor DA, Najman JM. Teenage children of teenage mothers: Psychological, behavioural and health outcomes from an Australian prospective longitudinal study. Social Science & Medicine. 2006; 62(10):2526–2539. [PubMed: 16332404]

South SJ, Crowder K. Neighborhood poverty and nonmarital fertility: Spatial and temporal dimensions. Journal of Marriage and Family. 2010; 72:89–104. [PubMed: 21373376]

Spears GV, Stein JA, Koniak-Griffin D. Latent growth trajectories of substrance use among pregnant and parenting adolescents. Psychology of Addictive Behaviors. 2010; 24(2):322–332. [PubMed: 20565158]

Stattin, H.; Ken, M.; Mahoney, J.; Persson, A.; Magnusson, D. Organized activities as contexts of development: Extracurricular activities, after-school and community programs. (2211–2234. Mahwah, NJ, US: Lawrence Erlbaum Associates Publishers; 2005. Explaining why a leisure context is bad for some girls and not for others *Mahoney, Joseph L.; Larson, Reed W.; Eccles, Jacquelynne S* (pp. (2005); p. xiip. 2550

Steinberg L. A social neuroscience perspective on adolescent risk-taking. Developmental Review. 2008; 28:78–106. [PubMed: 18509515]

Turley RNL. Are children of young mothers disadvantaged because of their mother's age or family background? Child Development. 2003; 74:465–474. [PubMed: 12705567]

Wakschlag, LS.; Hans, SL. Early parenthood in context: Implications for development and intervention. In: Zeanah, CH., Jr, editor. Handbook of infant mental health. 2nd ed.. New York, NY: Guilford Press; 2000. p. 129-144.

Whitman, TL.; Borkowski, JG.; Keogh, DA.; Weed, K. Intervowen lives: Adolescent mothers and their children. Mahwah, NJ: Lawrence Erlbaum Associates; 2001.

Woodward LJ, Fergusson DM. Early conduct problems and later risk of teenage pregnancy in girls. Development and Psychopathology. 1999; 11(1):127–141. [PubMed: 10208359]

Woodward LJ, Fergusson DM, Horwood LJ. Risk factors and life processes associated with teenage pregnancy: Results of a prospective study from birth to 20 years. Journal of Marriage & the Family. 2001; 63(4):1170–1184.

Xie H, Cairns BD, Cairns RB. Predicting teen motherhood and teen fatherhood: Individual characteristics and peer affiliations. Social Development. 2001; 10(4):488–509.

Yang Z, Gaydos L. Reasons for and challenges of recent increases in teen birth rates: A study of family planning service policies and demographic changes at the state level. Journal of Adolescent Health. 2010; 46:517–524. [PubMed: 20472207]

Zeck W, Bjelic-Radisic V, Haas J, Greimel E. Impact of adolescent pregnancy on the future life of young mothers in terms of social, familial, and educational changes. Journal of Adolescent Health. 2007; 41(4):380–388. [PubMed: 17875464]

Zoccolillo, M.; Paquette, D.; Azar, R.; Cote, S.; Tremblay, R. Parenting as an important outcome of conduct disorder in girls. In: Putallaz, M.; Bierman, KL., editors. Aggression, antisocial behavior, and violence among girls: A developmental perspective. New York: Guilford Publications; 2004. p. 242-261.

Zoccolillo, M.; Paquette, D.; Tremblay, R. Maternal conduct disorder and the risk for the next generation. In: Pepler, DJ.; Madsen, KC.; Wester, C.; Levere, KS., editors. The development and treatment of girlhood aggression. Mahwah, NJ: Lawrence Erlbaum; 2005.