

# Childhood Behavior Problems and Age at First Sexual Intercourse: A Prospective Birth Cohort Study

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abstract

**BACKGROUND AND OBJECTIVES:** Early first sexual intercourse (FSI) is a risk factor for unplanned teenage pregnancy, sexually transmitted infection, and adverse social, emotional, and physical health outcomes in adolescence and into adulthood. The aim of this study was to examine relationships between internalizing (eg, anxious/depressed, withdrawn) and externalizing (eg, delinquent, aggressive) behavior problems in childhood and age at FSI.

**METHODS:** We used a large, population-based birth cohort (The Western Australian Pregnancy Cohort [Raine] Study) to address this question. Child behavior was measured by using the Child Behavior Checklist collected from parents at ages 2, 5, 8, 10, and 14 and scores calculated for total, internalizing, and externalizing behavior problems. At age 17, 1200 participants reported sexual behavior.

**RESULTS:** Participants with clinically significant Child Behavior Checklist scores ( $T \geq 60$ ) were at increased risk for earlier first sexual intercourse (FSI) ( $<16$  years). Adjusted odds ratios revealed that total and externalizing behavior problems from age 5 years onward significantly increased the risk of earlier FSI for boys. In girls, externalizing problems from age 10 years increased the risk for earlier FSI. Internalizing problems at ages 8 and 10 were significantly associated with early FSI for boys but not girls.

**CONCLUSIONS:** Externalizing behavior from as early as 5 in boys and 10 in girls is a significant risk factor for earlier age at FSI. Adolescent sexual health promotion should consider early intervention in children with behavior problems, particularly boys.



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**WHAT'S KNOWN ON THIS SUBJECT:** Early first sexual intercourse (FSI) is a risk factor for unplanned teenage pregnancy, sexually transmitted infection, and adverse health outcomes in adolescence and into adulthood. In girls, externalizing behaviors are more strongly associated with earlier FSI than internalizing behaviors.

**WHAT THIS STUDY ADDS:** Externalizing behavior from as early as 5 in boys and 10 in girls is a significant risk factor for earlier age at FSI. Internalizing behavior at ages 8 and 10 was associated with early FSI for boys but not girls.

The onset of sexual activity is a normal part of human development. However, young age at first sexual intercourse (FSI) has been identified as an important predictor of a range of risky behaviors and adverse outcomes in boys and in girls. Earlier first sexual intercourse (FSI) is associated with unprotected intercourse,<sup>1</sup> inconsistent contraceptive use,<sup>2</sup> and multiple partners and with negative social and health outcomes, including partner violence,<sup>3</sup> lower educational attainment,<sup>4,5</sup> unintended pregnancy, teenage parenting,<sup>6</sup> and sexually transmitted infection.<sup>7,8</sup> Definitions of “early” FSI have varied, and include age 15 years and younger<sup>2,4,9</sup> or 16 years and younger,<sup>7,10</sup> or quartiles or tertiles of age at FSI in a study population.<sup>11,12</sup>

Previous prospective studies have demonstrated that a range of biological, social, and psychological precursors such as early puberty, childhood adversity, low socioeconomic status, dysfunctional family relationships, absence of a biological father at home, poor school adjustment, adolescent depression, and low self-esteem are associated with earlier age at FSI.<sup>13,14</sup> In addition, prospective studies have revealed associations between individual child and adolescent problem behaviors largely of the externalizing type and early FSI.<sup>15–18</sup> Problem behaviors encompass externalizing behaviors, which include aggressive and delinquent behaviors, linked to poor behavioral control, impulsivity and risk taking,<sup>15,19</sup> and internalizing behaviors including social avoidance and withdrawal, which are linked to depression and anxiety in adolescence.<sup>20</sup> Problem behaviors affect a child’s functioning, cause emotional distress, and are linked to other negative outcomes in later life, including high school noncompletion<sup>21</sup>; physical health problems<sup>22</sup>; drug and alcohol misuse<sup>23</sup>; marital difficulties<sup>24</sup>; increased mortality<sup>25</sup>; and

involvement in the criminal and justice system.<sup>26</sup> Although both early FSI and child problem behavior are clearly important indicators of poor health and well-being, the nature of the relationship between the 2 is as yet not well understood.

A large prospective population-based longitudinal cohort study is the most robust methodology to examine the relationship between early life events and age at FSI, adjusting for confounding and mediating factors.<sup>6,27</sup> The aim of this study was to examine the relationship between childhood behavior problems, including both internalizing and externalizing problems, and early FSI in 17-year-old boys and girls by using a large and well characterized Australian birth cohort.

## METHODS

### Participants

The Western Australian Pregnancy Cohort (Raine) Study is a prospective cohort study of 2868 live births resulting from 2900 pregnancies followed from 1989 to the present day. Complete cohort details and recruitment procedures are published elsewhere.<sup>28,29</sup> In brief, the cohort was recruited during pregnancy from the single tertiary-catchment maternity hospital in Western Australia, with clinical and questionnaire data collected at 18 and 34 weeks’ gestation. Study children and their families were then followed up at ages 1, 2, 3, 5, 8, 10, 14, and 17 years with extensive clinical and questionnaire data collected, including behavioral assessments (2, 5, 8, 10, 14, and 17 years), and sexual behavior (17 years). Informed consent was obtained at the time of study enrolment and at every subsequent follow-up. Study protocols were approved by the Human Ethics Committees at King Edward Memorial Hospital and Princess Margaret Hospital for Children in Perth, Western Australia.

### Responders Versus Nonresponders at the 17-Year Follow-up

At the 17-year follow-up, there were 1645 nonresponders (57.8%) and 1200 responders (42.3%) giving a total of 2845 from the initial cohort of 2868 (after excluding 19 neonatal deaths, 1 childhood death, and 3 cases of missing data). Mothers of nonresponders were significantly more likely to be younger than 25 years of age at the time of birth, of nonwhite ethnicity, less educated, and smoke during pregnancy (Supplemental Table 4). Among the entire cohort, adolescents who had clinically significant externalizing behavioral scores on the Child Behavior Checklist (CBCL) during childhood were significantly less likely to complete the 17-year follow-up (Supplemental Table 5).

### Predictor Variable

The CBCL for Ages 4 to 18 (CBCL/4–18) is a 118-item instrument designed to measure child behavior by parent report.<sup>30</sup> The CBCL has shown good internal consistency in diagnosis of child psychopathology in many previous reports, is comparable with standardized diagnostic interviews in identifying children and adolescents with psychiatric morbidity,<sup>31</sup> and has been widely used internationally in peer-reviewed literature on child behavioral development.<sup>32</sup> In addition to the CBCL/4–18 data collected at the 5-, 8-, 10-, and 14-year follow-ups, the CBCL for Ages 2 to 3 (CBCL/2–3), a 99-item, empirically validated measure of child behavior by parent report, was used at the 2-year follow-up.<sup>33</sup> Both CBCL forms produce raw scores that can be converted into 3 summary T scores (standardized by age and gender) for total, internalizing (withdrawal, somatic complaints, anxious/depressed), and externalizing (delinquency, aggression) behavior.<sup>30</sup> In this study, CBCL raw scores were converted to standardized T scores at each follow-up and dichotomized with reference

to published cutoff values (T scores  $\geq 60$ ), indicating clinically recognized behavioral disorders.

### Outcome Variable

Self-reported data on age (in years) of FSI were collected at age 17 years by using a confidential computer-assisted questionnaire derived from the National Survey of Secondary School Students, HIV/AIDS and Sexual Health, 2002.<sup>34</sup> Kaplan-Meier survival probabilities were used to estimate the cumulative incidence of age at FSI (Table 1). The cutoff for early FSI was defined as the age up to when 25% (first quartile) of the cohort reported their first experience of sexual intercourse. However, as age at FSI was reported in years only, the age in years when 25% of the population reported FSI was an approximate cutoff. For girls, 25% of the population reported FSI by age 16 (for boys this was 22%). Analyses were also performed by using earlier/later age cutoffs of FSI (<15 and 16/17 years of age).

### Control Variables

Key variables likely to modify the age at FSI were collected in pregnancy, birth, and at follow-up visits. These data included maternal age at birth of the child, maternal ethnicity (considered as white or other due to the low proportion of other single ethnic groups in this population), parental educational attainment (< high school completion, high school completion, trade certificate, or tertiary studies), and maternal employment in late pregnancy from 34 weeks (yes/no), a proxy for socioeconomic status (SES)<sup>35</sup> in this population. During pregnancy, we

documented mothers' relationship status (presence or absence of the biological father in the home), total family income, and parental substance use (cigarette smoking, alcohol intake, and drug use).

Age at menarche was included as a control variable because it has been associated with early FSI<sup>13,36</sup> and problem behavior.<sup>37</sup> Menarche was reported prospectively for 63.3% of female participants with a self-report diary of first 3 consecutive menstrual periods, whereas 23.9% of girls retrospectively recalled age of menarche to within 1 month of occurrence, and the rest recalled the event within 1 year of the date, or did not provide information.<sup>38,39</sup> A similarly reliable self-report measure of pubertal development in boys is not known.

### Statistical Analyses

Means and SDs or medians and interquartile ranges (IQRs) were used to summarize continuous data and frequency distributions summaries were used for categorical data. Univariate group comparisons were conducted by using *t* tests for continuous outcomes and  $\chi^2$  tests for categorical outcomes. All hypothesis tests were 2-sided and *P* values < .05 were considered statistically significant.

The primary analysis examined the effects of CBCL scores indicating clinically recognized behavioral problems on FSI, using univariate and multivariable logistic regression analysis. The effects of CBCL scores were summarized by using odds ratios (ORs) and their 95% confidence intervals (CIs).

Multivariable regression models of the role of CBCL scores on FSI were adjusted for predictors identified as statistically significant in univariate regression analyses. Separate logistic regressions were performed for each gender, and regressions for female adolescents were adjusted for time of menarche. SPSS for windows (version 18, IBM SPSS Statistics, IBM Corporation) software was used for data analysis.

## RESULTS

Age of the adolescents at the 17-year follow-up was similar between boys and girls (*P* = .10), with respective median ages of 17.0 (IQR, 16.9–17.1; range, 16.0–18.2) and 17.0 (IQR, 16.9–17.2; range, 16.6–18.9) for boys and girls. Data on age at menarche were available for 86.2% female adolescents (523 of 607). Median age at menarche for these female adolescents was 12.8 years (IQR, 12.0–13.5; range, 9.2–16.0). The baseline perinatal characteristics of our cohort, stratified by gender and early FSI, are presented in Table 2.

### Age at FSI

At the 17-year follow-up, 44.5% of boys (264 of 593) and 50.7% girls (308 of 607) reported having had sexual intercourse, and 21.8% boys (129) and 25.4% girls (154) reported having had sexual intercourse before the age of 16 years. Most participants who were in this category were aged 15 years; those aged 14 and younger were few. There were no differences in the age at menarche between girls who had and had not experienced FSI at the 17-year follow-up. More detail on the relationship between age at

**TABLE 1** Cumulative Incidence of FSI by Gender

Age	Boy			Girl		
	No. at Risk	No. Experiencing FSI	Proportion Experiencing FSI (95% CI)	No. at Risk	No. Experiencing FSI	Proportion Experiencing FSI (95% CI)
13	593	17	0.03 (0.02–0.04)	607	8	0.01 (0.00–0.02)
14	576	31	0.08 (0.06–0.10)	599	52	0.10 (0.08–0.12)
15	545	81	0.22 (0.18–0.25)	547	94	0.25 (0.22–0.29)
16	464	108	0.40 (0.36–0.44)	453	142	0.49 (0.45–0.53)
17	180	27	0.49 (0.44–0.53)	156	12	0.53 (0.48–0.57)

**TABLE 2** Baseline Family Characteristics Stratified by Adolescents' Gender and Early FSI

Characteristics	Male Adolescents			Female Adolescents		
	FSI <16 y, N (%)	FSI ≥16 y, N (%)	P	FSI <16 y, N (%)	FSI ≥16 y, N (%)	P
All	129 (100)	464 (100)		154 (100)	453 (100)	
Mother						
Age at delivery, y <sup>a</sup>	27.3 (5.5)	29.0 (5.6)	.002	27.1 (6.4)	29.0 (5.7)	.002
Ethnicity						
White	115 (92.0)	412 (89.9)	.454	136 (90.1)	394 (89.3)	.802
Education						
<High school	32 (26.7)	104 (23.5)	<.001	48 (33.6)	103 (24.3)	.045
High school	35 (29.2)	57 (12.9)		26 (18.2)	73 (17.3)	
Trade	45 (37.5)	209 (47.3)		57 (39.9)	179 (42.3)	
Tertiary	8 (6.7)	72 (16.3)		12 (8.4)	68 (16.1)	
Working at 34 weeks' gestation	59 (45.7)	267 (57.5)	.017	84 (54.5)	256 (56.5)	.671
High family income <sup>b</sup>	38 (31.9)	136 (32.6)	.889	48 (33.3)	128 (30.5)	.534
Father not at home <sup>c</sup>	18 (4.9)	28 (6.3)	.002	29 (19.7)	34 (8.0)	<.001
Smoking during pregnancy						
Mother	40 (31.3)	59 (12.7)	<.001	47 (30.7)	71 (15.8)	<.001
Father	55 (44.4)	123 (27.2)	<.001	70 (47.0)	128 (29.5)	<.001
Alcohol during pregnancy						
Mother	78 (66.7)	294 (69.7)	.534	97 (71.9)	283 (68.5)	.466
Drug use						
Mother	10 (8.5)	23 (5.3)	.198	28 (19.9)	28 (6.8)	<.001
Father	28 (22.8)	55 (12.2)	.003	42 (28.6)	78 (18.0)	.003

P values calculated from  $\chi^2$  test; Baseline data were collected at 18-wk and/or 34-wk pregnancy.

<sup>a</sup> Shown as mean (SD) and P value from t test.

<sup>b</sup> Top 30% of cohort.

<sup>c</sup> Father does not live with mother at 18-wk pregnancy.

menarche and FSI is reported elsewhere.<sup>39</sup>

### CBCL T Scores and Age of FSI

The proportions scoring above clinically significant cutoff are presented by gender and early FSI in Table 3. For boys, univariate analysis revealed total CBCL scores above T score cutoff at ages 5, 8, 10, and 14 years were significantly associated with earlier FSI ( $P < .05$ ), whereas for girls, total CBCL scores above T score cutoff were significantly associated with earlier FSI at ages 5, 10, and 14 years (Table 3). For both boys and girls, externalizing behavior T scores above cutoff at ages 5, 8, 10, and 14 years were associated with a significantly greater risk of early FSI ( $P < .05$ ). Internalizing behavioral problems at ages 8 and 10 significantly increased the risk for early FSI in boys, whereas for girls internalizing problems revealed no significant relationship with earlier age of FSI (Table 3). We found no significant association between total, externalizing or internalizing

problems, and early menarche (before 12 years of age) in girls (data not shown).

Analyses were subsequently adjusted to account for sociodemographic factors and age of menarche. In the adjusted models, all previously identified relationships between clinically significant behavior problem scores and early FSI remained significant for boys: total and externalizing T scores above cutoff were associated with an increased risk for early FSI at ages 5 (OR = 2.18, 95% CI = 1.31–3.62), 8 (OR = 1.95, 95% CI = 1.18–3.23), 10 (OR = 3.46, 95% CI = 1.98–6.05), and 14 (OR = 2.43, 95% CI = 1.38–4.28) years. Internalizing T scores above the cutoff at ages 8 and 10 years also remained significant in boys. For girls, only externalizing behavior T scores above cutoff at ages 10 (OR = 2.19, 95% CI = 1.17–4.10) and 14 (OR = 2.56, 95% CI = 1.44–4.56) remained significant predictors; there were no significant relationships between total and internalizing T scores above cutoff and earlier FSI (Table 3).

We evaluated whether children with T scores above cutoff for both internalizing and externalizing behavior were at greater risk of early FSI in adolescence (Supplemental Table 6). We found that having T scores above cutoff for both externalizing and internalizing behavior at ages 5, 8, 10, and 14 years significantly predicted early FSI in boys. In girls, T scores above this cutoff for both externalizing and internalizing behavior at ages 10 and 14 years significantly predicted early FSI.

We examined whether these relationships changed when early FSI was defined as less than 15 years. For girls, the associations were similar, and statistically significant (data not shown). For boys, as the number of cases was low, most associations lost their statistical significance (data not shown).

### DISCUSSION

Ours is the first and largest birth cohort to carefully examine the relationship between the range of

**TABLE 3** ORs of Early FSI for Adolescents With Clinically Significant CBCL Scores Compared With Normal CBCL Scores at Each Follow-up Year

CBCL Score $\geq 60$	Male Adolescents				Female Adolescents			
	FSI <16 y, N (%)	FSI $\geq 16$ y, N (%)	Risk of FSI <16 y		FSI <16 y, N (%)	FSI $\geq 16$ y, N (%)	Risk of FSI <16 y	
			OR (95% CI) Unadjusted	OR (95% CI) Adjusted <sup>a</sup>			OR (95% CI) Unadjusted	OR (95% CI) Adjusted <sup>b</sup>
Total								
Age 2	17 (16.7)	39 (10.2)	1.77 (0.95–3.28)	1.58 (0.81–3.07)	9 (7.4)	34 (9.1)	0.80 (0.37–1.71)	0.53 (0.23–1.21)
Age 5	44 (37.9)	67 (15.7)	3.29 (2.09–5.20)	2.70 (1.66–4.38)	35 (25.0)	68 (16.1)	1.74 (1.09–2.76)	1.23 (0.73–2.08)
Age 8	37 (30.6)	61 (14.2)	2.66 (1.66–4.27)	2.20 (1.33–3.65)	28 (20.1)	68 (16.0)	1.32 (0.81–2.15)	0.98 (0.56–1.69)
Age 10	37 (30.6)	54 (12.4)	3.12 (1.93–5.05)	2.61 (1.57–4.35)	28 (20.1)	46 (10.6)	2.13 (1.27–3.56)	1.69 (0.96–3.00)
Age 14	25 (21.6)	33 (7.8)	3.25 (1.84–5.73)	2.66 (1.45–4.86)	26 (18.2)	45 (10.5)	1.90 (1.12–3.21)	1.47 (0.81–2.67)
Externalizing								
Age 2	19 (18.6)	45 (11.7)	1.72 (0.96–3.10)	1.33 (0.71–2.51)	14 (11.5)	40 (10.7)	1.08 (0.57–2.07)	0.76 (0.37–1.55)
Age 5	36 (31.0)	64 (15.0)	2.56 (1.59–4.11)	2.18 (1.31–3.62)	34 (24.3)	62 (14.7)	1.86 (1.16–2.98)	1.32 (0.79–2.23)
Age 8	34 (28.1)	63 (14.7)	2.28 (1.41–3.67)	1.95 (1.18–3.23)	32 (23.0)	54 (12.7)	2.05 (1.26–3.34)	1.54 (0.90–2.62)
Age 10	33 (27.3)	37 (8.5)	4.05 (2.40–6.84)	3.46 (1.98–6.05)	27 (19.4)	35 (8.1)	2.75 (1.60–4.73)	2.19 (1.17–4.10)
Age 14	29 (25.0)	43 (10.2)	2.95 (1.74–4.98)	2.43 (1.38–4.28)	32 (22.4)	37 (8.6)	3.05 (1.82–5.13)	2.56 (1.44–4.56)
Internalizing								
Age 2	12 (11.8)	28 (7.3)	1.70 (0.83–3.46)	1.39 (0.64–3.04)	7 (5.7)	30 (8.0)	0.70 (0.30–1.63)	0.53 (0.21–1.35)
Age 5	29 (25.0)	87 (20.3)	1.31 (0.81–2.12)	1.23 (0.74–2.05)	23 (16.4)	56 (13.3)	1.28 (0.76–2.18)	0.97 (0.54–1.74)
Age 8	38 (31.4)	79 (18.4)	2.03 (1.29–3.21)	1.72 (1.07–2.79)	22 (15.8)	68 (16.0)	0.98 (0.58–1.66)	0.72 (0.40–1.29)
Age 10	40 (33.1)	68 (15.6)	2.68 (1.69–4.24)	2.35 (1.45–3.81)	25 (18.0)	65 (15.0)	1.24 (0.75–2.07)	1.11 (0.64–1.93)
Age 14	14 (12.1)	32 (7.6)	1.68 (0.86–3.26)	1.57 (0.79–3.13)	25 (17.5)	60 (14.0)	1.30 (0.78–2.17)	0.99 (0.56–1.77)

<sup>a</sup> ORs adjusted for mothers' age, smoking during pregnancy, and working near adolescent's birth.

<sup>b</sup> ORs adjusted for mothers' age, smoking, and father not living with mother during pregnancy, and age at onset of menarche.

childhood problem behavior and age at FSI in girls and boys by using a comprehensive behavior assessment tool, with measurement of internalizing and externalizing behavior at regular intervals over childhood, while taking into consideration the key biological, social, and psychological factors that may modify this relationship. The principal finding was that total and externalizing CBCL scores from as young as 5 years in boys increased the risk of earlier age at FSI. Clear gender differences were observed. In girls, only externalizing behavior increased the risk for early FSI, and from a later age (10 years). Internalizing problems in middle to late childhood (ages 8 and 10) were also significantly associated with early age at FSI for boys but not for girls.

Our observations confirm previous reports identifying externalizing behaviors as more strongly associated with earlier reported age of FSI than internalizing behaviors.<sup>17,40</sup> These studies collected age of FSI in young adulthood rather than adolescence. A broad review of correlates of early FSI, and the Dunedin

Multidisciplinary Health and Development Study (Dunedin Study), which collected data on mental health disorder diagnoses, also found the relationship between externalizing problems and FSI was stronger for boys.<sup>13,35</sup>

Our findings broadly support those of the Dunedin Study and another older birth cohort study in New Zealand. The Christchurch Health and Development Study<sup>6</sup> demonstrated that conduct disorder from age 8 was associated with increased risk of teenage pregnancy by age 18. Teenage pregnancy is a potentially adverse health outcome for mother and child, but is not always mediated through earlier age at FSI. These data do not help in understanding the relationship in boys. The Dunedin Study<sup>17</sup> revealed that antisocial behavior between ages 5 and 11 predicted FSI before age 16. A recent data linkage study in Western Australia revealed an association between behavior problems in girls aged 4 to 14 years (as measured by the CBCL in a representative cross-sectional survey) and teenage births.<sup>41</sup> Careful delineation of

problem behavior into internalizing and externalizing behaviors by using the CBCL allowed us to more precisely define the relationship between these behaviors, as measured throughout childhood and sexual behavior in adolescence.

This is the first report of an association between internalizing behavior and early onset of FSI in boys. A prospective school-based study in Canada revealed that although neither internalizing nor externalizing behavior alone predicted early sexual onset, boys with high externalizing and low internalizing scores were more likely to have early FSI,<sup>42</sup> and previous studies have revealed associations between depressive symptoms and multiple sexual partners,<sup>43</sup> condom nonuse,<sup>44</sup> and risky sexual behaviors<sup>45</sup> in boys and young men. Our data go further by examining this relationship from a young age and finding that both internalizing and externalizing behavior moderate sexual activity, at least in boys, and finding that those who display both kinds of problem behavior at an early age may be particularly at risk.

Although others have found that early menarche increases risk of delinquency and conduct disorder in girls,<sup>46–49</sup> in our analyses, menarche did not modify the relationship between externalizing behavior and FSI. Our study collected prospective data on menarche, in months and years and examined separately the effect of later menarche, which may explain differences in findings between cohort studies.<sup>39</sup>

Why problem behavior is associated with early FSI cannot be explained from this data. It is known, however, that externalizing behaviors are linked to poor self-control, impulsivity, and a lack of behavior self-management,<sup>15,19</sup> which may therefore increase likelihood of sexual experimentation. Internalizing behaviors are characterized by social anxiety, avoidance, and withdrawal<sup>50</sup> and depression, which may increase risk of FSI. It is possible that early FSI represents a manifestation of problem behavior in adolescence, more commonly evident in boys.

The principal strength of this study is the large, population-based prospective design and the ability to consider a broad range of potential modifying variables in evaluating the relationship between childhood behavior and age at FSI. This depth of analysis is beyond that reported by national surveys, meta-analyses, and vital statistics reports.<sup>13,51,52</sup> Another key strength of our study is that participants reported age at FSI close to the event compared with other similar birth cohorts. This reduces the likelihood of error, in particular for those with an earlier age of FSI.<sup>53</sup> Early age of FSI is an important indicator of future health risk, including sexual health, and other social and health outcomes in both boys and girls.

Further, this is the first birth cohort study to have used a standardized and widely used measure of behavioral problems (CBCL) with repeated measures from 2 to 14 years. The parent-report CBCL/4–18

has been well-validated as comparable to a clinical diagnosis, suggesting it can identify children with behavioral problems as effectively as a time-consuming clinical interview.<sup>54</sup> Although adolescents may have been affected by self-report biases, we asked sexual behavior questions around the time many of the cohort would have recently commenced sexual activity, thereby increasing the likelihood of accurate recall; and we also used computer-assisted reporting, which provides greater perceived confidentiality and adolescents report they are more likely to respond truthfully.<sup>55</sup> In addition, in a reliability assessment of the 1999 US Youth Risk Behavior Survey, questions related to sexual behaviors were found to have high reliability due to their salience to an adolescent population.<sup>56</sup>

There is no universal agreement on the age at which FSI becomes early, and this is likely to differ across cultures, communities, and countries. We elected to define early FSI as the lowest quartile of our population, which was <16 years; analyses with a different cutoff (<15 and 16/17 years of age) did not change the findings. Our study population's age of FSI was similar to a contemporaneous Australian population survey of high school students, where one-quarter of 15/16-year-old (year 10) students had experienced sexual intercourse, and just over 50% of 17/18-year-old (year 12) students.<sup>34</sup>

Finally, our results may have been affected by cohort attrition. The observed differential attrition, with fewer participants with problem behavior continuing in the study, biased our findings toward the null. With the entire sample, it is possible that we would see effects more strongly, or across both genders, for example. The differential attrition seen is not surprising, considering the challenges of participating in a study with such intensive data collection.

## Implications

Our findings allow the relative importance of childhood behavior on age at FSI to be considered in the context of other key biological and social factors likely to influence these outcomes. These observations have implications for understandings of the nature of early FSI via its link to childhood problem behavior. Programs aimed at reducing risky sexual behavior have been largely unsuccessful in preventing early onset of sexual activity.<sup>57–59</sup> Our data provide novel information about which children are at risk, and how gender influences this. Understanding these factors may inform more effective interventions.<sup>58,60,61</sup> For example, impulsivity may make planning safe sexual encounters challenging, truancy might mean less exposure to sex education in school, social withdrawal might mean that the child is less exposed to prosocial peers, less able to negotiate relationships and condom use, while social anxiety may heighten the adolescent's fear of rejection. Interventions targeting children with behavioral disorders should consider the risk of early FSI and possible associated sexual risk behavior.

## CONCLUSIONS

This is the first birth cohort study of early life problem behavior and age at FSI. Our findings suggest that externalizing behavior from as early as 5 years in boys and 10 years in girls predicts early age at FSI, which is a consistent marker of high risk sexual behavior in adolescence. Interventions targeting risky sexual behavior should acknowledge the potential role of early life behavioral problems, particularly in boys.

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**SIZING FOR ATHLETES:** *My daughter loves jeans, and over the years she has amassed quite a collection. However, finding the right fit is not easy. For her, getting the right pair involves a lot more than just picking the wash, leg taper, or feathering. A key issue is how the jeans fit her thighs. She is a fit, muscular collegiate athlete. Most jean manufacturers do not target that demographic so she has to spend a bit of time finding jeans that are neither too tight around her thighs nor too loose around her waist. While finding the right pair of jeans can take my daughter a bit more time than other young women, her issues pale compared to others. As reported in The New York Times (Sports: November 13, 2014), the problem has been so severe for elite athletes that several have developed their own clothing firms. The problem for elite cyclists or skiers, amongst others, is that they develop muscular thighs. 'Skinny' jeans that fit through the legs and end in a small leg opening are totally out of the question. Standard fit jeans are either far too tight around the thigh or far too loose around the waist. For example, a standard pair of men's jeans with a 34-inch waist has a circumference in the thigh area of approximately 23 inches. A fit weight lifter with a waist size of 32 inches is likely to have thighs with a circumference of at least 27 inches. To address this problem, athletes from different fields have developed partnerships with designers to develop clothing lines for curvy or muscular individuals. Using Kickstarter campaigns, most have raised a significant amount of money to start their businesses. Already, several have thousands of orders, and clothing lines developed specifically for body builders are doing a brisk business. Anyway, I know my daughter looks fantastic in her jeans. I am happy that others will be able to add this fashion staple to their wardrobe.*

*Noted by WVR, MD*

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