Nonresident Fatherhood and Adolescent Sexual Behavior:

A Genetically and Developmentally Sensitive Approach

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Abstract

Although voluminous research has linked nonresident fatherhood to riskier sexual behavior among adolescents, neither the causality of those links nor the mechanism accounting for them has been well-established. Using data from the National Longitudinal Survey of Youth 1979 – the Young Adult survey (CNLSY79-YA), the present study addresses both questions by comparing the sexual development of siblings discordant in age at father departure from the home and examining results across behavioral (age at first intercourse), biological (pubertal timing), and cognitive (attitudes about sex and childbearing) sexual outcomes (N = 5792). Findings indicate that nonresident fatherhood, beginning either at birth or during middle childhood, leads to an earlier sexual debut for girls, but not boys, an effect likely explained by altered attitudes toward sex and reproduction rather than accelerated pubertal development. Implications for policies to curb the incidence of risky sexual behavior in adolescence are discussed.

Nonresident Fatherhood and Adolescent Sexual Behavior: A Genetically and Developmentally Sensitive Approach

There exists a well-established association between nonresident fatherhood – as the result of nonmarital childbirth or divorce – and risky sexual behavior during adolescence. Teenagers who have experienced nonresident fatherhood initiate sexual behavior at an earlier age (Donohue et al., 2010; Ellis et al., 2003; James, Ellis, Schlomer, & Garber, 2012; Kiernan & Hobcraft, 1997) and have more sexual partners (James et al., 2012; Quinlan, 2003) than those who live with both biological parents until adolescence. These outcomes, in turn, elevate the risk of sexually transmitted disease and teenage pregnancy (Hofferth & Hayes, 1987; O'Donnell, O'Donnell, & Stueve, 2001), and the likelihood of nonmarital childbirth and family instability (Gee & Rhodes, 2003; Teachman, 2002). The apparent salience of nonresident fatherhood for sexual behavior, fertility and family formation in the next generation validates public concern over the precipitous rise in nonresident fatherhood over the past half century (U.S. Census Bureau, 2006; Ventura, 2009) and suggests public policies should be directed at reducing its incidence or ameliorating its effects.

Before advocating or enacting such policies in the name of curbing risky sexual behavior, however, research is needed to answer two outstanding questions. First, is the association between nonresident fatherhood and risky sexual behavior causal? It is neither possible nor ethical to randomly assign children to family structure experiences. Thus, family-level factors, both genetic and environmental, that select parents into family disruption may influence adolescent sexual behavior and in doing so drive the documented links. It is important to determine if these links are causal, for the selection and causation hypotheses imply different origins for risky sexual behavior, and thus different policy approaches to reducing its prevalence.

If we can establish that nonresident fatherhood – sexual behavior associations are at least plausibly causal, research must still address a second key question: by what mechanism does nonresident fatherhood lead to riskier sex? Only by understanding *how* nonresident fatherhood exerts this influence can we understand fathers' role in children's sexual development and identify policy approaches to ameliorating the impact of their absence from the home. The literature on these associations offers three broad theories. The *paternal investment theory* (PIT), an extension of Belsky, Steinberg and Draper's (1991) *psychosocial acceleration theory*, posits that early father departure signals to offspring that paternal investment is not essential to reproduction and modifies their neurophysiologic and motivational systems to speed pubertal maturation, accelerate sexual debut, and orient them toward weak pair bonds (Draper & Harpending, 1982; Ellis, 2004). By contrast, socialization theory posits that father absence models sexual attitudes favoring weak commitments and, thus earlier sexual behavior (Amato & DeBoer, 2001). Finally, parental monitoring or social control theory holds that father absence facilitates earlier sexual behavior via reduced parental supervision rather than attitudes (or biology) per se (Hogan & Kitagawa, 1985; Newcomer & Udry, 1987).

The present study addresses both questions by comparing the sexual development of siblings discordant in their experience of nonresident fatherhood. Comparing siblings within families, rather than unrelated youth across families, reduces the influence of unobserved genetic and environmental risks that vary between families and may drive family disruption, better isolating any causal effect of nonresident fatherhood on sexual behavior. Although siblings typically share the experience of nonresident fatherhood, they also differ in age (among non-twins), thus I can compare the effect of nonresident fatherhood among siblings by distinguishing effects by child age at the time of disruption. Comparing the effects across child age also

addresses the question of mechanism: the three theories described above suggest distinct patterns of effects by age at father departure. I also investigate mechanisms by comparing effects of nonresident fatherhood across different sexual domains. All three theories suggest nonresident fatherhood should impact sexual behavior, however, only the PIT suggests this link operates through pubertal timing and only the PIT and socialization theory suggest it operates through sexual attitudes. Because each theory implies a unique pathway, any variation in the impact of nonresident fatherhood by child age or sexual domain could pinpoint the active mechanism.

Nonresident Fatherhood and Risky Sexual Behavior: A Causal Link?

Although the link between nonresident fatherhood and risky sexual behavior has been well-established, the causality of that link has not. Most obviously, the link between nonresident fatherhood and risky sexual behavior could stem from genes parents and children share that drive both risky sexual behavior and nonresident fatherhood. Genes passed from parents to children, such as those for early puberty (Newcomer & Udry, 1984; Rowe, 2002), impulsive, externalizing behavior (Raine, 2008; Verweij, Zietsch, Bailey, & Martin, 2009), and sexual behavior itself (Rodgers, Rowe, & Buster, 1999) may trigger early and risky sexual behavior, which in turn predicts unstable relationships and nonresident fatherhood. Environmental factors such as low income, neighborhood disadvantage, and other familial stressors also covary with family disruption and risky sexual outcomes (Browning, Leventhal, & Brooks-Gunn, 2005; Kirby, 2002; Moore & Chase-Lansdale, 2001) and could confound associations. In short, familial factors that select families into disruption, both genetic and environmental, may also trigger earlier and risky sexual behavior, thus inducing a spurious link between the two.

The typical approach to minimizing influence of selection is to control for a robust set of environmental factors that covary with nonresident fatherhood and predict sexual behavior. This

approach has two problems: 1) it cannot eliminate the influence of all possible confounds because some factors are unmeasured and others likely unmeasurable; 2) it does not address genetic confounds.

A rigorous way to estimate whether links are plausibly causal is to compare relatives discordant for nonresident fatherhood; this approach reduces the influence of environmental and genetic risks shared by related youth that could bias associations. The few studies that have used this approach, however, have yielded conflicting findings. Some find father absence predicts both earlier age at menarche and earlier sexual debut with effects sizes comparable to those in between family studies (Tither & Ellis, 2009; D'Onofrio et al., 2006); others find small, non-significant associations (Mendle et al., 2009; 2006). These findings may conflict because D'Onofrio (2006) and Mendle (2006) used Australian and the others U.S. samples or because of different comparator groups (e.g., cousins versus siblings). Most importantly, perhaps, none of these studies rigorously compared effects by age at father departure. If effects do vary by age, averaging across ages would obscure larger effects for children at specific developmental levels. Thus, although these studies made significant methodological advances, it is still unclear whether within-family comparisons reveal an impact of nonresident fatherhood on sexual development.

Nonresident Fatherhood and Risky Sexual Behavior: Pathways of Influence

If links between nonresident fatherhood and adolescent sexual outcomes are determined to be plausibly causal, understanding *how* nonresident fatherhood shapes sexual development could help identify appropriate policy interventions. One way to investigate mechanisms is to compare impacts across child age at father departure. According to PIT, father departure before age 5, when children are forming fundamental attachment relationships with caregivers, signals that paternal investments of emotional and other resources are unavailable or unpredictable.

Human beings have evolved to respond in these environments, the theory maintains, to reach puberty earlier, initiate sexual behavior earlier, and develop weaker pair bonds to maximize family size and thus the chance offspring will reproduce in the absence of strong parental investment (Belsky et al., 1991; Boyce & Ellis, 2005). Thus, according to PIT, father departure before age 5 should impact sexual development more than departure later on (Ellis, 2004). Socialization and monitoring imply that father departure any time before puberty should equally impact sexual development because children would either be exposed to altered role-modeling or reach adolescence without a monitoring father. It is possible, however, that socialization would manifest in a linear relationship between age at departure and sexual behavior, with stronger effects at younger ages because children would spend more time exposed to the socializing influence.

Research comparing the sexual outcomes of unrelated adolescents offers conflicting findings about the effect of timing. Some find no difference between early versus later disruption on sexual outcomes (Teachman, 2002; 2003), others find that later transitions have a stronger effect on sexual behavior (Cavanagh et al., 2008), whereas others find only earlier father departure leads to earlier sexual development (Donohue et al., 2010; Quinlan, 2003). Previous studies using within-family comparisons have not rigorously investigated timing effects, perhaps because they have not had large enough samples to differentiate by child age.

Another way to investigate mechanisms is to compare impacts of nonresident fatherhood across sexual outcomes. PIT invokes a biological mechanism (earlier puberty), a behavioral mechanism (sex and reproduction outside committed pair bonds), and a cognitive mechanism (attitudes favoring sex and reproduction outside committed pair bonds) (Ellis, 2004). Socialization theory, however, suggests nonresident fatherhood impacts sexual attitudes and

behavior but does not invoke a biological mechanism. Parental monitoring acknowledges nonresident fatherhood impacts sexual behavior but does not imply impacts on sexual attitudes or pubertal timing. Thus, the pattern of findings across biological, behavioral, and attitudinal outcomes could illuminate which pathway best explains the link between nonresident fatherhood and risky sexual behavior.

Although individual studies have examined these outcomes, none have used this comparison-across-outcome approach to identify mechanisms. The larger literature has focused either on pubertal timing (Belsky et al., 2007; Tither & Ellis, 2009) or broad life course indicators such as age at first intercourse and first birth (James et al., 2012; Belsky et al., 2012; Ellis & Garber, 2000; Kiernan & Hobcraft, 1997; Moffit, Caspi, Belsky, & Silva, 1992; Moore & Chase-Lansdale, 2001). Only one study has examined sexual attitudes in relation to nonresident fatherhood (Hoier, 2003) even though they often precede risky sex. This study found that single motherhood was associated with less restricted sexual attitudes. Moreover, only two of the studies that have examined pubertal timing, and none of the studies examining attitudes, have used a within-family comparison approach.

Nonresident Fatherhood and Risky Sexual Behavior: Gender Differences

Theories about the link between nonresident fatherhood and adolescent sexual behavior suggest associations may differ by child gender. Because boys tend to have fewer intimate friendships than girls during adolescence (Maccoby, 1998) they may turn to romantic or sexual relationships for support more readily in response to family stressors than girls. Boys may also engage in risky sex more readily in response to father absence than girls if fathers serve as stronger sexual role models for sons. Most theories, however, suggest girls' behavior should be more affected by father absence. Girls are more attuned to relationships and relationship quality

than boys; in turn, their relationship skills might develop more strongly in response to family dynamics (Amato, 1993; Crockett & Randall, 2006). According to PIT specifically, girls have evolved to be more attuned to paternal investments of emotional resources during early childhood because females depend more on paternal (and familial) resources during pregnancy and childrearing than males (Gangestad & Simpson, 2000; Jackson & Ellis, 2009). This perspective implies that nonresident fatherhood should have stronger effects on girls' sexual behavior because it has unique implications for their reproductive strategy.

Evidence on gender differences in the association between nonresident fatherhood and sexual behavior is mixed. Some research finds that family structure instability, particular instability that occurs just before or during adolescence, is more strongly associated with boys' behavior (Cavanagh et al., 2008) or impacts boys and girls similarly (Kiernan & Hobcraft, 1997; Ryan, Franzetta, Schelar, & Manlove, 2009). However, most studies find that girls respond more to family disruption in terms of sexual behavior than boys (Davies & Friel, 2001; James, Ellis, Garber, & Schlomre, 2012; Thornton, 1991). Recently, James and colleagues (2012) found that nonresident fatherhood had direct effects on girls' but not boys' sexual risk taking and that this effect on girls was mediated through accelerated pubertal timing (age at menarche). This study jibes with other work looking specifically at pubertal timing that finds girls, but not boys, reach puberty earlier when fathers are nonresident, a difference not entirely attributable to less precise measurement of boys' pubertal timing (Belsky et al., 2007; James et al., 2012). In sum, there is some evidence that girls' respond more to father absence than boys in terms of sexual behavior and that a stronger biological sensitivity to early paternal investment may account for the difference.

Present Study

The proposed project addresses two outstanding questions about the association between nonresident fatherhood and adolescent sexual behavior: 1) are the documented links plausibly causal; and 2) if so, what mechanism likely accounts for those links. It addresses the first question by comparing siblings discordant for the experience of nonresident fatherhood, substantially reducing the influence of unobserved environmental and genetic risks that could confound associations. Data are drawn from a diverse, national dataset that offers a larger sample of related pairs than any previous study on this topic using a within-family approach, thus maximizing power to detect effects of father absence on sexual outcomes. It addresses the second question by comparing impacts of father absence across child age at father departure from the home and across sexual domains. Special attention is paid to differences in associations by child gender. By addressing both *how* nonresident fatherhood may impact sexual development, as well as *whether* it does, the project aims to illuminate the unique role fathers may play in children's sexual development and approaches to alleviating the potential effects of their nonresidence.

Method

Data and Sample

Data are drawn from the Children of the National Longitudinal Survey of Youth 1979 – the Young Adult survey (CNLSY79-YA). The NLSY79 is a nationally representative sample of 12,686 young men and women who were 14-22 years old when they were first surveyed in 1979 and are currently interviewed on a biennial basis. Starting in 1994, all children of NLSY79 female respondents aged 14 or older were interviewed biennially for the CNLSY-YA, with the most recent data used in the present study collected in 2008 when YA respondents were between 14- and 37-years-old (Center for Human Resource Research, 2009). Youth were asked a range of

questions about their development, behavior, and attitudes, including those about pubertal timing, sexual behavior, and attitudes toward marriage and childbirth. Because most female respondents had more than one child, the CNLSY-YA contains a large number of sibling pairs, making it ideal for a within-family approach. The analytic sample was limited to all youth with at least one YA interview, at least one interviewed sibling, and data on age at father departure from the home (N = 6141). The sample was further limited to youth with valid data on sexual outcomes, which ranged across measures (see below).

Descriptive statistics for all dependent variables and all covariates by age at father departure from the home are presented in Table 1, using the sample with valid data on the key dependent variable, age at first intercourse (N = 5792; descriptive statistics did not vary substantively in analytic samples for the other dependent variables). Overall, the analytic sample is disadvantaged relative to national norms because the CNLSY oversampled mothers who had children by 1986, who were disproportionately teenaged. Over a third of children were African American, over a third had half siblings, and over a third of mothers had less than a high school degree at the time of their first birth. Demographic characteristics also varied in expected ways by nonresident fatherhood. Over half of youth whose fathers were always coresident were non-Hispanic/non-African American whereas only 11% of those whose fathers were never coresident were non-Hispanic/non-African American. A quarter of youth whose fathers were always coresident had mothers with less than a high school degree versus over half of those whose fathers were never coresident. Average household incomes were also lower in families that had experienced nonresident fatherhood than in families that had not. These patterns indicate that family contexts differ systematically by a child's age at father departure from the home.

Measures

Age at father departure. Information on timing of father departure from the home was gathered from various sources in the NSLY79 and CNLSY-YA. Youth were asked during their YA interview if they lived with their biological father and, if not, when they last lived with him. If youth reported on age at father departure in multiple interviews, responses were drawn from the earliest wave. Mothers also reported whether the child lived with his or her biological father in each CNLSY mother interview prior to the youth entering the YA study. Finally, in the mothers' main NLSY79 interview, she was asked about her marriage and cohabitation history. This information was used to create complete marriage and cohabitation histories for all mothers. These histories revealed the child's age when the cohabitation or marriage that was ongoing at the time of the child's birth ended. These histories also revealed whether the mother was cohabiting or married at the time of the child's birth.

Information from these three sources on age at father departure was combined in the following way. First, for each report, youth were divided into four exclusive groups: father always present (coresiding with both parents through age 13); father never present (father left before child was born/father and mother never lived together); father left between birth and age 5, and father left between ages 6 and 13. Those whose fathers departed during the teenage years were categorized as father always present because for those youth puberty and sexual intercourse would be increasingly likely have occurred after father departure. Next, the youth and mother report from the CNLSY-YA and CNLSY interviews were compared. If the youth and mother reported the same age period for father departure, which they did in 75% of cases, that age period was used. For all remaining cases, information based on the mothers' marriage and cohabitation history was used. These resulting four-level variable was recoded into three indicator variables for father always absent, father left between birth and age 5, and father left

between ages 6 and 13, with father always present as the reference. Results reported were substantively unchanged when an indicator variable for source of father departure information was entered into models.

Within-family deviation in age at father departure. In order to estimate the within-family effect of father departure at different child ages, a child-level deviation from the family's average for each father absence indicator was computed. First, within-family averages on each father absence indicator were generated. For example, if there were two children in a family and the parents separated when one child was 2 and the other was 6-years-old, the family average for father left between birth and age 5 would be .5 and the family average for father left between ages 6 and 13 would be .5. Second, child-level deviations from the family average were calculated by subtracting the average from each child's score on each indicator. So, the 2-year-old would have a deviation score of .5 for father left between birth and age 5, whereas the 6-year-old would have a deviation score of -.5. For father left between ages 6 and 13, the deviation scores would be reversed. In this way, the child-level deviations for each father absence category operate as within-family dummy variables.

Although most siblings in the analytic sample had the same nonresident fatherhood experience, there was adequate discordance among siblings to estimate within-family effects. Because the reference group is father always present, it is most important to consider the number of siblings who differ on that experience. Among the 5792 in the age at first intercourse analyses, 257 of youth who had their fathers always present had a sibling whose father left between ages 6 and 13, 173 had a sibling whose father who left between birth and age 5, and 139 had a sibling whose father was always absent. Not surprisingly, families in the latter group had the largest proportion of half siblings (85% had a half sibling in the family versus 30% for those with a

sibling whose father left after age 6). Half sibling status was controlled in all models to account for this difference.

Sexual outcomes. Means and standard deviations, or percentages, for all dependent variables are reported in Table 1. *Sexual behavior.* The CNLSY-YA asked if youth had ever had sexual intercourse and, if so, age in years at first intercourse. The age at first intercourse is used as the indicator of risky sexual behavior, with earlier age indicating riskier behavior. The average age at first intercourse was 15.7 (*SD* = 2.18), however, 30% of the analytic sample had not had sexual intercourse by the time of their last YA interview. *Pubertal timing*. The CNLSY-YA asked girls if they ever had a menstrual period and, if so, at what age they reached menarche. Information on age at menarche was drawn from the first interview in which the youth reported experiencing menarche (*M* = 12.24, *SD* = 1.38). The CNLSY-YA did not ask boys about their pubertal development, so analyses on pubertal timing were conducted only with girls and girls who also had female sibling in the YA sample (*N* = 1894) so that within-family deviations could be computed. *Sexual and relationship attitudes.* In the CNLSY-YA, youth are asked at what ages they would ideally get married and have a first child. Analyses examined ideal age at first childbirth, assuming that earlier ideal age of childbirth reflects orientations toward reproduction within weaker, less stable relationships (*M* = 25.15, *SD* = 4.38). A dichotomous variable was also constructed reflecting whether the age at ideal marriage precedes age at ideal childbirth, assuming an ideal age at childbirth before marriage also reflects orientations toward weaker, less stable relationships (79.4% reported an ideal marriage age younger than ideal childbirth age). Age at ideal marriage was not examined in isolation because the direction of the hypothesized effect of nonresident fatherhood is ambiguous. Responses to these questions were drawn from youths' earliest interview (usually age 14).

Covariates. Child and family-level covariates exogenous to father absence were included in all models. Child-level covariates were characteristics that could vary across related children and confound within-family associations: child gender, child's birth year (to control for cohort effects and birth order), and race/ethnicity. Birth order was added as an additional covariate in supplementary models, however, it was non-significant when child's birth year was also included. Low birth weight status was controlled in earlier analyses but was excluded from final models due to non-significance. Nuclear-family covariates were parent characteristics that could vary across nuclear families, including age at mothers' first birth, mothers' education level at first birth, and the presence of half siblings in the home. Although family income is potentially endogenous to father absence, the mother's household income averaged across all interview years was entered as a measure of permanent income to control for large differences in families' socioeconomic status across nuclear families. In sensitivity tests, mothers' household income in the year before her first birth, and the year before the child's birth, were entered as alternate income controls. Results were not substantively changed in these models.

Analytic Strategy

A 2-level hierarchical linear model (HLM) was fit for each sexual outcome, with child-level variance at level 1 and family-level variance at level 2. HLM was used because it can accommodate multiply nested data and unequal cluster sizes (i.e., large and small families). At level 1, each child's deviation from the family average for father always absent, father left between birth and age 5, and father left between ages 6 and 13 was entered along with child-level covariates. At level 2, family-level averages on each father absence indicator were entered along with mother-level covariates. The combined level 1 and 2 model takes the following form:

$$Y_{ij} = \gamma_{00} + \beta_{1j}\text{allab\_cdev}_{ij} + \gamma_{01}\text{allab\_fav}_{j} + \beta_{2j}\text{earab\_cdev}_{ij} + \gamma_{02}\text{earab\_fav}_{j} + \beta_{3j}\text{latab\_cdev}_{ij} + \gamma_{03}\text{latab\_fav}_{j} + \sum\beta_{qj}(\text{ChildVars})_{ij} + \sum\gamma_{0q}(\text{MotherVars})_{j} + u_{0j} + r_{ij}$$

The variables allab_cdev_{ij}, earab_cdev_{ij}, and latab_cdev_{ij} reflect the child-level deviations from the family average; the variables with the suffix _fav_{j} are the analogous family-level averages. With child-level deviations and family-level averages entered into the model, the associated coefficients for the child-level deviations ($\beta_{1\text{-}3j}$) estimate the within-family effect of father departure at different ages, while the family average coefficients ($\gamma_{01\text{-}3}$) estimate the between-family effect of father departure (Rabe-Hesketh & Skrondal, 2012). Because the family averages do not account for unobserved genetic and environmental confounds that differentiate children across families, these estimates are analogous to those generated from a standard regression model comparing children across families, controlling for observable family-level differences. My interest, therefore, is in the less biased within-family estimates of father departure. These estimates will illuminate whether associations between nonresident fatherhood and each sexual outcome are plausibly causal. Moreover, comparing across the within- and between-family estimates will illuminate the degree of bias genetic and environmental confounds introduce into nonresident fatherhood – sexual behavior associations.

Another strength of HLM for these analyses is that it can accommodate non-normal dependent variable distributions including binary and count data (Raudenbush & Bryk, 2002). For continuous dependent variables – age at menarche (all but 8 girls had a reported menarche age in the YA sample, so right-censoring did not call for a hazard model) and ideal age at first childbirth – multilevel mixed-effects linear regression models were run with random intercepts at the family level. However, for the right-censored variable age at first intercourse, discrete multilevel hazard models were run, fit similarly to the HLMs described above. I also ran

multilevel survival models on age at first intercourse with a parametric Weibull distribution, as well as a Cox regression model, and results were nearly identical to those obtained using a discrete hazard model that included a linear and quadratic measure for year. For the dichotomous variable ideal age at marriage precedes ideal age at childbirth, multilevel mixed-effects logit models were run, again fit similarly to the models described above.

Results

Bivariate Comparisons by Age at Father Departure

Table 1 displays descriptive statistics on all sexual outcomes by youth's age at father departure. These means are unadjusted for genetic or environmental confounds, so simply assess the correlation between age at father departure from the home and sexual development. A clear linear pattern emerged for all outcomes such that the longer a youth spent living apart from his or her biological father, the riskier the average sexual outcome. Youth whose fathers were always absent from their home had the earliest average age at first intercourse, and were more likely to have had sex, than those in all other groups; those whose fathers left the home either during early or middle childhood had earlier ages at first intercourse, and were more likely to have had sex, than those whose fathers were always resident. In line with the PIT, girls whose fathers were always absent or left during early childhood had an earlier average age at menarche than other groups, although only differences between girls with fathers always absent and the other groups were significant. In line with socialization theory, differences in sexual attitudes by age at father departure were striking. Youth whose fathers were always absent reported a significantly lower ideal age at childbirth than all others, by over year relative to those whose fathers were always present. Moreover, only 61% of youth with fathers always absent reported an ideal age at

marriage younger than their ideal age at childbirth versus 87% of youth with fathers always present.

Between versus Within Family Estimates

Age at first intercourse. Table 2 displays random intercept HLM models predicting all sexual outcomes. For age at first intercourse, positive coefficients reflect higher hazards – or probabilities – of having first sex in each year. The between family estimates for each age at father departure reflect average differences between families with father always absent, father left between birth and age 5, and father left between ages 6 and 13 relative to those with father always present, controlling for child and family-level demographic differences. For age at first intercourse, families whose fathers left at any time had significantly higher hazards than those whose fathers were always present. Associations were similar in magnitude across ages at father departure. The within family estimates of father absence were smaller in size but told a similar story. Youth whose fathers were always absent had significantly higher hazards than siblings whose fathers were always present, as did youth whose fathers left between ages 6 and 13 relative to siblings with fathers always present. No association emerged, however, between having a father leave between birth and age 5 and age at first intercourse.

Age at menarche. Results from random intercept regression models predicting girls' age at menarche are also displayed in Table 2. A marginally significant between-family association emerged between having a father always absent and age at menarche of less than a third of a year. No other significant between-family associations emerged. Moreover, no significant within-family associations emerged between father departure and age at menarche. That is, sisters with different experiences of nonresident fatherhood did not reach menarche at significantly different ages.

Sexual attitudes: Ideal age at childbirth and ideal age at marriage before ideal age at childbirth. No associations emerged between youths' ideal age at childbirth and experience of father absence at the between-family level once family-level characteristics were held constant. The within-family estimates, however, indicate that siblings who had a father always absent or who left between birth and age 5 reported younger ideal ages at childbirth, by over a half a year, than siblings whose fathers were always present, although the association was only marginally significant. The size of the age at father departure coefficients follows a linear pattern consistent with socialization theory.

A similar albeit weaker within-family pattern emerged for an ideal age at marriage younger than ideal age at childbirth. Siblings whose fathers were always absent were less likely to report an ideal age at marriage younger than ideal age at childbirth than those whose fathers were always present. The analogous between-family association was larger and statistically significant. The within and between-family coefficients for father departure between birth and age 5 were also negative, but non-significant.

Differences by Gender

To explore whether associations between nonresident fatherhood and sexual outcomes varied by gender, models were run separately for girls and boys. Results are reported in Table 3. Note, the sum of *n*s across models (noted in Table 3) does not equal the total *N* for the full sample models because only youth with same-sex siblings could be included.

Age at first intercourse. For girls, associations between age at father departure and age at first intercourse resembled those for the full sample model, although they were somewhat stronger. Again, all three between-family father absence experiences were significantly associated with higher hazards of first sex in each year. Moreover, the positive within-family

association between a sibling with a father always absent versus one with father always present was twice as large for girls as in the full sample model. The within-family association between father departure after age 6 and age at first intercourse was similar in size in the girls only and full sample models, although non-significant in the former. For boys, by contrast, no significant associations emerge between age at father departure and age at first intercourse. The within-family coefficients for father always absent were significantly different across gender models according to a post-hoc t-test ($t = 3.32$, $p < .001$) (Gujarati, 1995).

Sexual attitudes: Ideal age at childbirth and ideal age at marriage before ideal age at childbirth. Differences by gender also emerged for sexual attitudes. For girls, a linear within-family pattern between age at father departure and age at ideal childbirth emerged that was consistent with socialization theory. Siblings with father always absent reported ideal ages at childbirth over two years younger, on average, than siblings with fathers always present; siblings whose fathers left between birth and age 5 reported ideal ages at childbirth over one year younger than those with fathers always present. For boys, however, father departure at any age was unassociated with ideal childbirth age. The within-family coefficients for father always absent and father left between birth and age 5 were significantly different across models ($t = 2.80$, $p < .01$; $t = 2.64$, $p < .01$).

No significant within-family differences emerged between age at father departure and ideal marriage age before ideal childbirth age for girls or boys. However, the negative coefficients for father always absent and father departure between birth and age 5 were larger for girls than boys, and larger than in the full sample models. Thus, although the coefficients were non-significant in the girls only model, the pattern was consistent with the results for ideal age at childbirth.

Discussion

Although previous research had implicated nonresident fatherhood in adolescent sexual behavior, the precise role nonresident fatherhood plays in sexual development is unclear. Specifically, it is unclear whether these links reflect a causal chain from nonresident fatherhood to risky sexual behavior and, if so, what mechanism accounts for the impacts. The present study used a genetically and developmentally sensitive approach to address both questions. In models that compared siblings who differed by age of father departure, having an always absent father and having a father leave home between ages 6 and 13 predicted an earlier age at first intercourse. Nonresident fatherhood was not associated, however, with age at menarche for girls within families, suggesting the effect of nonresident fatherhood on sexual behavior was not mediated through accelerated pubertal timing. Rather, a linear pattern of associations emerged between age at father departure and ideal age at childbirth suggesting that socialization processes favoring less restrictive attitudes toward sex and reproduction account for the links between nonresident fatherhood and age at first intercourse.

The Question of Causality

By comparing siblings discordant for nonresident fatherhood, this study reduced the influence of unobserved environmental and genetic factors that typically confound comparisons of unrelated youth. Using this conservative approach, the experience of father absence from the home, and father's departure during middle childhood, predicted earlier age at first sex within families. The former association likely reflects the impact of nonmarital childbirth on children's sexual behavior, rather than divorce, for fathers are most likely to never live with a child if parents are unwed at the time of birth, whereas the latter association likely reflects the impact of divorce because most cohabiting relationships either end or become marriages within three years

of the child's birth (McLanahan & Beck, 2010). These findings suggest a plausibly causal link between nonresident fatherhood, through nonmarital childbirth or divorce, and riskier sexual behavior.

Father departure was not associated with age at first intercourse across all ages, however. Youth whose fathers left between birth and age 5 did not have a younger age at first intercourse than siblings whose fathers were always present. These differential timing effects may account for the null within-family effects of nonresident fatherhood that Mendle et al. (2009) report, for averaging across ages at father departure could obscure the impacts of very early and later departure. The question remains as to why youth whose fathers left the home in that period would not experience the same effects as their siblings. It is possible that these youth were more likely than those whose fathers were always absent or left later on to develop a stable relationship with a stepfather, and that these relationships ameliorated the effects of father absence. Youth whose fathers were always absent may be more likely to have been born to unwed parents (see above), and mothers are less likely to remarry after a nonmarital childbirth than a marital one (Bzostek, Carlson, & McLanahan, 2012; Lundberg & Rose 2003); if the child was between 6 and 13 when her parents divorced or separated, she may not have had enough time before adolescence to build a buffering relationship with a stepfather even if her mother remarried. Future research on nonresident fatherhood and adolescent sexual behavior should investigate the potential buffering effect of a stable relationship with a stepfather.

It is important to note that genetic and environmental factors that differ between siblings still threaten causal inference using this approach. Most notably, youth whose fathers were always absent but had siblings with fathers always present were more likely than any other group to have a half sibling. Because half siblings share fewer genes on average than full siblings, this

comparison controls less robustly for genetic confounds than comparisons between those whose fathers left between ages 6 and 13 and those whose fathers were always present, only 30% of whom had a half sibling. Indeed, Mendle et al. (2009) found that the within-family effects of father absence were smaller among more closely related pairs, suggesting genetic factors confound within-family models. However, the fact that associations between having a father always absent and having a father leave between ages 6 and 13 and age at first intercourse were comparable in size and significance suggests genetic confounds do not entirely drive the former effect. Moreover, half sibling status was controlled in all analyses.

The Question of Mechanism

Mechanisms that might account for the link between nonresident fatherhood and earlier age at first intercourse were explored in two ways: (1) by comparing effects across age at father departure from the home and (2) comparing effects across sexual outcomes. The age pattern did not clearly support one mechanism over another. The PIT predicts that both father always absent and father departure during the first five years would be associated with earlier age at first intercourse, yet only the former predicted age at first intercourse. However, the association between father always absent and age at first intercourse could support the PIT. The age pattern could also support either socialization or monitoring theory if we assume a unique experience – such as the presence of a stable stepfather – distinguishes those whose fathers left between birth and age 5.

Comparing results across sexual outcomes suggests a clearer answer to the question of mechanism. First, no within-family association emerged between father absence and age at menarche for girls. Because the PIT invokes earlier pubertal timing as an active mechanism linking nonresident fatherhood to risky sexual behavior, these findings do not support the PIT.

Other studies too have failed to find an association between nonresident fatherhood and earlier age at menarche (Kiernan & Hobcraft, 1997; Mendle et al., 2006). It has been suggested that although earlier pubertal timing may be an evolutionarily adaptive response to nonresident fatherhood, the rise of other environmental risk factors, such as poor nutrition leading to higher rates of childhood obesity, have lowered the average age at menarche, making it hard to detect the unique influence of one risk factor (Belsky et al., 1991). If so, youth's evolutionary-biological response to nonresident fatherhood would impact sexual attitudes and behavior more clearly than pubertal timing. In this way, the PIT could be considered an "ultimate" level theory, one which explains why sexual attitudes and behavior might respond to nonresident fatherhood as they do, whereas socialization theory is a more "proximal" pathway linking early experience to reproductive strategy (James et al., 2012). Nonetheless, any support for the PIT is ambiguous because no effects emerged for menarche.

The findings across sexual outcomes support socialization theory less ambiguously. A linear pattern emerged between age at father departure and ideal age at childbirth such that those who lived apart from their fathers longer reported younger ideal ages at childbirth, a pattern consistent with socialization theory. A marginally significant negative effect of nonresident fatherhood on ideal age at marriage younger than ideal age at childbirth emerged only for those whose fathers were always absent, however. Younger age at childbirth is associated with a higher likelihood of a nonmarital childbirth (Gee & Rhodes, 2003), thus a younger ideal age at childbirth reflects an orientation toward weaker, less stable relationships. However, reporting an ideal age at childbirth younger than ideal age at marriage is arguably a clearer indication of that orientation, for it suggests a preference for or expectation of a nonmarital birth. Thus, the unique effect (although marginally significant) of father always absent on that outcome, combined with

its stronger effect on ideal age at childbirth, could explain the unique effect of father always absent on age at first intercourse relative to father departure between birth and age 5. That is, never having lived in an intact family may exert a unique, or at least much stronger, influence on adolescents' attitudes toward sex and reproduction than experiencing parental separation during early childhood.

Socialization theory cannot explain effect of having a father leave after age 6 on sexual behavior because father departure after that age was not associated with sexual attitudes. For these youth, the lack of monitoring and social control that can accompany single parenthood may account for their earlier age at first intercourse. This mechanism may uniquely impact children in this group because their mothers may have less time prior to the youth's adolescence to repartner. It is also possible, however, that the impact of later father departure on sexual behavior may not stem from weaker monitoring, but from the emotional distress of a very recent family disruption. Indeed, Cavanagh et al. (2008) found that later family disruption predicted a higher number of romantic relationships in adolescence, another indicator of risky sexual behavior, and posited this explanation. To test this pathway, future research should explore the effects of age at father departure, using a within-family design, on adolescent mental health outcomes such as depression and anxiety.

Gender Differences

The significant effects of nonresident fatherhood on age at first intercourse and sexual attitudes emerged more strongly, indeed exclusively, for girls. Post-hoc t-tests revealed that all significant age at father departure coefficients for age at first intercourse and ideal age at childbirth in the girls-only models were significantly larger than in the boys-only models. Previous research has also found that nonresident fatherhood, and family structure instability,

predict girls' sexual behavior more so than boys' (James et al., 2012; Thornton, 1991). However, the unique influence of nonresident fatherhood for girls did not appear to be biological in nature, as some previous research has found (Belsky et al., 2007; James et al., 2012; Tither & Ellis, 2008): nonresident fatherhood had no within-family effect on girls' age at menarche. Rather, girls' attitudes toward sex and reproduction appear more vulnerable to the effects of father absence than boys', and this affect more likely accounts for their younger age at first intercourse.

Specifically, having a father always absent predicted a younger age at first intercourse for girls but not boys, and having a father always absent, or depart in the first five years, predicted a younger ideal age at childbirth for girls only. Although the negative effect of having a father always absent on ideal age at marriage younger than ideal age at childbirth was nonsignificant, the within-family coefficients were comparable in size in the girls-only and full sample models according to post-hoc t-tests. Thus, low statistical power may account for the nonsignificant effects in the girls-only model. In sum, girls appear to develop attitudes favoring earlier sexual behavior and childbirth, and perhaps anticipate childbirth outside of marriage, in response to having a father always absent in a way that boys do not. In general, girls are more attuned to relationships and relationship quality than boys, and their relationship skills, as well as expectations, might develop more strongly in response to family dynamics (Amato, 1993; Crockett & Randall, 2006). Girls may also expect to replicate their mothers' relationship and reproductive experiences in ways that boys do not if children identify more with their same-sex parent. Finally, although our findings were inconsistent with an evolutionary-biological pathway, they may indicate that girls' attitudes and subsequent behavior are more influenced by early cues about the availability of paternal investments than boys' because the availability of those investments are more salient to their reproductive success.

Limitations

The sibling comparison approach has several limitations one must consider before drawing theoretical or policy implications from these findings. As mentioned above, comparing siblings does not eliminate environmental or genetic differences that could confound associations between nonresident fatherhood and sexual outcomes. The only way to fully eliminate genetic confounds, and greatly reduce environmental differences that distinguish siblings of different ages, would be to compare monozygotic twins. MZ twins, however, could not by definition differ on the experience of father departure. It is also unclear to what extent within-family estimates are generalizable to a broader population, for families in which siblings have very different experiences of father coresidency may differ from other families in meaningful ways. The present paper attempted to reduce that bias by controlling for key family demographic characteristics. Nonetheless, the results reflect effects within a relatively unique family type. It is also possible that the results partially reflect the impact of having a sibling with a very different experience of paternal investment and the influence of that filial comparison on sexual identity. In that way, within-family comparisons may not estimate the pure effect of father absence.

It is also important to note that the definition of nonresident fatherhood used in the present study did not consider the various levels of involvement nonresident fathers have with their children. Indeed, the term “father absence”, which is used in this study, belies the high levels of investment many biological fathers make, emotionally and economically, in their noncustodial children (Cabrera et al., 2008). To the extent that the effect of nonresident fathers on adolescent sexual development hinges on their lower level of involvement relative to resident fathers, a difference which studies have repeatedly shown (e.g., Carlson & Corcoran, 2001), average associations may obscure variation in effects by level of father involvement. The role of

nonresident father involvement was beyond the scope of the present study. However, future research should explore whether the effects observed are smaller, or disappear, in families in which fathers have frequent contact or close relationships with their noncustodial children.

Policy Implications

Despite these limitations, the study's results have implications for child and family policy. The fact that nonresident fatherhood had a direct effect on sexual behavior suggests efforts to promote family formation and father involvement, such as those within the President's Fatherhood and Mentoring Initiative (FMI), could reduce risky sexual behavior in adolescence. However, efforts to date to promote marriage and relationship stability in populations with high single parenthood rates have been relatively unsuccessful (Hsueh et al., 2012; Moore, Wood, Clarkwest, Killewald, & Monahan, 2012). Perhaps, then, efforts to ameliorate the effects of nonresident fatherhood on risky sexual behavior should target the mediating mechanism – sexual attitudes – rather than nonresident fatherhood per se. For example, school-based programs aimed at reducing risky sexual behavior by encouraging abstinence or safe sex could also encourage youth to discuss the way their parents' separation or divorce may have shaped their expectations for sexual relationships and, ultimately, childrearing. Making these connections may be particularly important for girls, on whom nonresident fatherhood had a unique influence. To the extent that weak monitoring drove the impact of later father departure from the home on sexual behavior, these results also suggest that alternate forms of caregiving for children of single parents, such as community or school-based after school programs or extracurricular activities, could reduce opportunities for risky sexual behavior.

Summary

This study used a genetically and developmentally sensitive approach to explore the impact of nonresident fatherhood on adolescent sexual behavior. Because this approach substantially reduced the confounding effects of unobserved environmental and genetic factors that vary between families, the results strongly suggest that nonresident fatherhood, beginning either at birth or during middle childhood, leads to an earlier sexual debut for girls, but not for boys, an effect likely mediated through altered attitudes toward sex and reproduction rather than accelerated pubertal development. Future research should explore the buffering role that stable stepfathers, or highly involved nonresident fathers, may play in this apparent pathway. If father involvement moderates effects, it would suggest that programs to promote responsible fatherhood should encourage father involvement, not marriage or family formation per se. If stepfather presence moderates effects, it would suggest the potential benefit of encouraging social father involvement within these programs. Overall, the present study suggests all efforts to reduce the prevalence of risky sexual behavior among adolescents should consider the role nonresident fatherhood plays in its etiology.

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Table 1
Descriptive Statistics by Age at Father Departure

	Full Sample	**Father always Absent**	**Father left early (0-5)**	**Father left late (6-13)**	**Father always present**
Age of first intercourse	15.68 (2.18)	15.06 (2.08)$_a$	15.49 (2.22)$_b$	15.38(2.12)$_b$	16.20 (2.12)$_c$
Had sex before censoring (%)	69.97	79.74	76.54	76.30	61.71
Age at menarche (girls only)	12.24 (1.38)	11.95 (1.30)$_a$	12.21 (1.57)$_{ab}$	12.26 (1.38)$_b$	12.37 (1.31)$_b$
Ideal age at childbirth	25.15 (4.38)	24.20 (5.09)$_a$	25.08 (4.06)$_b$	25.34 (4.49)$_b$	25.47 (3.97)$_b$
Ideal marriage < Ideal childbirth	79.36	60.99	75.53	80.03	86.90
Male (%)	50.98	48.43	49.35	51.59	52.30
Family has half siblings (%)	35.39	79.57	55.59	30.84	13.39
Mother's education level (%)					
Less than high school	36.64	57.76	41.49	39.77	25.84
High school degree	35.50	28.98	38.67	36.60	36.35
Some college	17.71	11.39	15.21	17.68	20.99
College graduate	7.86	0.69	3.02	4.42	13.58
Missing	2.30	1.18	1.61	1.54	3.25
Race of child (%)					
Non Hispanic/Non African American	41.97	11.00	36.15	42.65	55.33
African American	34.82	74.85	40.38	30.64	19.53
Hispanic	23.20	14.15	23.46	26.71	25.15
Mother's age at first birth	21.03 (3.81)	19.02 (2.99)	20.18 (3.39)	20.58 (3.47)	22.26 (3.90)
Average household income (ln)	9.85 (0.69)	9.31 (0.58)	9.66 (0.62)	9.78 (0.61)	10.16 (0.63)

Note. N = 5792 for age at first intercourse; N = 1894 for age at menarche (girls only); N = 4147 for ideal marriage age before ideal childbirth age. Means for age at first intercourse, age at menarche, and ideal age at childbirth with different subscripted letters are significantly different at $p <$ .05.

Table 2

Random intercept models predicting sexual development outcomes from age at father departure

	Age at First Intercourse			Age at Menarche			Age at Ideal Childbirth			Marriage < Childbirth		
	b	*se*		*b*	*se*		*b*	*se*		*b*	*se*	
Between Family	0.46	0.10	***	-0.28	0.15	+	-0.42	0.29		-0.57	0.21	**
Father always absent	0.47	0.09	***	-0.18	0.13		0.25	0.26		-0.14	0.19	
Left birth to age 5	0.54	0.08	***	0.07	0.13		0.40	0.24	+	-0.27	0.18	
Left age 6 to 13	--	--		--	--		--	--		--	--	
Always Present (omitted)												
Within Family												
Father always absent	0.30	0.11	**	0.00	0.17		-0.67	0.36	+	-0.47	0.25	+
Left birth to age 5	0.09	0.10		0.18	0.16		-0.59	0.33	+	-0.27	0.24	
Left age 6 to 13	0.28	0.10	**	0.01	0.15		-0.22	0.32		0.16	0.23	
Always Present (omitted)	--	--		--	--		--	--		--	--	
Youth is a girl	-0.41	0.04	***	--	--		-0.52	0.12	***	-0.12	0.09	
Year of youth's birth	0.04	0.01	***	0.03	0.01	***	-0.08	0.02	***	-0.03	0.01	**
Youth is African American	0.32	0.06	***	-0.37	0.09	***	-0.35	0.19	+	-1.32	0.14	**
Youth is Hispanic	0.03	0.06		-0.47	0.10	***	0.15	0.18		-0.60	0.14	**
Youth is White (omitted)	--	--		--	--		--	--		--	--	
Mother has HS degree	-0.07	0.06		0.17	0.09	+	0.36	0.18		0.13	0.13	
Mother has some college	-0.08	0.08		0.08	0.13		0.43	0.24		0.23	0.18	
Mother has college	-0.77	0.13	***	0.26	0.20		1.05	0.35		0.94	0.38	*
Mother has less than HS	--	--		--	--					--	--	

degree												
Mother's age	-0.04	0.01	***	0.02	0.01		0.07	0.03	*	0.05	0.02	*
Family income	-0.06	0.04		-0.02	0.07		0.64	0.13	***	0.50	0.10	***
Family has half siblings	0.12	0.06		-0.04	0.09		0.65	0.18	***	0.11	0.13	
Year	1.48	0.04	***	--	--		--	--		--	--	
Year-squared	-0.08	0.00										
Constant	-6.30	0.50	***	12.33	0.72	***	17.16	1.42	***	-3.53	1.13	**
Random effects												
Variance of constant	0.42	0.04		0.37	0.06		1.99	0.29		0.88	0.18	
Variance of residual				1.43	0.06		14.60	0.39				
N	5792			1894			4459			4157		

Note. Age at menarche is estimated only for girls.
+p<.10; *p<.05; **p<.01; ***p<.001.

Table 3

Random intercept models predicting sexual development outcomes from age at father departure, by gender

	Age at First Intercourse						Ideal Age at Childbirth						Marriage < Childbirth					
	Girls Only			Boys Only			Girls Only			Boys Only			Girls Only			Boys Only		
	b	*se*		*b*	*se*		*b*	*se*		*b*	*se*		*b*	*se*		*b*	*se*	
Between Family																		
Father always absent	0.57	0.18	**	0.41	0.16	*	0.39	0.53		-0.47	0.49		-0.54	0.41		-1.06	0.30	***
Left birth to age 5	0.57	0.16	***	0.24	0.15		0.48	0.45		0.23	0.44		-0.21	0.36		-0.10	0.29	
Left age 6 to 13	0.59	0.15	***	0.52	0.14	***	0.31	0.43		0.34	0.43		-0.35	0.35		0.02	0.29	
Always Present (omitted)																		
Within Family																		
Father always absent	0.66	0.21	**	-0.33	0.21		-2.13	0.61	**	0.49	0.71		-0.66	0.50		-0.09	0.45	
Left birth to age 5	0.09	0.20		-0.03	0.19		-1.41	0.58	*	0.90	0.65		-0.38	0.49		-0.31	0.43	
Left age 6 to 13	0.22	0.19		0.09	0.19		-0.37	0.55		0.34	0.61		0.04	0.45		0.83	0.43	
Always Present (omitted)																		
Year of youth's birth	0.06	0.01	***	0.04	0.01	***	-0.06	0.03	*	-0.11	0.03	***	-0.01	0.02		-0.05	0.02	**
Youth is African American	0.06	0.11		0.58	0.11	*	-0.49	0.33		-0.41	0.34		-1.54	0.27	***	-0.99	0.23	***
Youth is Hispanic	-0.11	0.12		0.20	0.11	+	-0.10	0.33		0.45	0.33		-0.69	0.27	*	-0.44	0.23	+
Youth is White (omitted)																		
Mother has HS degree	-0.08	0.11		-0.04	0.11		0.20	0.33		0.48	0.32		0.08	0.26		0.19	0.20	
Mother has some college	-0.31	0.15	*	0.12	0.15		0.41	0.43		0.33	0.43		0.46	0.37		-0.11	0.28	
Mother has college	-0.94	0.25	***	-0.76	0.24	**	0.60	0.63		1.43	0.68	*	0.67	0.60		1.22	0.80	
Mother has less than HS																		
Mothers' age	-0.03	0.02		-0.05	0.02	**	0.05	0.05		0.08	0.05		0.02	0.04		0.07	0.04	+

Family income	-0.07	0.08		-0.08	0.08		1.00	0.23	***	0.65	0.24	**	0.74	0.20	**	0.30	0.16	+
Family has half siblings	0.00	0.11		0.27	0.11	*	0.30	0.33		1.12	0.33	**	0.25	0.26		0.25	0.21	
Year	1.75	0.08	***	1.45	0.06	***	--	--		--	--		--	--		--	--	
Year-squared	-0.09	0.00	***	-0.08	0.00	***	--	--		--	--		--	--		--	--	
Constant	-7.84	0.91	***	-5.92	0.84	***	13.50	2.54	***	16.52	2.58	***	-5.28	2.14	*	-2.22	1.76	
Random effects																		
Variance of constant	0.49	0.08		0.59	0.08		3.11	0.54		1.68	0.61		1.47	0.43		0.37	0.27	
Variance of residual							11.88	0.61		17.04	0.83							
N	1820			1969			1324			1470			1202			1366		

Note. Model *N*s do not sum to full sample *N*s because gender models could only be estimated for youth with same-sex siblings.
+$p<.10$; *$p<.05$; **$p<.01$; ***$p<.001$.