Like Father, Like Son: The Intergenerational Cycle of Adolescent Fatherhood

| Heather Sipsma, MPhil, Katie Brooks Biello, MPH, Heather Cole-Lewis, MPH, and Trace Kershaw, PhD

After years of declines, rates of adolescent pregnancy and parenthood in the United States still remain among the highest among industrialized nations.[1] In fact, the most recent data suggest that the rate of childbirth among females aged 15 to 19 years actually increased 3% from the previous year, resulting in over 435 000 babies born to adolescent women in 2006 alone.[2]

Adolescent parenthood can negatively affect young parents and their offspring. Adolescent mothers and fathers typically have more limited educational attainment and more restricted economic opportunities than peers who delay childbearing. Furthermore, adolescent parenthood hinders normative psychological development and can result in poorer psychological functioning.[3] The adversity associated with young parenthood makes it difficult for adolescent parents to transcend the cycle of poverty into which many are born.[3–5] Their children are often raised in lower-income homes and are at higher risk for abuse and neglect than children of older mothers.[6] They are also at increased risk for developmental delays and deficits leading to cognitive impairment and poor behavioral outcomes over time.[3,7,8]

Several studies have documented an intergenerational cycle of adolescent motherhood, in which daughters of adolescent mothers are more likely than are daughters of older mothers to become adolescent mothers themselves.[9–13] Research suggests that the transmission of the timing of first birth may be a direct effect of a biological predisposition[14,15] or heritability of attitudes and norms surrounding early childbearing.[13,16,17] Additionally, this intergenerational transmission of adolescent parenthood may be an indirect result of the socioeconomic environment created by early first births.[18–23] Such an intergenerational cycle among young men, however, has not yet been studied despite a strong rationale for doing so. Characteristics associated with young fatherhood may create contexts for children that would predispose them

Objectives. Strong evidence exists to support an intergenerational cycle of adolescent fatherhood, yet such a cycle has not been studied. We examined whether paternal adolescent fatherhood (i.e., father of study participant was age 19 years or younger when his first child was born) and other factors derived from the ecological systems theory predicted participant adolescent fatherhood.

Methods. Data included 1496 young males who were interviewed annually from the National Longitudinal Survey of Youth 1997. Cox regression survival analysis was used to determine the effect of paternal adolescent fatherhood on participant adolescent fatherhood.

Results. Sons of adolescent fathers were 1.8 times more likely to become adolescent fathers than were sons of older fathers, after other risk factors were accounted for. Additionally, factors from each ecological domain—individual (delinquency), family (maternal education), peer (early adolescent dating), and environment (race/ethnicity, physical risk environment)—were independent predictors of adolescent fatherhood.

Conclusions. These findings support the need for pregnancy prevention interventions specifically designed for young males who may be at high risk for continuing this cycle. Interventions that address multiple levels of risk will likely be most successful at reducing pregnancies among partners of young men. (*Am J Public Health.* 2010;100:517–524. doi:10.2105/AJPH.2009.177600)

to increased sexual risk behavior and adolescent parenthood. For instance, adolescent fatherhood is associated with low socioeconomic status, low educational attainment,[3] delinquency,[24] and poor parental attachment.[25,26] Low socioeconomic status,[3,24,25] low parental education,[27] negative parenting practices,[25,27–29] and low parental support[27,30,31] all have been associated with increased sexual risk behavior or adolescent fatherhood among young males, suggesting the possibility of an intergenerational cycle of adolescent fatherhood.

In this study, our primary aim was to prospectively examine whether paternal adolescent fatherhood and maternal adolescent motherhood (i.e., the fathers and mothers of study participants were age 19 years or younger when their first child was born) were significant predictors that the study participant would become an adolescent father (referred to here as "participant adolescent fatherhood"). Additionally, we used Bronfenbrenner's ecological systems theory[32] to identify ecological

predictors of adolescent fatherhood. This theoretical approach asserts that multiple levels of environmental factors influence individual behavior, with the strongest influences being those most proximal to the individual. The theory also asserts that influences can be both bidirectional and interrelated.[32] Finally, we examined whether the identified risk factors of adolescent fatherhood differed between sons of younger parents and sons of older parents (i.e., interaction effects) on the basis of previous work suggesting unique predictors of adolescent pregnancy across the ecological model for daughters of adolescent mothers.[9]

METHODS

Data for this study came from the National Longitudinal Survey of Youth 1997 (NLSY97),[33] a longitudinal, nationally representative survey (which included an oversample of racial minorities) of 8984 youths born in the early 1980s and living in the United States. Households

were randomly selected for participation. After an extensive screening process that collected demographic information both on the youth's household members and those immediate family members living elsewhere, interviews were conducted with computer-assisted devices to improve data validity and consistency. The youth and 1 parent each completed a personal interview lasting approximately 1 hour. Adolescent participants were interviewed on a yearly basis. Further details on the NLSY97 procedures can be found elsewhere.[34]

Baseline interviews were completed in 1997 and 1998. Although there are 11 rounds of data currently available (1997–2007), 8 rounds were used for this analysis (1997–2004) to ensure follow-up of participants through age 20 years. For this study, sampling weights were not used because the purpose was to examine predictors of adolescent fatherhood, not to describe rates of adolescent fatherhood in the United States.[35]

On the basis of our objectives, our sample was limited to the 4599 adolescent males in the NLSY97 cohort. The study population was further restricted to those who were age 13 or 14 years on December 31, 1996 (n=1887) to prospectively examine fatherhood across the teen years. Participants who were already fathers at baseline (n=2) or who did not have at least 1 follow-up visit (n=31) were ineligible. Participants of mixed race (n=14) were also excluded as they could not be appropriately reclassified. Additionally, participants without valid information on paternal age at first birth (n=344) were excluded. These exclusions resulted in a final sample size of 1496 adolescent males.

Measures

The main predictor variables and ecological covariates were obtained from baseline interviews, and the outcome measure was compiled from available subsequent interviews (1998–2004).

Primary outcome measure. Participant's age at birth of first child was determined by self-report of age of respondent at birth of first biological child. Participant adolescent fatherhood was defined as the participant being less than age 20 years at birth of his first child.

Baseline predictor variables. Both maternal and paternal ages at first child were determined

by computing the difference between the self-reported biological father's and mother's date of birth and the date of birth of their first biological child, which was collected at the initial household screening. Maternal adolescent motherhood and paternal adolescent fatherhood were dichotomized into 2 categories: adolescent (aged less than 20 years) or older (aged 20 years or older).

Ecological covariates. Four variables were used to describe individual characteristics of the adolescent respondents. Participants reported their date of birth, from which age at baseline was calculated. The Behavioral/Emotional Scale for Boys was assessed by 4 questions from the Child Behavior Checklist (e.g., "Do you get along with other kids?").[36] Responses were measured on a 3-point scale—not true, sometimes true, or often true; higher scores indicated greater distress. Although internal consistency was slightly less than acceptable ($\alpha=0.52$), this measure demonstrated strong construct and predictive validity.[37] Delinquency was obtained from the study's Delinquency Index,[37] which consisted of 10 items asking about deviant behaviors (e.g., running away). Responses were summed for a possible total of 10 points, with higher scores indicating higher levels of delinquency. Substance use was derived from the Substance Use Index,[37] which consisted of 3 items that ascertained use of cigarettes, alcohol, and marijuana. These responses were summed for a possible total of 3, with higher scores indicating higher levels of substance use.

The family domain was described by 8 covariates. The responding parent of each participant was asked to report the number of years of education completed by the youth's biological parents. Maternal education and paternal education were dichotomized into less than 12 years or 12 years or more. Parents also indicated whether the participant lived in 1 home with both biological parents at age 2. From the household roster information, number of children in home tallied the number of people aged younger than 18 years who lived with the participant at baseline. The participant reported whether he lived with a "mother figure" or "father figure" and his relationship with this figure (biological, step, adoptive, and so on). This information was used to develop 3 dichotomous variables: participant lived (1) in single-parent home, (2) with biological mother,

and (3) with biological father. Finally, a series of 4 questions was used to measure parental monitoring. Participants responded to items (e.g., "How much does [he or she] know about your close friends?") on a 5-point scale to indicate maternal monitoring and again to indicate paternal monitoring; scores could range from 0 to 16, with higher scores indicating more monitoring ($\alpha=0.71$ and $\alpha=0.78$, respectively).[37] For this study, parental monitoring was based on the highest score for either maternal or paternal monitoring.

Three variables were used to understand behavior among participants' peers. A deviant peer norms variable was created from 5 items (smoke cigarettes; get drunk; belong to gangs; use drugs; skip school) and an enriching peer norms variable was created from 4 items (participate in organized activities; plan to go to college; do volunteer work; go to religious services regularly). Participants used a 5-point scale to report the percentage of peers who engaged in these behaviors. Mean scores were computed for each scale ($\alpha=0.82$ for deviant norms; $\alpha=0.57$ for enriching norms). Early adolescent dating was defined as having been on a date with a girlfriend by the time of the baseline interview.

The environmental domain was described by 3 covariates. Race/ethnicity was self-reported by each youth and categorized into non-Hispanic White or other, non-Hispanic Black, and Hispanic. Enriching environment[37] was based on participants' responses to 3 items: having a computer in the home, having a dictionary in the home, and taking extra classes or lessons. Items were summed for a composite score ranging from 0 to 3, with higher scores indicating a more enriching environment. Finally, physical risk environment[37] was compiled by responses to 3 questions answered by the interviewer (i.e., regarding perceived safeness of neighborhood and home, physical status of youth's home, and physical status of the buildings on the street) and 2 questions answered by the participant (i.e., regarding electricity and heat in the home and frequency of gunshots in the neighborhood). Responses were summed, with higher scores indicating higher risk. Both indices have acceptable measures of validity.[37]

Statistical Analysis

Frequencies were determined and the χ^2 test was conducted to compare age at birth of

a

b
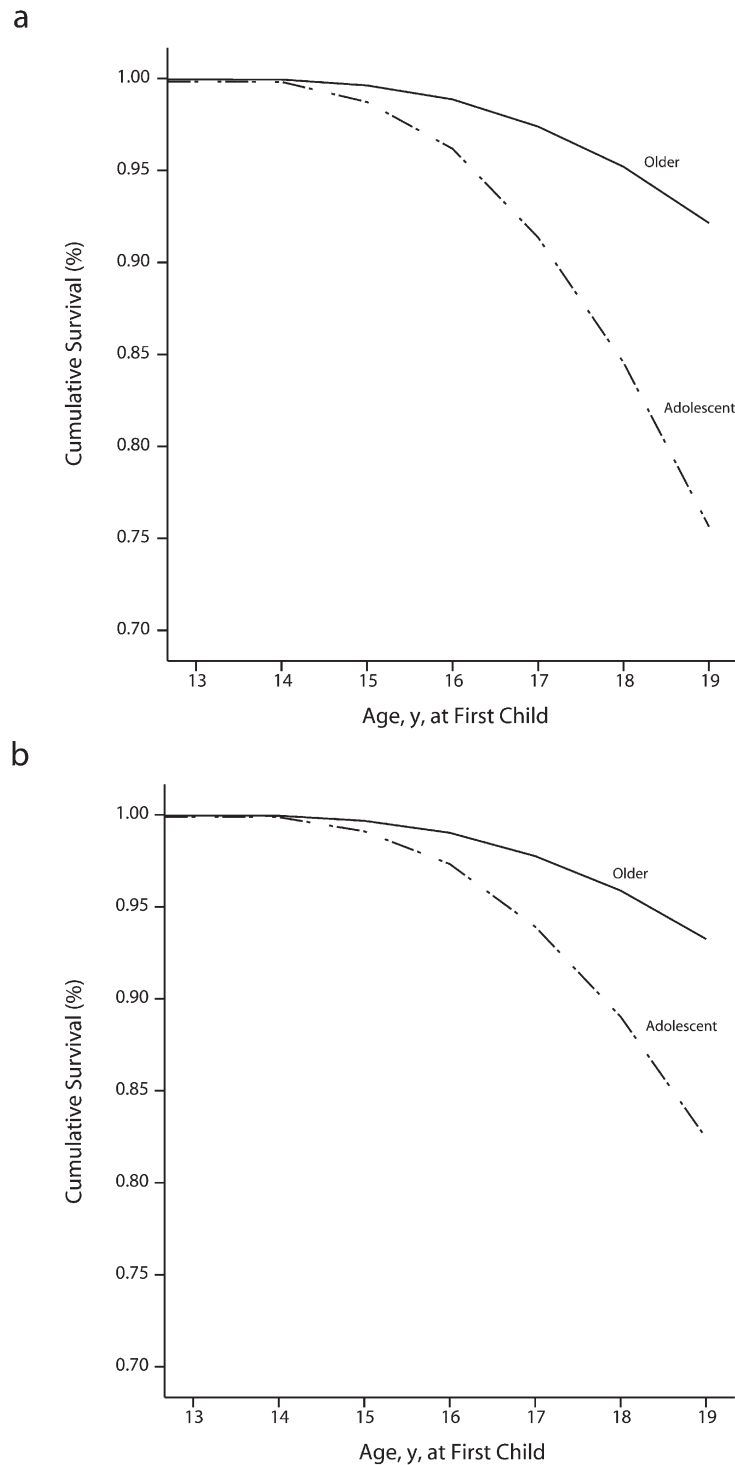
Note. The model controlled for age at baseline interview. For paternal adolescent fatherhood, $\chi^2_2 = 46.49$; $P < .001$; for maternal adolescent motherhood, $\chi^2_2 = 39.50$; $P < .001$.

FIGURE 1—Unadjusted Cox regression survival curves for participant's age at first child, by (a) paternal adolescent fatherhood and (b) maternal adolescent motherhood: National Longitudinal Survey of Youth, 1997–2004.

first child among sons of adolescent parents versus sons of older parents. Survival analysis compared the difference in these rates across the adolescent years. Individual, family, peer, and environmental characteristics were compared for those who became adolescent fathers versus those who did not via the χ^2 test for categorical variables and the *t* test for continuous variables. Risk factors were considered significant through use of a Bonferroni adjustment for multiple comparisons ($P = .002$).

To examine the influence of paternal adolescent fatherhood on participant adolescent fatherhood after accounting for maternal adolescent motherhood and other potential risk factors, we used hierarchical Cox regression analysis. Risk factors that were significant at $P < .20$ in bivariate analyses (without adjustment for multiple comparisons) were included in multivariate analysis. In accordance with the ecological systems theory, the individual-level factors were entered as a block first, followed by family-level, peer-level, and environment-level factors. Maternal adolescent motherhood was then entered into the model, followed by paternal adolescent fatherhood. We examined interaction effects for paternal adolescent fatherhood by all other predictor variables by adding cross-product terms 1-by-1 to the final regression model.

Because the inclusion criteria required that participants were aged 13 or 14 years on December 31, 1996, and because baseline interviews took place in February through October 1997 and March through May 1998, age at baseline interview could vary from 13 to 16 years. Therefore, all analyses controlled for age at baseline interview.

A small proportion of participants had missing data for some predictor variables (all less than 12%). Missing values were imputed on the basis of means for continuous variables and modes for categorical variables. All analyses were conducted with SPSS version 16.0 (SPSS Inc, Chicago, IL).

RESULTS

The sample comprised 1496 adolescent males. At baseline interview, participants ranged in age from 13 to 16 years, averaging 13.85 years (SD = 0.713). Approximately 57% were non-Hispanic White or other (including

Asian), 22% were non-Hispanic Black, and 21% were Hispanic. Whereas 90.1% lived with a biological mother, only 68.9% lived with a biological father. Additionally, 23.3% lived in a single-parent home. On average, mothers of the participants were aged 23.0 years (SD=4.62) and fathers of the participants aged 25.7 years (SD=5.83) at the birth of the first child. Approximately 10% (n=154) of participants were sons of adolescent fathers and 25% (n=379) were sons of adolescent mothers.

Overall, 140 participants (9.4%) became a father before age 20 years. Across the teen years, sons of adolescent fathers were significantly more likely to have had a child than sons of older fathers. Specifically, by age 19 years, sons of adolescent fathers were more than 3 times as likely to have had at least 1 child compared with sons of older fathers (relative risk [RR]=3.13; 95% confidence interval [CI]=2.24, 4.38; $P<.001$). Similarly, sons of adolescent mothers were 2.7 times more likely than were sons of older mothers to have had an adolescent childbirth (RR=2.70; 95% CI=1.98, 3.69; $P<.001$; data not shown). Figure 1a and Figure 1b plot the unadjusted Cox regression survival curves stratified by paternal and maternal adolescent parenthood, respectively. Sons of adolescent fathers were more likely than were sons of older fathers to have a child during the adolescent years ($\chi^2_2=46.49$; $P<.001$), with the absolute difference growing larger with increasing age. Similarly, sons of adolescent mothers were more likely than were sons of older mothers to become a father before age 20 years ($\chi^2_2=39.50$; $P<.001$).

Table 1 presents bivariate associations between individual, family, peer, and environmental risk factors and participant adolescent fatherhood. Specifically, higher delinquency, higher substance use, fewer years of parental education, more children in the home, biological parents not living with the child at age 2 years, living in a single-parent home, not living with biological father, higher level of deviant peer norms, early adolescent dating, non-Hispanic Black or Hispanic race/ethnicity, lack of enriching environment, and higher physical risk environment were significant predictors of participant adolescent fatherhood. Additionally, as demonstrated in survival analysis, paternal adolescent fatherhood and maternal adolescent motherhood were significantly associated with participant adolescent fatherhood.

To examine the multivariate association between the risk factors and a participant's age at birth of first child, hierarchical Cox regression survival analysis was used. Each domain significantly improved the fit of the model (individual, $\chi^2_3=24.50$; $P<.001$; family, $\chi^2_7=66.89$; $P<.001$; peer, $\chi^2_3=17.55$; $P=.001$; environment, $\chi^2_4=41.81$; $P<.001$). Additionally, factors from each domain remained significant in the final multivariate model (Table 2). Specifically, delinquency (RR=1.12; 95% CI=1.01, 1.23), less maternal education (RR=1.61; 95% CI=1.09, 2.37), early adolescent dating (RR=2.15; 95% CI=1.39, 3.32), non-Hispanic Black race/ethnicity (RR=1.95; 95% CI=1.24, 3.06) and Hispanic race/ethnicity (RR=2.20; 95%

TABLE 1—Individual, Family, Peer, and Environmental Characteristics, by Adolescent Fatherhood Status: National Longitudinal Survey of Youth, 1997–2004

Characteristic	Overall, Mean ±SD or No. (%)	Adolescent Fatherhood (n = 140), Mean ±SD or No. (%)	No Adolescent Fatherhood (n = 1356), Mean ±SD or No. (%)	P
Individual				
Behavioral/Emotional Scale[a]	2.1 ±1.57	2.4 ±1.58	2.1 ±1.57	.020
Delinquency Index[b]	1.6 ±1.93	2.4 ±2.44	1.5 ±1.85	<.001[c]
Substance Use Index[d]	0.9 ±1.05	1.2 ±1.14	0.87 ±1.04	<.001[c]
Family				
Maternal education <12 y	321 (21.5)	63 (45.0)	258 (19.0)	<.001[c]
Paternal education <12 y	332 (22.2)	53 (37.9)	279 (20.6)	<.001[c]
No. of children in the home	2.5 ±1.18	3.0 ±1.34	2.4 ±1.15	.001[c]
Both biological parents living with child at age 2 y	892 (59.6)	57 (40.7)	835 (61.6)	<.001[c]
Single-parent home	349 (23.3)	53 (37.9)	296 (21.8)	<.001[c]
Live with biological mother	1348 (90.1)	122 (87.1)	1226 (90.4)	.217
Live with biological father	1030 (68.9)	70 (50.0)	960 (70.8)	<.001[c]
Parental monitoring	10.0 ±3.17	9.6 ±3.45	10.1 ±3.14	.074
Maternal adolescent motherhood	379 (25.3)	67 (47.9)	312 (23.0)	<.001[c]
Paternal adolescent fatherhood	154 (10.3)	37 (26.4)	117 (8.6)	<.001[c]
Peer				
Deviant peer norms	1.9 ±0.84	2.2 ±0.89	1.9 ±0.83	.001[c]
Enriching peer norms	3.0 ±0.72	3.0 ±0.78	3.0 ±0.71	.183
Early adolescent dating	860 (57.5)	109 (77.9)	751 (55.4)	<.001[c]
Environmental				
Race/ethnicity				<.001[c]
Non-Hispanic White/other	857 (57.3)	43 (30.7)	814 (60.0)	
Non-Hispanic Black	332 (22.2)	50 (35.7)	282 (20.8)	
Hispanic	307 (20.5)	47 (33.6)	260 (19.2)	
Enriching environment	1.7 ±0.75	1.4 ±0.75	1.7 ±0.74	<.001[c]
Physical risk environment	1.3 ±1.30	2.2 ±1.50	1.2 ±1.25	<.001[c]

Note. SD = standard deviation. "Paternal adolescent fatherhood" and "maternal adolescent motherhood" mean that the fathers and mothers of study participants were aged 19 years or younger when their first child was born.
[a]Assessed by 4 questions from the Child Behavior Checklist[36] measured on a 3-point scale—not true, sometimes true, or often true; higher scores indicate greater distress.
[b]Assessed by 10 items from the Delinquency Index[37] asking about deviant behaviors; responses were summed for a possible total of 10 points, with higher scores indicating higher levels of delinquency.
[c]These factors remained significant after a Bonferroni adjustment for multiple comparisons ($P \le .002$).
[d]Assessed by the Substance Use Index[37] consisting of 3 items that ascertained use of cigarettes, alcohol, and marijuana; responses were summed for a possible total of 3, with higher scores indicating higher levels of substance use.

TABLE 2—Multivariate Hierarchical Cox Regression Model Predicting Time to First Child Among Adolescent Male Participants: National Longitudinal Survey of Youth, 1997–2004

	$\chi^2 (df)^a$	P^a	RR (95% CI)^b
Block 1: individual	24.50 (3)	<.001	
Behavioral/Emotional Scale^c			0.96 (0.86, 1.09)
Delinquency Index^d			1.12* (1.01, 1.23)
Substance Use Index^e			1.10 (0.91, 1.34)
Block 2: family	66.89 (7)	<.001	
Maternal education			1.61* (1.09, 2.37)
Paternal education			1.14 (0.78, 1.69)
No. of children in the home			1.12 (0.98, 1.27)
Both biological parents living with child at age 2 y			1.00 (0.64, 1.57)
Single-parent home			1.22 (0.77, 1.94)
Parental monitoring			1.00 (0.94, 1.06)
Child lives with biological father			0.76 (0.46, 1.26)
Block 3: peer	17.55 (3)	.001	
Deviant peer norms			0.91 (0.74, 1.13)
Enriching peer norms			1.08 (0.86, 1.36)
Early adolescent dating			2.15** (1.39, 3.32)
Block 4: environment	41.81 (4)	<.001	
Race/ethnicity: Black vs White/other			1.95** (1.24, 3.06)
Race/ethnicity: Hispanic vs White/other			2.20** (1.42, 3.43)
Enriching environment			0.86 (0.67, 1.10)
Physical risk environment			1.26** (1.12, 1.42)
Block 5: maternal adolescent motherhood	3.66 (1)	.056	1.26 (0.86, 1.85)
Block 6: paternal adolescent fatherhood	7.37 (1)	.007	1.80** (1.19, 2.71)

Note. CI = confidence interval; RR = relative risk. Individual, family, peer, and environmental predictors were measured at baseline; only those that were significant at $P < .20$ in bivariate analyses were included in multivariate analysis. The analysis controlled for age at baseline interview. The total sample was N = 1496.
^{a}Chi-square and P values refer to the additional variability explained by each block sequentially, after accounting for previously entered blocks.
^{b}Relative risk and confidence interval values are for the final model, with all blocks entered.
^{c}Assessed by 4 questions from the Child Behavior Checklist[36] measured on a 3-point scale—not true, sometimes true, or often true; higher scores indicate greater distress.
^{d}Assessed by 10 items from the Delinquency Index[37] asking about deviant behaviors; responses were summed for a possible total of 10 points, with higher scores indicating higher levels of delinquency.
^{e}Assessed by the Substance Use Index[37] consisting of 3 items that ascertained use of cigarettes, alcohol, and marijuana; responses were summed for a possible total of 3, with higher scores indicating higher levels of substance use.
*$P \leq .05$; **$P \leq .01$.

CI = 1.42, 3.43), and physical risk environment (RR = 1.26; 95% CI = 1.12, 1.42) were independent predictors of a participant's age at birth of first child.

Notably, after accounting for these risk factors, maternal adolescent motherhood only marginally improved the fit of the model ($\chi^2_1 = 3.66$; $P = .056$) and was not a significant independent predictor of age at birth of first child in the final model (RR = 1.26; 95% CI = 0.86, 1.85). On the other hand, as hypothesized, paternal adolescent fatherhood was

significant ($\chi^2_1 = 7.37$; $P = .007$). Specifically, the increased risk of adolescent fatherhood for sons of adolescent fathers compared with sons of older fathers remained even after control for all risk factors and maternal adolescent motherhood (RR = 1.80; 95% CI = 1.19, 2.71; Table 2). Figure 2 presents the multivariate Cox regression survival curve stratified by paternal adolescent fatherhood. Although the effect was attenuated after risk factors were accounted for, sons of adolescent fathers were more likely than were sons of older fathers to

have a child during the adolescent years ($\chi^2_{20} = 184.50$; $P < .001$), with the difference growing larger with increasing age.

To determine whether the effect of paternal adolescent fatherhood on participant's age at birth of first child differed according to the risk factors included in the multivariate model, we tested for statistical interaction. We examined interaction terms by treating the continuous variables as continuous and as dichotomous using median splits. Surprisingly, there were no significant interaction effects ($P < .05$) between paternal adolescent fatherhood and any of the covariates with either approach. Most notably, no interaction effect was found between paternal and maternal adolescent parenthood ($P = .83$; data not shown), indicating that there was no added risk of becoming an adolescent father when both parents were adolescent parents.

DISCUSSION

We prospectively examined the effect of paternal adolescent fatherhood on participant adolescent fatherhood among a national cohort of young males from the NLSY97. Sons of adolescent fathers were at significantly increased risk for becoming adolescent fathers themselves compared with sons of older fathers. This effect remained significant even after control for other related risk factors, thereby providing evidence for an intergenerational cycle of adolescent fatherhood. This report, therefore, is the first to suggest an intergenerational cycle of risk for young fatherhood among a contemporary population of young males.

Parents often shape adolescent attitudes and peer networks by communicating their values and expectations through their behavior.[30] For instance, the work the Coley et al. demonstrated that youths who interacted more regularly with their families and who had more involved fathers participated in less risky sexual behaviors.[30] Similarly, Ream and Savin-Williams[38] found that closer parent–youth relationships were associated with later sexual initiation. Parents also strongly influence the structural context in which their children are raised. Single-parent homes and dangerous physical environments are characteristics derived from parents and associated with increased sexual risk behavior.[27,39] Several
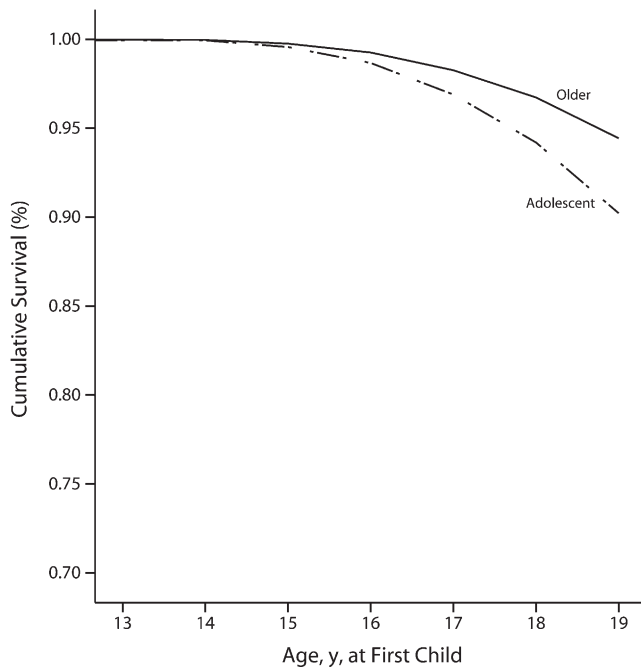
Note. Individual, family, peer, and environmental predictors were measured at baseline; only those that were significant at $P<.20$ in bivariate analyses were included in multivariate analysis. The model controlled for age at baseline interview ($\chi^2_{20}=183.30$; $P<.001$).

FIGURE 2—Adjusted model of Cox regression survival curve for participant's age at first child, by paternal adolescent fatherhood, adjusted for individual, family, peer, and environmental risk factors: National Longitudinal Survey of Youth, 1997–2004.

studies have demonstrated the importance of a father figure in reducing the risk for early fatherhood.[40–43] This evidence suggests that programs aimed at preventing adolescent pregnancy are needed for both young women and young men.

Ecological Systems Theory and Adolescent Fatherhood

Consistent with the ecological systems theory, individual, family, peer, and environmental factors predicted adolescent fatherhood, with each domain significantly contributing to the final model. After control for these risk factors, the relative risk of adolescent fatherhood among sons of adolescent fathers compared with sons of older fathers was somewhat attenuated but still significant, suggesting that this effect is partially accounted for by factors from each domain.

From the individual domain, delinquency emerged as a significant risk factor for adolescent fatherhood. Delinquency has been commonly associated with other risky behaviors such as substance use and sexual risk.[44,45] Because adolescent delinquency has been linked to family structural factors,[46] this may explain why covariates from the family domain may have been significant in the bivariate analysis but did not retain significance in the multivariate model.

Maternal education, which has consistently been associated with adolescent sexual risk behavior,[27] was the only significant predictor from the family domain. Lower maternal education may represent lower expectations for academic achievement and career development or may be an indicator of socioeconomic status, representing the availability of fewer economic resources.

From the peer domain, participants' history of early dating not surprisingly emerged as an important predictor of adolescent fatherhood, signifying increased opportunities for early sexual initiation[47] or reflecting the desire to build a family.[48]

Non-Hispanic Black and Hispanic males had almost double the risk of non-Hispanic White males, consistent with national teen pregnancy and parenthood rates among these subpopulations.[2] This increased risk was evident even after we accounted for individual, family, and peer characteristics, reflecting an otherwise unmeasured environmental aspect of race/ethnicity. Physical risk environment also appeared as an important predictor of adolescent fatherhood, corroborating other work.[24]

The effect of maternal adolescent motherhood, although significant in the bivariate analyses, was only marginally significant after we controlled for other factors. The effect of adolescent motherhood appears to have been explained entirely by these ecological covariates, including delinquency, maternal education, early dating history, race/ethnicity, and physical risk environment. These results differ somewhat from those in the existing literature,[12,13,25,49] although this discrepancy may be due to the order in which the covariates were entered in our analysis or covariates that were not controlled for in previous work.

Limitations and Strengths

Our analysis is not without limitations. We report on the results of a secondary data analysis of the NLSY97. As a result, we were limited to the data that had been collected, including certain constructs with questionable reliability and validity, and were unable to include potentially important predictors, such as exposures that occurred in early childhood. Additionally, data were collected by self-report, which can lead to misclassification. As indicated in Methods, however, audio- and computer-assisted self-interviews were used to assess sensitive constructs, such as sexual behaviors, to minimize bias. Last, as with any study on fatherhood, the classification "fatherhood" assumes that men know about and are willing to admit their paternal role.

Approximately 18% of adolescent males were excluded from this analysis because the father's age at first biological child could not be determined. These excluded participants were older at birth of their first child compared with those participants who had adolescent fathers, but were younger at birth of their first child compared with participants with older fathers. To better characterize the magnitude and

direction of this potential bias, we conducted a sensitivity analysis to test the most extreme scenarios for categorizing the excluded participants. The multivariate Cox regression was repeated twice: first with all the excluded participants categorized as being sons of adolescent fathers (RR=1.374; 95% CI=1.004, 1.883; P=.047) and then with all excluded participants categorized as being sons of older fathers (RR=1.664; 95% CI=1.127, 2.451; P=.010). Although the magnitude was attenuated, the effect of paternal adolescent fatherhood remained significant in both scenarios. Therefore, even in the most extreme circumstances, paternal adolescent fatherhood remained an important predictor of adolescent fatherhood.

Notwithstanding these limitations, this analysis has a number of strengths. To the best of our knowledge, it is the first to describe the intergenerational cycle of adolescent fatherhood among young adults in the United States. Additionally, the longitudinal design allowed us to assess adolescent fatherhood prospectively over time. Furthermore, the sampling techniques of the NLSY97 allowed for comparison of a large, diverse population of adolescents in the United States. Finally, by allowing the ecological systems theory to guide our analysis, we were able to understand the intergenerational cycle of adolescent fatherhood in greater depth in the context of multiple levels of risks.

Significance and Implications

Men are an important but neglected group in reproductive health. The results of this study indicate an intergenerational cycle of adolescent fatherhood above and beyond the influence of having an adolescent mother and other traditional risk factors for adolescent pregnancy. These findings support the need for pregnancy prevention interventions specifically designed for and targeted at young males who may be at high risk for continuing this cycle. Interventions that address multiple levels of risk will likely be most successful at reducing pregnancies among partners of young men. ∎

About the Authors

The authors are with the Yale School of Public Health and the Center for Interdisciplinary Research on AIDS, Yale University, New Haven, CT.

Correspondence can be sent to Trace Kershaw, PhD, Yale School of Public Health, 60 College St, New Haven, CT 06520-8034 (e-mail: trace.kershaw@yale.edu). Reprints can be ordered at http://www.ajph.org by clicking the "Reprints/Eprints" link.

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