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## Childhood Abuse and Age at Menarche

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### Abstract

**Purpose**—Physical and sexual abuse are prevalent social hazards. We sought to examine the association between childhood physical and sexual abuse and age at menarche.

**Methods**—Among 68,505 participants enrolled in the Nurses' Health Study II we investigated the association between childhood physical abuse and sexual abuse on menarche prior to age 11 (early) or after age 15 (late) using multivariate logistic regression analysis, mutually adjusting for both types of abuse.

**Results**—Fifty-seven percent of respondents reported some form of physical or sexual abuse in childhood. We found a positive dose-response association between severity of sexual abuse in childhood and risk for early menarche. Compared to women who reported no childhood sexual abuse, the adjusted odds ratio [AOR] for early menarche was 1.20 (95% confidence interval [CI], 1.10, 1.37) for sexual touching and 1.49 (95% CI, 1.34, 1.66) for forced sexual activity. Only severe physical abuse predicted early menarche (AOR=1.22, 95% CI, 1.10–1.37). Childhood physical abuse had a dose-response association with late age at menarche: AOR 1.17 (95% CI, 1.04, 1.32) for mild, 1.20 (95% CI, 1.08, 1.33) for moderate, and 1.50 (95% CI, 1.27, 1.77) for severe physical abuse. Sexual abuse was not associated with late menarche.

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**Conclusion**—Childhood abuse was very prevalent in this large cohort of U.S. women. Severity of childhood sexual abuse was associated with risk for early onset of menarche, and physical abuse was associated with both early and late onset menarche.

**Implications and Contribution**—The severity of childhood sexual abuse and severe physical abuse were associated with risk for accelerated menarche, while severity of childhood physical abuse was associated with risk for delayed onset of menarche. The nature of the association between different forms of childhood adversities and reproductive lifespan may vary.

### Keywords

menarche; adversities; child abuse; emotional support

### Introduction

Age at menarche is a sentinel marker for the onset of the female reproductive cycle. Mounting evidence has established the significance of this once symbolic lever as both a footprint for chronic disease risk and compass for health and developmental trajectory. Earlier age at menarche has been linked to all-cause mortality,<sup>1</sup> risk for breast cancer, depression, cardiovascular disease and metabolic syndrome including overweight/obesity, insulin resistance, and polycystic ovarian syndrome, as well as, poorer school performance and health risk behaviors.<sup>2, 3</sup> Later age at menarche is associated with depression,<sup>3</sup> fractures and lower bone mineral density.<sup>4</sup> Risk factors for age at menarche include: patterns of growth and body composition,<sup>5</sup> diet, and energy expenditure.<sup>6</sup>

Socioeconomic factors<sup>7</sup> and psychosocial stressors, have been linked to timing of menarche,<sup>8</sup> although the nature of these associations differ. Material hardships, poverty, and exposure to war have been linked to later age at menarche.<sup>9</sup> Early family rearing experiences—both stressors and supports—are postulated to influence reproductive maturation.<sup>10, 11</sup> Early age at menarche is associated with familial conflict,<sup>12</sup> alterations in family structure,<sup>13</sup> stressful home circumstances, paternal absence in childhood,<sup>14</sup> and poor attachment relationships.<sup>15</sup> Child abuse and age at menarche have been associated in several studies.<sup>8, 16–22</sup> Sexual abuse<sup>8, 16–22</sup> has a consistent association with early menarche while physical abuse has a weak association with early age at menarche in some.<sup>17, 18, 20</sup>

The life history paradigm provides a framework for positing that child abuse influences pubertal maturation—the hypothesis that psychosocial stressors either accelerate or delay onset of puberty derive from ‘psychosocial acceleration theory’ and ‘stress suppression theory,’ respectively.<sup>15</sup> Excessive activation of the stress response system can suppress the hypothalamic-pituitary-gonadal (HPG) axis, and delay pubertal maturation through diminished gonadotropin-releasing hormone (GnRH) pulsatility, decreased pituitary responsiveness to GnRH, and altered sex steroid production.<sup>15</sup> Alternatively, psychosocial acceleration theory posits that under environmental conditions where parental investment and resources are low or unpredictable, reproductive maturation is accelerated.<sup>15</sup> Boyce and Ellis’s theory of stress reactivity—biological sensitivity to context<sup>23</sup>—reconciles these disparate hypotheses and posits that there is a curvilinear, U-shaped association between early life adversity and reactivity to stress. The supportiveness or stressfulness of the family environment, may influence biological stress responses to early adversities, and thereby either accelerate or suppress the HPG axis.

Mounting research evidence supports the role of childhood adversities on reproductive lifespan,<sup>24</sup> yet there is a limited understanding of mechanisms. We tested Boyce and Ellis’s theory of stress reactivity, hypothesizing that (1) severity of physical and sexual abuse is associated with earlier and later ages at menarche; and (2) emotional support in childhood

buffers the impact of child abuse on age at menarche. The Nurses' Health Study II (NHSII) cohort presents a unique opportunity to investigate pathways between type of childhood adversity and timing of menarche.

## Methods

### Study Population

The NHS II is an ongoing prospective cohort study designed to explore factors that influence morbidity and mortality among women. The NHS II began in 1989 with a representative sample of 116,678 registered female nurses aged 25–44 years at baseline and residents of 14 states in the U.S. A biennial follow-up is sent to participants who respond to questionnaires regarding health behaviors and disease occurrence. A supplemental questionnaire on lifetime exposure to violence and victimization was mailed to 91,248 NHSII participants in 2001 (excluding those who had previously requested short form surveys or who required more than four mailings before responding to the 1999 questionnaire). We received 68,505 questionnaires, a 75% response rate. Details of the prenatal and childhood environment of the nurse participant were obtained from a separate questionnaire completed by their mothers (the 2001 Nurses' Mothers' Cohort Study) and merged with longitudinal data. The survey obtained separate approval by the Institutional Review Board at Brigham and Women's Hospital and the Human Subjects Committee at Harvard School of Public Health. Completion of the questionnaire indicated consent to participate.

The study population for this analysis was restricted to women who responded to the 2001 violence survey. Participants were excluded if they had missing data for age at menarche ( $n=223$ ), exposure to violence during childhood ( $n=394$ ), or childhood emotional support ( $n=102$ ). After the exclusions, 67,658 women remained for analysis. This sample does not differ appreciably from the full cohort with respect to baseline socio-demographics.

### Assessment of Outcome

Age at menarche was reported by the participant on the 1989 baseline survey from a single question with categorical responses of: age 9 or less, 10, 11, 12, 13, 14, 15, 16, 17+, or unknown. We categorized early menarche as <11 years and late menarche as >15 years. In our study questions, child abuse was examined as exposure prior to age 11 years, and therefore we categorized early menarche as <11 years. We repeated analyses using a more commonly applied definition of early menarche, <12 years.<sup>17–19</sup>

### Assessment of childhood and adolescent exposure to violence

**Sexual and Physical Abuse**—Physical and sexual abuse in childhood was measured using items from the Revised Conflict Tactics Scale (CTS)<sup>25</sup> and the Sexual Experience Survey.<sup>26</sup> Five items from the Revised CTS instrument assessed exposure to physical abuse by a parent, step-parent or adult guardian.<sup>25</sup> Respondents were queried about specific types of abuse in childhood (up to age 11) including: physical attack, choke or burn, kick bite or punch, push or grab, and being hit with something that hurt; and the frequency of each type of abuse was indicated on a 4 point scale (never, once, a few times, more than a few times). Subjects also reported whether their parent(s) or guardians spanked them for discipline. Questions on forced sexual experiences up to age 11 were modified from questions on the Sexual Experiences Survey.<sup>26</sup> Participants rated the frequency of the following exposures on a 3-point scale (never, once, more than once): “were you ever touched in a sexual way” or “force(d) into any sexual activity” by an adult or an older child.

As previously described,<sup>27</sup> we performed a factor analysis, using the maximum likelihood estimation method followed by the oblique (promax) rotation that yielded two factors which were consistent with our theoretically pre-determined latent constructs of physical and sexual abuse. Factor loadings were > 0.45 for all items on the assigned factor. The internal consistency for each of the abuse factors was 0.70 (Cronbach's alpha). The item related to spanking for discipline did not load on either of the abuse factors and was not counted towards the abuse classification. We evaluated the distribution of reported types of and frequencies of exposure to violence in the physical abuse factors. Categories for severity of physical abuse were based on both factor loadings in the principal components analysis and frequency trends. Mild physical abuse included being "kicked, bitten, or punched" once, "hit with something" once, or any frequency of being "pushed, grabbed, or shoved." Moderate physical abuse included being "physically attacked" once, or "hit with something" more than once. Severe abuse included being "choked or burned" ever, "physically attacked" more than once, or "kicked, bitten, or punched" more than once. Sexual abuse was categorized based on reported type—none, sexual touching, or forced sexual activity.

**Emotional support**—A single item assessed emotional support from the Childhood Trauma Questionnaire-short form (CTQ-sf),<sup>28</sup> "There was someone in my family who helped me feel that I was important or special." This item was rated on a 5-point Likert scale according to frequency (1 = never, 2 = rarely, 3 = sometimes, 4 = often, or 5 = very often true). Emotional support was explored independently as a dichotomous (very often/often and sometimes/rarely/never) effect modifier of child abuse.

### Statistical Analysis

Multivariable logistic regression models were computed to estimate the odds ratios (OR) of early or late menarche while controlling for factors associated with age at menarche using the SAS PROC LOGISTIC procedure (SAS Institute, 1991). The early menarche analyses contrasted menarche <11 years to the reference group of those who experienced menarche at 11–15 years while the late menarche analyses compared menarche >15 years to menarche 11–15 years. Both sets of analyses controlled for the same covariates, including: age (years), race/ethnicity (Asian, Black, Latina, White, Other), maternal age at participant's birth (years), maternal height (feet), paternal height (feet), maternal usual pre-pregnancy weight (lbs), participant's birth weight (lbs), and socioeconomic status in childhood (SES). Childhood SES was based on the highest parental educational attainment at the time of the participant's birth, categorized as high school graduate or less versus any advanced education. We also explored participant's age 5 somatogram classification (1 (smallest), 2, 3, 4 (largest)), child physical activity (highly active, active, mostly inactive/inactive), and television viewing at age 5 years (none, ½-2hrs, > 2hrs/day). Covariates included in the multivariable model were known predictors of age at menarche or biologically plausible based on existing research evidence. Missing covariate data were modeled with a missing indicator. We incorporated cross-product interaction terms between emotional support (yes/no) with categories of physical and sexual abuse into our fully adjusted models and performed formal tests for heterogeneity using the Cochrane's Chi-Square test,  $p < 0.05$ .

### Results

Overall, 57% of women in the cohort reported a history of physical or sexual abuse in childhood. Specifically, 8% reported sexual abuse only, 36% physical abuse only, and 13% both physical and sexual abuse in childhood. Paternal educational status was inversely associated with abuse. The frequency of abuse also varied by race/ethnicity (see Table 1). As has been previously reported, age 5 somatogram had a very weak association with childhood sexual abuse, and no association with childhood physical abuse<sup>29</sup> Participants'

median and mean ages at menarche were 12 and 12.4 years, respectively, with 7.7% reporting before age 11 years and 3.1% after age 15 years.

### Early Age at Menarche

Sexual and physical abuse were associated with early age at menarche (Table 2). Unwanted sexual touching was associated with a 20% increased risk for early menarche and forced sexual activity was associated with a 49% increased risk for early menarche, both statistically significant in fully adjusted models. Although mild and moderate physical abuse were not associated with early age at menarche, severe physical abuse was associated with 22% higher risk for early menarche. Similar results appeared in models using a less stringent cutoff for age at menarche (<12 years). Using age at menarche <12 years, compared to those with no abuse history, the adjusted odds for early menarche were 1.14 (95%CI: 1.06, 1.22) for severe physical abuse, 1.13 (95%CI: 1.08, 1.19) for sexual touching and 1.27 (95%CI: 1.18, 1.37) for forced sexual activity,

### Late Age at Menarche

There was a dose-response association between severity of physical abuse and risk for late menarche at age >15 years. Compared to those with no history of childhood abuse, those with mild, moderate, or severe physical abuse had an increased risk for late menarche of 17%, 20%, and 50%, respectively in the fully adjusted model. In contrast, sexual abuse was not associated with risk of late menarche.

In models evaluating type of abuse and menarche, those exposed to both physical and sexual abuse had a higher risk for early menarche (multivariate OR 1.39, 95%CI: 1.28, 1.51) than those exposed to either physical abuse only (multivariate OR 1.02; 95%CI: 0.95, 1.09) or sexual abuse alone (multivariate OR 1.21; 95%CI: 1.09, 1.34). We also investigated whether emotional support in childhood modified the association between child abuse and age at menarche (Table 3). We found no statistically significant differences in the associations of abuse with menarcheal age by level of emotional support ( $p$ -interaction=0.45 and 0.25 for early and late menarche, respectively).

## Discussion

In a longitudinal cohort of female nurses, we found a strong association between reported sexual abuse and early menarche, consistent with previous studies.<sup>8, 17-22</sup> While there is a clear association between sexual abuse and early age at menarche, we cannot assess causality. As our measure of sexual abuse (up to age 11) was coincident with the time frame for early menarche (before age 11), we cannot distinguish whether the sexual abuse preceded or postdated menarche. This problem is common to studies of sexual abuse and age at menarche. Indeed, the earliest physical signs of puberty begin to emerge approximately two years before menarche, making it difficult to pinpoint which came first, the abuse or the sexual development. A prospective cohort of 180 preschool girls followed through age 11 years revealed that paternal report of lower marital conflict/depression, higher parental investment, and higher maternal supportiveness predicted later sexual development in the daughter.<sup>14</sup> Based on these findings, it is possible that features of the childhood social environment influence timing of sexual development.

Physical abuse in childhood (up to age 11) was weakly associated with early menarche but was significantly associated in a dose-response manner with late menarche (after age 15). Our results are consistent with prior studies that found an association albeit a weaker one between physical abuse and early menarche.<sup>18, 22</sup> To our knowledge, no prior studies have investigated the association of child abuse on late menarche. As with sexual abuse, we

cannot determine whether physical abuse preceded or postdated early menarche. However, severity of physical abuse prior to age 11 had a dose-response association with age at menarche after age 15. Our findings lend support to Boyce and Ellis's theory of stress reactivity. Consistent with stress suppression theory, increasing severity of physical abuse was associated with a graded increase in risk for late menarche. Also, consistent with psychosocial acceleration theory, sexual abuse in early life was associated with earlier maturation. It is plausible that the associations between child abuse and timing of menarche may vary depending on the characteristics of the abuse and accordingly related to different constructs. A building literature suggests that both type and timing<sup>30</sup> of maltreatment differentially influence functioning of the hypothalamic-pituitary-adrenal axis. Different forms of child maltreatment may be associated with different forms of social deprivation and psychobiological sequelae. Our findings of the association between sexual abuse and early menarche mirror the literature supporting an association between family dysfunction, parental conflict, and stressful home circumstances with early menarche. Our association between physical abuse and late menarche parallel findings in studies of severe socio-emotional stress and material hardships, prolonged psychological stress from war and delayed puberty. Physical abuse may be more likely to be associated with other forms of maltreatment such as neglect, including deprivation of food or food insecurity, than sexual abuse. The association between material conditions and childhood growth is well established.<sup>31</sup> If children exposed to physical abuse are more likely to suffer from nutrient deprivation, this may enhance risk for later menarche. However, in our data, there was no apparent association between physical abuse and body size at age 5. Furthermore, adjustment for paternal education made almost no difference in the association of abuse with age at menarche. Thus, it seems likely that psychosocial aspects of abuse, rather than material hardships, underlie the observed relationship of physical abuse with late menarche.

Onset of puberty is characterized by re-emergence of pulsatile gonadotropin releasing hormone (GnRH) signaling from the hypothalamus and changes in luteinizing hormone (LH) secretion, under the direction of the hypothalamic-pituitary-gonadal (HPG) axis. Severe stress in early life is associated with suppression of the HPG axis.<sup>32, 33</sup> However, animal research suggests that under conditions of stress, the HPA axis may release endogenous glucocorticoids that prevent stress-induced suppression of the HPG axis.<sup>32, 33</sup>

Another plausible mechanism linking child maltreatment to age at menarche is via health behaviors and biochemical processes that influence body mass index (BMI). Increasing evidence demonstrates the influence of childhood weight gain and body composition on age at onset of menarche.<sup>34</sup> Childhood adversities influence BMI trajectory,<sup>29, 35</sup> obesity, and have been linked to disordered eating,<sup>36</sup> and central adiposity. Sexual abuse has been most strongly associated with weight trajectory,<sup>35</sup> and elevated weight gain in early childhood is associated with early pubertal onset.<sup>5</sup> Adversity may engender emotion-focused coping strategies that include disordered eating and sedentary behaviors, or influence neural reward pathways associated with eating. Therefore, it is plausible that sexual abuse may lead to stress-associated increases in weight gain in childhood and thereby influence risk for early menarche.

Finally, although research on the role of social cues on HPG maturation and reproductive development is still in its infancy, there is evidence from animal and human studies that fathers, step-fathers, and other paternal figures may play unique roles in influencing the pubertal timing of girls— notably referred to as the paternal investment theory.<sup>15</sup> Therefore, it is plausible that sexual abuse, rather than physical abuse, may be associated with earlier menarche, in part due, to the interactive effects of paternal investment with psychosocial stressors.

## Limitations and Strengths

Strengths of the study include the large cohort size, the detailed data on type and severity of abuse. Importantly, we examine the association between child abuse and both early and late menarche as separate outcomes, which is an analysis not previously reported in prior studies. This study also has limitations worth noting. Age at menarche is based on retrospective self-report. Studies of the validity of self-reported age at menarche have revealed mixed findings;<sup>37</sup> however, in this cohort we found that age at menarche is consistently associated with breast cancer risk, and is predicted by childhood body size.<sup>38</sup> We lack information on maternal age at menarche. Child abuse was also retrospectively reported and therefore may be subject to biases in reporting.<sup>39</sup> Moreover, questions on child abuse, such as ‘sexual activity’ may be subject to different interpretation by respondents and thereby limit precision of this measurement.<sup>40</sup> As age at menarche was reported in 1989 and abuse exposures in 2001, it is unlikely that the report of menarcheal age influenced the report of abuse. Our study lacked finer detail on the relative timing of abuse, emergence of secondary sexual characteristics, and age at menarche. Therefore, it is also plausible that earlier sexual maturation preceded abuse. Other limitations are that we have a single measure of emotional support, and lack additional measures of family functioning. Without a more robust measure of emotional support, we are unable to rule out the potential effect.

## Conclusions

In summary, both childhood sexual and physical abuse were associated with increased risk for early menarche, while physical abuse in childhood was associated with late menarche. The nature of the association between different forms of childhood adversities and reproductive lifespan may vary. Type of abuse may be associated with different biological or behavioral pathways to timing of menarche. If replicated, these findings support the hypothesis that the impact of child abuse on health is not homogenous, rather moderated by factors associated with characteristics of the type, timing, and severity of abuse, the individual, and greater social context. Importantly, this work emphasizes the need for translational research that applies basic science and epidemiologic research to inform clinical practice, treatment, public health strategies, and health policy to optimize health and development for survivors of child abuse. Although routine screening for child abuse in clinical practice is supported by pediatricians and parents, it is often inconsistently done. Child abuse is associated with a significant health burden over the life course, yet there are limited efforts to formulate more effective treatment approaches for subgroups of children and adolescents that are informed by scientific understanding of the impact of trauma and early life adversities on physical and mental health and development. Our findings underscore the need for future prospective research to explore the impact of childhood adversities on age at menarche, and more importantly the timing and tempo of pubertal maturation. While our study did not find a moderating effect of emotional support, future studies should explore factors that may foster biological resiliency. Exploring pathways and mechanisms that vary by form of adversity, are encountered at different developmental stages, and leave an enduring biological imprint are worthy research endeavors to remedy the ill effects on future generations of young women.

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**Table 1**

Distribution of Nurse's Health Study II Participant Characteristics by Retrospective Report of Physical and/or Sexual Abuse in Childhood (up to age 11) (N=67,658)

	Type of child abuse			
	None	Physical abuse only	Sexual abuse only	Physical and Sexual abuse
<b>All</b>	29053 (43)	24374 (36)	5445 (8)	8786 (13)
<b>Participant Characteristics</b>				
Age in 1989 in years (mean, SD)	34.5 (4.7)	34.5 (4.6)	34.9 (4.6)	35.0 (4.5)
Race/ethnicity (N, %)				
White	27515 (95)	22799 (94)	5111 (94)	7999 (91)
Black	223 (1)	320 (1.5)	59 (1.5)	199 (2.5)
Hispanic	236 (1)	316 (1.5)	99 (2)	209 (2.5)
Asian	358 (2)	352 (2)	78 (1.5)	175 (2)
<b>Prenatal Factors (mean, SD)</b>				
Birth weight (kg)	3.30 (0.5)	3.28 (0.5)	3.30 (0.5)	3.29 (0.5)
Maternal pre-pregnancy weight (lbs)	125 (16)	125 (17)	126 (17)	126 (17)
Maternal height (ft)	5.36 (0.2)	5.36 (0.2)	5.36 (0.2)	5.35 (0.2)
Paternal height (ft)	5.85 (0.2)	5.84 (0.2)	5.85 (0.2)	5.84 (0.2)
Maternal age at participant's birth (years)	27 (5)	26 (5)	27 (5)	26 (5)
Maternal pregnancy weight gain (N, %)				
<10 lbs	428 (3)	367 (4)	76 (4)	120 (4)
10–14 lbs	1454 (12)	1054 (10)	263 (13)	366 (11)
15–19 lbs	2579 (21)	2077 (20)	453 (22)	696 (21)
20–29 lbs	5205 (42)	4265 (42)	864 (42)	1322 (40)
30–39 lbs	2061 (17)	1812 (18)	342 (16)	592 (18)
40 + lbs	604 (5)	606 (6)	90 (4)	209 (6)
<b>Childhood Household Characteristics</b>				
Paternal education (N, %)				
<= High School	21571 (74)	18672 (77)	4229 (78)	7170 (82)
College and/or Graduate School	7482 (26)	5702 (23)	1216 (22)	1616 (18)
<b>Childhood Health Behaviors</b>				
Child body size at age 5years (N, %)				
Somatogram Picture 1 (lean)	6685 (24)	5913 (25)	1187 (22)	2056 (24)
Somatogram Picture 2	9252 (33)	7661 (32)	1598 (30)	2590 (30)
Somatogram Picture 3	7063 (25)	5678 (24)	1382 (26)	2039 (24)
Somatogram Picture >=4 (heavy)	5500 (19)	4648 (20)	1178 (22)	1914 (22)
Childhood physical activity (N, %)				
Highly active	3644 (27)	3354 (31)	675 (29)	1129 (32)
Active	9131 (68)	7159 (65)	1536 (67)	2286 (64)
Mostly inactive/Inactive	554 (4)	447 (4)	88 (4)	150 (4)
Childhood television watching (N, %)				
No TV	854 (6)	687 (6)	204 (9)	252 (7)

	Type of child abuse			
	None	Physical abuse only	Sexual abuse only	Physical and Sexual abuse
TV ½ -2 hrs/day	10466 (79)	8502 (78)	1757 (77)	2712 (77)
TV >2 hrs/day	1876 (14)	1676 (15)	314 (14)	563 (16)

**Table 2**

Multivariable Regression Models<sup>†</sup> of Child Abuse and Timing of Menarche (N=67,658)\*

	Total N	Menarche < 11 years			Menarche > 15 years		
		N (%)	Age & Race-Adjusted OR (95% CI)**	Adjusted OR (95% CI)***	N (%)	Age & Race-Adjusted OR (95% CI)**	Adjusted OR (95% CI)***
<b>Sexual abuse</b>							
No sexual abuse	53427	3805 (7)	1.00 <i>referent</i>	1.00 <i>referent</i>	1678 (3)	1.00 <i>referent</i>	1.00 <i>referent</i>
Sexual touching	10107	892 (9)	<b>1.22 (1.13 1.32)</b>	<b>1.20 (1.11 1.29)</b>	293 (3)	0.91 (0.80 1.03)	0.92 (0.81 1.05)
Forced sexual activity	4124	467 (11)	<b>1.54 (1.39 1.71)</b>	<b>1.49 (1.34 1.66)</b>	148 (4)	1.05 (0.88 1.25)	1.06 (0.89 1.27)
<b>Physical abuse severity</b>							
No physical abuse	34498	2513 (7)	1.00 <i>referent</i>	1.00 <i>referent</i>	974 (3)	1.00 <i>referent</i>	1.00 <i>referent</i>
Mild physical abuse	11055	831 (8)	1.01 (0.93 1.10)	1.02 (0.93 1.10)	364 (3)	<b>1.17 (1.04 1.33)</b>	<b>1.17 (1.04 1.32)</b>
Moderate physical abuse	17413	1348 (8)	1.02 (0.95 1.09)	1.01 (0.94 1.09)	587 (3)	<b>1.21 (1.08 1.33)</b>	<b>1.20 (1.08 1.33)</b>
Severe physical abuse	4692	472 (10)	<b>1.24 (1.12 1.38)</b>	<b>1.22 (1.10 1.37)</b>	194 (4)	<b>1.51 (1.28 1.77)</b>	<b>1.50 (1.27 1.77)</b>

<sup>†</sup> Models mutually adjust for physical and sexual abuse

\* Outcome variable compares early and late age at menarche with age at menarche (11–15 years old)

\*\* Model 1 controls for age (years) and race/ethnicity (white, black, Hispanic, Asian, Other race/ethnicity)

\*\*\* Model 2-adjusted OR controls for all covariates in model 1 and birth weight (<5.5, 5.5–7, 7–8.5, 8.5–10, >10lbs), maternal pre-pregnancy weight (by 10lbs), maternal height (inches), paternal height (inches), maternal age at participants birth (<23 years, 23–26, 27–29, >29 years); maternal weight gain in pregnancy (<10, 10–14, 15–29, 30–40, >40lbs); paternal education (<=high school graduation, college and or/graduate school); child body size at age 5 (somatogram picture 1->=4); child physical activity (highly, active, mostly inactive/inactive); television viewing (none, 1/2-2hours/day, >2hrs per day)

**Table 3**  
 Multivariable Analysis<sup>†</sup> of Child Abuse and Timing of Menarche Stratified by Childhood Emotional Support\*

	Early Menarche					
	Emotional Support			Lack of Emotional support		
	Total N	N (%)	Adjusted OR	Total N	N (%)	Adjusted OR
<b>Sexual abuse</b>						
No sexual abuse	47406 (81)	3350 (7)	1.00 referent	6021 (68)	455 (8)	1.00 referent
Sexual touching	8443 (14)	755 (9)	<b>1.23 (1.13 1.34)</b>	1664 (19)	137 (8)	1.05 (0.86 1.30)
Forced sexual activity	3006 (5)	325 (11)	<b>1.45 (1.28 1.64)</b>	1118 (13)	142 (13)	<b>1.64 (1.32 2.03)</b>
<b>Physical abuse severity</b>						
No physical abuse	32091 (54)	2336 (7)	1.00 referent	2407 (27)	177 (7)	1.00 referent
Mild physical abuse	9667 (16)	713 (7)	1.00 (0.91 1.08)	1388 (16)	118 (9)	1.14 (0.90 1.47)
Moderate physical abuse	14175 (24)	1095 (8)	1.01 (0.94 1.09)	3238 (37)	253 (8)	1.03 (0.84 1.26)
Severe physical abuse	2922 (5)	286 (10)	<b>1.22 (1.06 1.39)</b>	1770 (20)	186 (11)	<b>1.27 (1.01 1.60)</b>
				Late Menarche		
				Emotional Support		
				Total N	N (%)	Adjusted OR
<b>Sexual assault</b>						
No sexual abuse	47406 (81)	1472 (3)	1.00 referent	6021 (68)	206 (3)	1.00 referent
Sexual touching	8443 (14)	254 (3)	0.97 (0.88 1.33)	1664 (19)	39 (2)	<b>0.66 (0.47 0.94)</b>
Forced sexual activity	3006 (5)	106 (4)	1.08 (0.88 1.33)	1118 (13)	42 (4)	0.96 (0.67 1.37)
<b>Physical abuse severity</b>						
No physical abuse	32230 (54)	902 (3)	1.00 referent	2407 (27)	72 (3)	1.00 referent
Mild physical abuse	9711 (16)	326 (3)	<b>1.20 (1.06 1.37)</b>	1388 (16)	38 (3)	0.92 (0.62 1.38)
Moderate physical abuse	14328 (24)	487 (3)	<b>1.22 (1.09 1.37)</b>	3238 (37)	100 (3)	1.06 (0.78 1.45)
Severe physical abuse	2952 (5)	117 (4)	<b>1.44 (1.17 1.76)</b>	1770 (20)	77 (4)	<b>1.51 (1.07 2.13)</b>

<sup>†</sup> Models mutually adjust for physical and sexual abuse

\* Models control for all covariates listed in Table 2