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Dimensions of Early Adversity and Sexual Behavior in a US Population-Based Adolescent Sample

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A B S T R A C T

Purpose: Early life adversity (ELA) is associated with sexual risk, but ELA dimensions—and potential mechanisms—have been less examined. We evaluated associations between threat and deprivation—two key ELA dimensions—and sexual behaviors in adolescents. Secondary analyses investigated age at menarche as a mechanism linking ELA with sexual outcomes in girls. We predicted associations between threat and sexual behaviors, with younger age at menarche as a pathway.

Methods: Data were from the National Comorbidity Survey, Adolescent Supplement. Adolescents and caregivers reported on youths' ELA experiences, which were categorized as threat- or deprivation-related. Adolescents reported if they engaged in sex ($N = 9{,}937$) and on specific sexual risk indicators, including age at first sex, number of past-year sexual partners, and condom use consistency ("always" vs. "not always" used). Girls reported age at menarche.

Results: Threat (odds ratio [OR] = 1.76 [95% confidence interval [CI], 1.62–1.92]) and deprivation (OR = 1.51 [95% CI, 1.24–1.83]) were each linked with engagement in sex, $ps < .05$. Threat-related experiences were associated with multiple sexual risk markers, even when accounting for deprivation: earlier age at first sex ($b = -0.20$ [95% CI, −0.27 to 0.13]), greater number of partners ($b = 0.17$ [95% CI, 0.10–0.25]), and inconsistent condom use (OR = 0.72 [95% CI, 0.64–0.80]), $ps < .001$. Deprivation was not associated with sexual risk when adjusting for threat. We observed no significant indirect effects through age at menarche.

Discussion: Although threat and deprivation were related to engagement in sexual activity, threat-related experiences were uniquely associated with sexual risk. Screening for threat-related ELA may identify adolescents at-risk for poor sexual health.

IMPLICATIONS AND CONTRIBUTION

Early adversity—operationalized as discrete adversities or cumulative adversity—is associated with sexual risk; adversity dimensions have been less examined. Although dimensions of threat and deprivation were related to engagement in sex, threat-related experiences were uniquely linked with sexual risk. Younger age at menarche did not explain associations in girls.

Early life adversity (ELA)—including sexual, physical, and emotional abuse and neglect—impacts approximately one-half of all US youth [1] and is associated with deleterious mental and physical health, including sexual health, across the lifespan [1–5]. Although initiation of sexual behavior is normative in adolescence [6], certain behaviors—particularly those carrying potential consequences of pregnancy or sexually transmitted

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infections (STIs)—may pose risk for adolescents' health. Despite comprising only a quarter of sexually active individuals, youth aged 15–24 years account for half of the annual cases of STIs [7]. Further, unintended adolescent pregnancy can carry substantial costs for mothers and offspring. Extensive evidence supports ELA as a predictor of sexual risk [5,8], including STIs [9,10], unintended pregnancy [11–13], greater number of sexual partners [10,14,15], and earlier age at first intercourse [14,15]. Identifying and understanding links between ELA and sexual behavior in adolescents can inform timely intervention.

Recent conceptual models propose a dimensional understanding of ELA when elucidating pathways linking ELA with poor health, focusing on central, and underlying dimensions that occur in adversities with shared elements [16]. Two key dimensions that pervade multiple ELA experiences include threat (harm to physical integrity; e.g., violence and sexual assault) and deprivation (absence of expected environmental inputs; e.g., food insecurity and neglect) [17], and research demonstrates that these dimensions have distinct developmental consequences. In particular, early experiences of threat, but not deprivation, have been linked to accelerated development across multiple systems [18–22], including reproductive strategy indicators of biological aging like pubertal timing [19,22]. Aligned with this perspective is Life History Theory, a developmental-evolutionary framework which posits that experiencing environments characterized by harshness (e.g., threat-related experiences) may accelerate development to maximize the potential for reproduction prior to mortality [23,24].

Although ELA has been associated with sexual risk, limited research has adopted a dimensional framework, instead focusing on discrete exposures (e.g., physical abuse) or cumulative risk. Although informative, these approaches respectively imply that the mechanisms linking ELA with sexual behavior are either wholly distinct or entirely shared across different adversities [for review, see [16]]. In contrast, a dimensional perspective advances that discrete ELA experiences characterized by common features may operate through shared mechanistic processes. Thus, considering similar ELA experiences in tandem allows for investigation of potential mechanisms, which may serve as intervention targets.

Advanced pubertal development—a marker of biological aging commonly studied in youth—may be one such mechanism. The timing and pace of puberty—metrics of which include pubertal stage relative to chronological age, as well as age of menarche in girls—is an established correlate of both threat-related adversity [19,22] and adolescent sexual behavior [15,25,26]. Two largely independent literature support this potential pathway, linking (1) ELA—often operationalized as childhood sexual assault—with early menarche [24,27]; and (2) pubertal metrics with sexual risk (e.g., numerous partners and teen pregnancy) [25,26]. Although some research has documented associations between ELA, pubertal timing, and sexual risk [15,28,29], this work has focused largely on individual ELA types—despite evidence that adversities are highly co-occurring [1] and growing appreciation for dimensional frameworks' capacity to identify and test mechanisms [16,30].

In this study, we examined associations between ELA dimensions of threat and deprivation with sexual behavior—including both engagement in sexual activity and indicators of sexual risk (e.g., condom use consistency)—in a large, population-representative sample of US adolescents. Aligned with evolutionary thinking [23], we predicted that threat-related ELA would be associated with indicators of both sexual activity and sexual risk, even when accounting for co-occurring deprivation. We also tested for moderation by participant sex, as ELA may differentially impact sexual behavior in boys and girls [31,32]. Specifically, because these groups experience different behavioral consequences of sexual activity (e.g., carrying a pregnancy), there may be important sex differences in discrete sexual behaviors following adversity [33]. Additionally, we evaluated age at menarche as a potential biological aging mechanism underlying these associations in girls. This study builds on work in this sample demonstrating that greater experiences of early life threat were associated with adverse psychological health in girls, in part through the age of menarche [18]. Similarly, we predicted that the threat-sexual behavior associations in girls may be partially explained by younger age at menarche.

Methods

Study design

Data were from the National Comorbidity Survey—Adolescent Supplement (NCS-A), an epidemiological assessment of 10,123 US adolescents. Conducted from 2001 to 2004, the NCS-A utilized a dual-frame design, recruiting youth aged 13–18 years from households and schools. Sample data were weighted based on the 2000 Census. Additional detail is provided in the Supplement and elsewhere [34].

Caregivers provided written informed consent, and adolescents provided written assent. Adolescents completed interviews about early experiences and health, including sexual behaviors, and caregivers completed questionnaires about youths' developmental experiences and risk and protective factors. The analytic sample for this study comprised adolescents with valid data on ELA and the sexual behavior with the largest response (engagement in sex, n = 9,937; see Table 1 for participant characteristics).

Measures

Early life adversity. As in prior NCS-A work [1,18], ELA experiences were captured via multi-informant, multimethod assessment. Adolescents and caregivers reported on lifetime exposure to nine ELAs, categorized as falling primarily along one of the two dimensions: threat-related (physical abuse, emotional abuse, domestic violence, sexual assault, violent victimization, and witnessing violence) or deprivation-related (neglect, food insecurity, and parental education attainment less than a high school degree). Each adversity was coded as present if endorsed by the adolescent and/or caregiver; adversities were summed to create total composite scores for both threat and deprivation.

Sexual behavior. Adolescents disclosed if they ever engaged in sexual intercourse (n = 9,937). Those endorsing sexual experience then reported on three sexual risk indicators. First, adolescents indicated their age at first intercourse (n = 2,151). Consistent with prior NCS-A research [35], we excluded girls who reported this age as ≤11 years due to greater likelihood of this activity being nonconsensual. Second, adolescents reported the number of past-year sexual partners (n = 2,217). Third, adolescents reported how frequently they or their partner(s) wore condoms during sex during the past year (n = 2,016). We

Table 1
Participant characteristics ($N = 9,937$)

	M (SD)	Range	% (n)
Demographics			
Age, years	15.2 (1.50)	13-18	
Sex, %			
Girls			50.9 (5,055)
Boys			49.1 (4,882)
Race/ethnicity, %			
White			56.2 (5,588)
Black			18.8 (1,872)
Latino			18.8 (1,870)
Other			6.1 (607)
Household income-to-poverty ratio	6.02 (7.64)	0-142.06	
Parent education, %			
<HS graduate			16.4 (1,631)
HS graduate			30.3 (3,015)
Some college			19.8 (1,965)
College graduate or advanced			33.5 (3,326)
Early life adversity experiences			
Threat-related experiences composite	0.59 (0.98)	0-6	
Physical abuse, %			3.9 (390)
Domestic violence, %			9.4 (938)
Sexual assault, %			5.3 (526)
Violet victimization, %			8.9 (885)
Witnessing violence, %			12.8 (1,268)
Emotional abuse, %			6.3 (625)
Deprivation-related experiences composite	0.30 (0.52)	0-3	
Low parent education (<HS graduate), %			16.4 (1,631)
Food insecurity, %			12.8 (1,275)
Neglect, %			0.7 (73)
Age at Menarche			
Age at menarche, years	12.1 (1.26)	6-17	
Sexual behaviors			
Ever engaged in sex, %			22.7 (2,259)
Age at first sex, years	14.80 (1.35)	12-18	
Number of past-year sexual partners	1.63 (1.24)	0-5	
Condom use consistency, %			
Consistent (“Always”)			64.1 (1,292)
Inconsistent (“Not always”)			35.9 (724)

HS = high school; M = mean; SD = standard deviation.

dichotomized responses into consistent (“always”) versus inconsistent (“not always”), as in other NCS-A research [36].

Age at menarche. Girls reported the age at which they experienced their first period ($n = 4,937$). There was no equivalent measure of pubertal timing available for boys.

Covariates. Analyses adjusted for age, race, and ethnicity (White, Black, Latinx, and other), and family income (specifically, household income-to-poverty ratio). Participant sex was included as a covariate in models using the overall sample and as a potential moderator of ELA-sexual behavior associations.

Table 2
Associations between ELA dimensions and sexual behavior in overall sample

	Ever engaged in sex $n = 9,937$		Age at first sex $n = 2,151$		Number of past-year partners $n = 2,217$		Condom use consistency $n = 2,016$	
	OR (95% CI)	p	b (95% CI)	p	b (95% CI)	p	OR (95% CI)	p
Threat-related experiences								
Model 1[a]	1.76 (1.62, 1.92)	**<.001**	−0.21 (−0.28, −0.14)	**<.001**	0.17 (0.10, 0.25)	**<.001**	0.71 (0.64, 0.79)	**<.001**
Model 2[b]	1.73 (1.58, 1.89)	**<.001**	−0.20 (−0.27, −0.13)	**<.001**	0.17 (0.10, 0.25)	**<.001**	0.72 (0.64, 0.80)	**<.001**
Deprivation-related experiences								
Model 1[a]	1.51 (1.24, 1.83)	**<.001**	−0.23 (−0.37, −0.09)	**.003**	0.09 (−0.08, 0.25)	.31	0.79 (0.63, 1.00)	.06
Model 2[c]	1.26 (1.10, 1.56)	**.04**	−0.14 (−0.28, 0.01)	.07	0.00 (−0.17, 0.17)	.99	0.92 (0.71, 1.20)	.56

Sample sizes varied given differential responses across items. Bolded values represent statistically significant *p*-values that are less than the conventional significance level ($p < .05$).
CI = confidence interval; ELA = Early life adversity; OR = odds ratio.
[a] Model adjusted for sex, age, race and ethnicity, and family income (household income-to-poverty ratio).
[b] Model one further adjusted for the number of deprivation-related experiences.
[c] Model one further adjusted for the number of threat-related experiences.

Table 3
Parameter estimates for participant sex x ELA dimension interactions in predicting sexual behaviors in the overall sample

	Ever engaged in sex n = 9,937		Age at first sex n = 2,151		Number of past-year partners n = 2,217		Condom use consistency n = 2,016	
	b (95% CI)	p	b (95% CI)	p	b (95% CI)	p	b (95% CI)	p
Participant sex x threat-related experiences								
Model 1[a]	0.20 (0.03, 0.37)	**.03**	0.09 (−0.01, 0.20)	.09	−0.12 (−0.24, −0.01)	**.04**	0.01 (−0.24, 0.27)	.92
Model 2[b]	0.20 (0.03, 0.37)	**.03**	0.10 (−0.00, 0.21)	.07	−0.12 (−0.24, −0.01)	**.04**	0.02 (−0.24, 0.27)	.90
Participant sex x deprivation-related experiences								
Model 1[a]	−0.05 (−0.32, 0.22)	.71	−0.23 (−0.39, 0.14)	.36	−0.27 (−0.51, −0.03)	**.04**	−0.32 (−0.79, 0.15)	.19
Model 2[c]	−0.13 (−0.41, 0.16)	.39	−0.03 (−0.31, 0.25)	.84	−0.36 (−0.60, −0.11)	**.007**	−0.18 (−0.64, 0.29)	.46

Sample sizes varied given differential responses across items. Bolded values represent statistically significant *p*-values that are less than the conventional significance level ($p < .05$).
CI = confidence interval; ELA = Early life adversity; OR = odds ratio.
[a] Model adjusted for sex, age, race, ethnicity, and family income (household income-to-poverty ratio).
[b] Model one further adjusted for the number of deprivation-related experiences.
[c] Model one further adjusted for the number of threat-related experiences.

Statistical analysis

After employing descriptive statistics to characterize the sample, we completed a series of survey-weighted regression analyses. First, we examined associations between threat and deprivation with the four sexual behaviors, with separate models for each dimension and outcome. Logistic regression was used for binary outcomes (engagement in sex and condom use consistency), and linear regression was used for continuous outcomes (age at first sex, number of past-year partners). Given moderate co-occurrence of threat- and deprivation-related experiences ($r = .20$, $p < .001$), we estimated models that included both dimensions to model unique associations of one dimension while statistically controlling for the other. Next, we tested for interactions between participant sex and ELA in the ELA-sexual behavior associations. Finally, in girls only, we examined their age at menarche as a candidate pathway linking ELA with sexual behavior. Because prior work in this sample established a threat-specific association with the age at menarche [18], we did not reiterate those findings. Instead, we focused on independent associations between the age at menarche and sexual behaviors and tested for indirect effects in instances where an ELA dimension was significantly associated with a discrete sexual behavior.

We conducted several sensitivity analyses. First, given a robust literature linking experiences of childhood sexual assault with risky sexual behavior [27], we examined whether any threat-specific findings were driven by childhood sexual assault by recalculating the threat composite without this indicator. Second, our threat composite included more indicators than did our deprivation composite, potentially biasing results due to wider variability of one dimension. We created standardized scores of both the threat and deprivation composites to evaluate this possibility. Third, in subanalyses involving menarche, we considered body mass index (BMI) as an additional covariate. Given sizeable missingness in BMI data ($n = 251$), we elected to present results with and without BMI to maximize sample size while also testing robustness of findings. Fourth, given the wide range of reported age at menarche and potential medical etiologies of early onset [37], we removed girls reporting menarche onset at <10 years. Fifth, in order to address temporal issues regarding ELA and pubertal timing, we excluded postmenarche

Table 4
Sex-stratified associations between threat-related ELA experiences and select sexual behaviors

Ever engaged in sex	Boys		Girls	
	n = 4,882		*n* = 5,055	
	OR (95% CI)	p	OR (95% CI)	p
Threat-related experiences				
Model 1[a]	1.53 (1.37, 1.71)	**<.001**	1.97 (1.73, 2.26)	**<.001**
Model 2[b]	1.29 (0.99, 1.68)	**<.001**	1.94 (1.69, 2.23)	**<.001**
Number of past-year partners	*n* = 1,162		*n* = 1,055	
	b (95% CI)	p	b (95% CI)	p
Threat-related experiences				
Model 1[a]	0.24 (0.12, 0.35)	**<.001**	0.14 (0.07, 0.20)	**<.001**
Model 2[b]	0.23 (0.11, 0.35)	**<.001**	0.15 (0.09, 0.21)	**<.001**

Sample sizes varied given differential responses across items. Bolded values represent statistically significant *p*-values that are less than the conventional significance level ($p < .05$).
CI = confidence interval; ELA = Early life adversity; OR = odds ratio.
[a] Model adjusted for age, race and ethnicity, and family income (household income-to-poverty ratio).
[b] Model one further adjusted for the number of deprivation-related experiences.

Table 5
Associations between ELA experiences, age at menarche, and sexual behavior in adolescent girls

	Ever engaged in sex $n = 4,819$		Age at first sex $n = 1,025$		Number of past-year partners $n = 1,041$		Condom use consistency $n = 964$	
	OR (95% CI)	p	b (95% CI)	p	b (95% CI)	p	OR (95% CI)	p
Associations between pubertal timing and sexual behavior								
Age at menarche	0.86 (0.78, 0.95)	**.004**	0.12 (0.05, 0.18)	**.002**	0.00 (−0.06, 0.06)	>.99	0.99 (0.86, 1.13)	.83
Mediation model								
Threat-related experiences								
Indirect effect[a]	1.01 (1.00, 1.03)	.10	0.00 (−0.02, 0.01)	.48	0.00 (0.00, 0.00)	.87	1.00 (0.99, 1.01)	.82
Direct effect[b]	1.95 (1.72, 2.21)	**<.001**	−0.18 (−0.26, −0.09)	**<.001**	0.14 (0.07, 0.21)	**<.001**	0.72 (0.60, 0.82)	**<.001**
Total effect[c]	1.97 (1.74, 2.24)	**<.001**	−0.18 (−0.27, −0.09)	**<.001**	0.14 (0.07, 0.20)	**<.001**	0.73 (0.60, 0.83)	**<.001**
Deprivation-related experiences								
Indirect effect[a]	1.01 (1.00, 1.00)	.28						
Direct effect[b]	1.62 (1.23, 1.99)	**.001**						
Total effect[c]	1.63 (1.28, 2.00)	**.001**						

All models adjusted for age, race, and ethnicity, and family income (household income-to-poverty ratio). Sample sizes varied given differential responses across items. Bolded values represent statistically significant *p*-values that are less than the conventional significance level ($p < .05$).
CI = confidence interval; ELA = Early life adversity; OR = odds ratio.
[a] Effect of ELA dimension on sexual behavior through age of menarche.
[b] Effect of ELA dimension on the sexual behavior when accounting for age of menarche.
[c] Effect of ELA dimension on sexual behavior.

ELA experiences where data on ELA timing were available. Additional detail regarding the methods and analytic approach is available in the Supplement.

Results

Descriptive statistics

As shown in Table 1, adolescents had a mean age of 15.2 years. Over one-half were White, with the remaining of minoritized racial and ethnic status. Many (45.2%) endorsed at least one threat- or deprivation-related experience; the most commonly endorsed ELA was low parental education. Nearly one-quarter of the sample reported a history of sexual activity. Among those with sexual experience, adolescents were 14 years of age, on average, at their first sexual intercourse. The average number of past-year partners was 1.62, and most reported consistent condom use. Among girls, the average age at menarche was 12.1 years.

Associations between early life adversity dimensions and sexual behavior

Experiencing a greater number of threat-related adversities was associated with all sexual behaviors (Table 2). Specifically, higher threat composite scores predicted elevated odds of having ever engaged in sex (odds ratio [OR] = 1.76 [95% confidence interval [CI], 1.62–1.92]) and inconsistent condom use (OR = 0.71 [95% CI, 0.64–0.79]), in addition to earlier age at first sex (b = -0.21 [95% CI, -0.28 to 0.14]) and greater number of past-year partners (b = 0.17 [95% CI, 0.10–0.25]). Effect sizes for threat-related ELA were similar and remained significant when adjusting for deprivation (Table 2).

Although deprivation-related ELA was associated with greater likelihood of having ever engaged in sex and earlier age at first sex, only the association with engagement in sex remained significant when adjusting for threat (OR = 1.26 [95% CI, 1.10–1.56]; Table 2).

Moderation by participant sex

We then investigated potential moderation by participant sex. As seen in Table 3, there was a significant sex x threat–related ELA interaction in predicting engagement in sex (b = 0.20, p = .03) and number of past-year partners (b = -0.12, p = .04), even when controlling for deprivation. Table 4 presents sex-stratified results for these threat-specific associations. Although cumulative threat significantly predicted greater likelihood of engagement in sex and more past-year partners in both subgroups, the association of threat with engagement in sex was stronger for girls than for boys, whereas the association of threat with number of recent partners was stronger for boys than girls. In contrast, only one significant sex x deprivation–related ELA interaction emerged (Table 3), which did not reveal meaningful differences in sexual behaviors in boys versus girls (Table S2).

Associations between early life adversity, age at menarche, and sexual behavior in girls

As seen in Table 5, earlier age at menarche was associated with elevated odds of engagement in sex (OR = 0.86 [95% CI, 0.78–0.95]) and with earlier age at first sex (b = 0.12 [95% CI, 0.05–0.18]). No significant associations were observed with number of past-year partners or condom use consistency. In tests of indirect effects linking ELA dimensions, age at menarche, and sexual behavior, no significant indirect effects emerged (Table 5).

Sensitivity analyses

Results demonstrating associations between the dimensions and sexual behaviors did not change when we removed experiences of sexual assault from the threat composite (Table S3), nor when we used standardized scores for both composites (Table S4). Findings from tests of indirect effects linking ELA and sexual behavior through younger age at menarche were also largely unchanged when we included the BMI covariate (Table S5), as well as when limiting analyses to girls with menarche onset ≥10 years (Table S6) and when excluding known instances of post-menarche ELA (Table S7).

Discussion

We present novel evidence demonstrating dimension-specific associations between ELA and sexual behavior in adolescents. Specifically, we found that although ELA experiences characterized by threat and deprivation both predicted engagement in sexual behavior, a greater number of threat-related experiences uniquely predicted diverse indicators of sexual risk, including earlier age at first sex, a greater number of past-year partners, and inconsistent condom use. These specific behaviors are notable in that they contribute to heightened risk for unintended pregnancy and STI contraction and are associated with suboptimal adolescent health [7]. Understanding variation in early experiences and associated risk for poor sexual health may inform interventions in adolescence.

Our findings complement and extend the evidence linking ELA and adverse sexual health. Epidemiological work has demonstrated associations between cumulative measures of ELA and various sexual risk markers [9–14]. Other research has linked select ELA experiences—frequently, childhood sexual assault—with risky sexual behavior in youth [15], including a prior NCS-A study examining physical abuse and condom use [36]. Another study in a nationally representative sample found that childhood sexual and physical abuse—but not neglect—were associated with an earlier age at first sex and a greater number of partners—findings aligned with our own demonstrating differential associations for threat and deprivation experiences [15]. Indeed, the divergence in findings for threat- versus deprivation-related ELA was consistent across sexual risk indicators. Whereas threat experiences were associated with younger age at first sex, a greater number of past-year partners, and inconsistent condom use even when adjusting for deprivation, associations of deprivation-related ELA with earlier age at first sex were attenuated and no longer significant when adjusting for threat. This pattern of results mirrors findings in the dimensional ELA literature [20] and suggests specificity of associations between the threat and sexual risk. Notably, threat-specific findings remained even when removing sexual assault—a well-established early-life predictor of sexual sequelae [27]—from the threat composite. This suggests there is something about the experience of threat generally, rather than particular to sexual assault per se, that confers risk for adverse sexual behavior, thereby demonstrating the value of dimensional approaches.

To our knowledge, only two other studies have examined ELA dimensions and sexual behavior [29,38]. Both employed a dimensional model capturing experiences of early life unpredictability—indexed by variation in parental employment, residences, and cohabitation patterns—and harshness—indexed by low socioeconomic status—in contrast to our model of threat and deprivation. Though this research linked unpredictability with greater number of sexual partners, findings regarding the role of harshness were mixed. Although the authors acknowledge that their operationalizations represent only one way of capturing ELA, these results suggest that when it comes to sexual behavior, threat and deprivation may not be the only relevant dimensions of environmental experience. Indeed, recent proposals emphasize incorporating unpredictability into the threat-deprivation framework [30], as certain ELA experiences may contain elements of multiple dimensions (e.g., experience is both threatening and unpredictable). Future research should incorporate indicators of unpredictability in tandem with threat and deprivation and examine how interactions across dimensions influence outcomes.

Despite evidence that ELA may differentially impact sexual behavior in boys and girls [31,32], we found largely similar patterns of associations in this population-representative sample. Nevertheless, some small differences emerged. Similar to prior work [32], threat-exposed boys reported more past-year partners than similarly exposed girls, whereas girls with greater threat-related ELA were at slightly elevated odds of engagement in sex compared to boys. Evolutionarily, reproductive success involves distinct life history strategies across the sexes, which may translate into different sexual behaviors based on associated sex-specific trade-offs between mating and reproduction [33]. However, given socialization processes that dictate the differential acceptability of sexual behavior for men and women, these differences could also reflect social norms [39].

Contrary to hypotheses, biological aging—defined by age at menarche—did not emerge as a pathway linking threat-related ELA and sexual behaviors. Prior research rooted in Life History Theory has supported a threat-specific link with accelerated pubertal timing as indexed by age at menarche [19], including in previous work in this sample [18] and a population-representative sample of Chinese women [22]. Further, the prior study in this sample demonstrated that younger age at menarche explained associations between a threat-related ELA and psychopathology [18], highlighting pubertal timing as a threat-specific sequelae. A logical extension of this work is to examine associations between threat, biological aging, and sexual behaviors, as reproductively oriented life history strategies. In this study, we found that a younger age at menarche was associated with elevated odds of engagement in sex and with an earlier age at first sex. However, we observed no significant indirect effects of age at menarche on associations between threat-related experiences and sexual behaviors, even when adjusting for BMI, an established confounder of pubertal timing [37]. In contrast, research in another nationally representative sample established that a younger age at menarche partially explained associations between childhood sexual abuse and age at first sex [15]. A smaller study found that maternal harshness predicted earlier age at menarche, which predicted greater sexual risk-taking [28]. Although we did not observe similar mechanistic patterns here, we propose equifinality—or rather, that while both ELA and menarche appear to be important for certain sexual behaviors, these constructs may not operate through one another as hypothesized. Additionally, several methodological issues—including lack of data on duration of ELA experiences—may preclude our study's ability to rule out pubertal timing as a pathway.

While our results cannot speak to why threatening experiences are uniquely associated with sexual risk, we offer hypotheses. As proposed by Life History Theory [23,30], certain behaviors lead to greater reproductive success in adverse environments. These behaviors may subsequently be selected for over generations and thereby be more well-represented in specific contexts. For example, threatening environments (e.g., interpersonal violence) may select for behaviors that increase the likelihood of pregnancy (e.g., multiple partners) and thus maximize potential reproduction prior to harm or death. In contrast, depriving environments (e.g., food-insecure) constrain resources necessary for successful development and reproduction. In these contexts, the same sexual behaviors may not be as advantageous. Importantly, this theory asserts that natural selection implicitly

shapes reproductively-oriented behaviors over time. In other words, the idea is not that adversity-exposed individuals consciously choose behaviors that are more likely to pass along their genes. Rather, specific behaviors are selected for and thus become more likely to be represented in future generations in certain environments. Toward this way of thinking, threat and deprivation impose distinct pressures and constraints that might lead to divergent associations with sexual behaviors—theoretical proposals consistent with our study's findings. Future research should continue to explore these divergences, as well as test other potential mechanisms—including other, non-pubertal markers of biological aging—linking threat-related ELA with sexual risk.

In this article, we extend the literature on dimensional distinctions of threat- and deprivation-related ELA to a domain with particular importance to providers who work with adolescents: sexual behavior. Nationally, there is growing interest in integrating ELA screening into healthcare settings to facilitate early detection and intervention. Indeed, one pediatric screener—the PEARLS [40], based largely on the Adverse Childhood Experiences inventory [2]—recently qualified for Medi-Cal reimbursement. Though this tool and others may cast a broad net to identify individuals most at-risk for negative ELA-related outcomes, our findings suggest that targeted screening of ELA dimensions may hold clinical promise and tailor identification efforts. In particular, screening for threat-related ELA during routine healthcare visits may help identify youth at-risk for adverse sexual health. We encourage development of more focused ELA screeners (e.g., those that assess threat-related experiences) to assess potential sexual risk in pediatric healthcare settings. While screening alone is not enough to offset risk, understanding nuances in how different types of adverse experiences confer sexual risk may guide appropriate referrals and interventions, such as sexual health education or counseling for threat-exposed youth.

This study has limitations. As with most work on ELA and biological aging, analyses were cross-sectional, with ELA, menarche, and sexual behaviors retrospectively reported. Further, due to differential responses for different sexual behaviors, sample sizes varied across outcomes, and all were self-reported by youth. Moreover, we were unable to investigate biological aging in boys due to unavailable data. Finally, though our examination of these associations in a nationally representative sample allows for generalization of findings, it may result in more conservative estimates compared to more circumscribed samples, such as among individuals selected for adversity exposure or sexual risk. We encourage additional research to test these questions in such samples. Nevertheless, our study has several strengths, including using a multi-informat, multi-method approach to assessing ELA dimensions; examining multiple indicators of sexual behavior in a population-representative sample of adolescents; and conducting several sensitivity analyses to determine the robustness of our threat-specific findings.

Conclusion

Considering ELA dimensions revealed nuanced associations with sexual behaviors in adolescents. Though both threat- and deprivation-related ELA were associated with engagement in sex, threat-related experiences were uniquely associated with earlier age at first sex, greater number of past-year partners, and inconsistent condom use in both boys and girls. Early pubertal timing independently predicted select sexual behaviors, but did not emerge as a pathway linking threat with sexual outcomes, suggesting that additional mechanisms may be operating. Early threat-related experiences may indicate that youth are vulnerable to risky sexual behavior during adolescence.

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Supplementary Data

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References

[1] McLaughlin KA, Green JG, Gruber MJ, et al. Childhood adversities and first onset of psychiatric disorders in a national sample of US adolescents. Arch Gen Psychiatry 2012;69:1151–60.
[2] Felitti VJ, Anda RF, Nordenberg D, et al. Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults: The Adverse Childhood Experiences (ACE) study. Am J Prev Med 1998;14:245–58.
[3] Norman RE, Byambaa M, De R, et al. The long-term health consequences of child physical abuse, emotional abuse, and neglect: A systematic review and meta-analysis. PLoS Med 2012;9:e1001349.
[4] Belsky J, Ruttle PL, Boyce WT, et al. Early adversity, elevated stress physiology, accelerated sexual maturation and poor health in female. Dev Psychol 2015;51:816–22.
[5] Alley J, Diamond LM. Early childhood adversity and women's sexual behavior: The role of sensitivity to sexual reward. Dev Rev 2021;61:100982.
[6] Tolman DL, McClelland SI. Normative sexuality development in adolescence: A decade in review, 2000-2009. J Res Adolesc 2011;21:242–55.
[7] Centers for Disease Control and Prevention. Sexual risk behaviors can lead to HIV, STDs, and teen pregnancy, https://www.cdc.gov/healthyyouth/sexualbehaviors/index.htm. Accessed October 5, 2022.
[8] Abajobir AA, Kisely S, Maravilla JC, et al. Gender differences in the association between childhood sexual abuse and risky sexual behaviors: A systematic review and meta-analysis. Child Abuse Negl 2017;63:249–60.
[9] Hillis SD, Anda RF, Felitti VJ, et al. Adverse childhood experiences and sexually transmitted diseases in men and women: A retrospective study. Pediatrics 2000;106:e11.

[10] London S, Quinn K, Scheidell JD, et al. Adverse experiences in childhood and sexually transmitted infection risk from adolescence into adulthood. Sex Transm Dis 2017;44:524–32.
[11] Dietz PM, Spitz AM, Anda RF, et al. Unintended pregnancy among adult women exposed to abuse or household dysfunction during their childhood. JAMA 1999;282:1359–64.
[12] Hall KS, Beauregard JL, Rentmeester ST, et al. Adverse life experiences and risk of unintended pregnancy in adolescence and early adulthood: Implications for toxic stress and reproductive health. SSM Popul Health 2019;7:100344.
[13] Hillis SD, Anda RF, Dube SR, et al. The association between adverse childhood experiences and adolescent pregnancy, long-term psychosocial consequences, and fetal death. Pediatrics 2004;113:320–7.
[14] Hillis SD, Anda RF, Felitti VJ, Marchbanks PA. Adverse childhood experiences and sexual risk behaviors in women: A retrospective cohort study. Fam Plann Perspect 2001;33:206–11.
[15] Ryan RM, Mendle J, Markowitz AJ. Early childhood maltreatment and girls' sexual behavior: The mediating role of pubertal timing. J Adolesc Health 2015;57:342–7.
[16] McLaughlin KA, Sheridan MA, Humphreys KL, et al. The value of dimensional models of early experience: Thinking clearly about concepts and categories. Perspect Psychol Sci 2021:1745691621992346.
[17] McLaughlin KA, Sheridan MA. Beyond cumulative risk: A dimensional approach to childhood adversity. Curr Dir Psychol Sci 2016;25:239–45.
[18] Colich NL, Platt JM, Keyes KM, et al. Earlier age at menarche as a transdiagnostic mechanism linking childhood trauma with multiple forms of psychopathology in adolescent girls. Psychol Med 2020;50:1090–8.
[19] Colich NL, Rosen ML, Williams ES, McLaughlin KA. Biological aging in childhood and adolescence following experiences of threat and deprivation: A systematic review and meta-analysis. Psychol Bull 2020;146:721–64.
[20] Sumner JA, Colich NL, Uddin M, et al. Early experiences of threat, but not deprivation, are associated with accelerated biological aging in children and adolescents. Biol Psychiatry 2019;85:268–78.
[21] Sun Y, Fang J, Wan Y, et al. Association of early-life adversity with measures of accelerated biological aging among children in China. JAMA Netw Open 2020;3:e2013588.
[22] Yuan J, Yu Y, Liu D, Sun Y. Associations between distinct dimensions of early life adversity and accelerated reproductive strategy among middle-aged women in China. Am J Obstet Gynecol 2022;226:104.e1–104.e14.
[23] Belsky J. Early-life adversity accelerates child and adolescent development. Curr Dir Psychol Sci 2019;28:241–6.
[24] Ellis BJ. Timing of pubertal maturation in girls: An integrated life history approach. Psychol Bull 2004;130:920–58.
[25] Copeland W, Shanahan L, Miller S, et al. Outcomes of early pubertal timing in young women: A prospective population-based study. Am J Psychiatry 2010;167:1218–25.
[26] Udry JR. Age at menarche, at first intercourse, and at first pregnancy. J Biosoc Sci 1979;11:433–41.
[27] Noll JG. Child sexual abuse as a unique risk factor for the development of psychopathology: The compounded convergence of mechanisms. Annu Rev Clin Psychol 2021;17:439–64.
[28] Belsky J, Steinberg L, Houts RM, et al. The development of reproductive strategy in females: Early maternal harshness → earlier menarche → increased sexual risk taking. Dev Psychol 2010;46:120–8.
[29] Simpson JA, Griskevicius V, I-Chun Kuo S, et al. Evolution, stress, and sensitive periods: The influence of unpredictability in early versus late childhood on sex and risky behavior. Dev Psychol 2012;48:674–86.
[30] Ellis BJ, Sheridan MA, Belsky J, McLaughlin KA. Why and how does early adversity influence development? Toward an integrated model of dimensions of environmental experience. Dev Psychopathol 2022:1–25.
[31] James J, Ellis BJ, Schlomer GL, Garber J. Sex-specific pathways to early puberty, sexual debut, and sexual risk taking: Tests of an integrated evolutionary–developmental model. Dev Psychol 2012;48:687–702.
[32] Negriff S, Schneiderman JU, Trickett PK. Child maltreatment and sexual risk behavior: Maltreatment types and gender differences. J Dev Behav Pediatr 2015;36:708–16.
[33] Del Giudice M. Sex, attachment, and the development of reproductive strategies. Behav Brain Sci 2009;32:1–67.
[34] Kessler RC, Avenevoli S, Costello EJ, et al. National comorbidity survey replication adolescent supplement (NCS-A): II. Overview and design. J Am Acad Child Adolesc Psychiatry 2009;48:380–5.
[35] Vafai Y, Thoma ME, Steinberg JR. Association between first depressive episode in the same year as sexual debut and teenage pregnancy. J Adolesc Health 2020;67:239–44.
[36] Miller KM, Briggs HE, Elkins J, et al. Physical abuse and adolescent sexual behaviors: Moderating effects of mental health disorders and substance use. J Child Adolesc Trauma 2018;13:55–62.
[37] Rosenfield RL, Lipton RB, Drum ML. Thelarche, pubarche, and menarche attainment in children with normal and elevated body mass index. Pediatrics 2009;123:84–8.
[38] Belsky J, Schlomer GL, Ellis BJ. Beyond cumulative risk: Distinguishing harshness and unpredictability as determinants of parenting and early life history strategy. Dev Psychol 2012;48:662–73.
[39] Conley TD, Moors AC, Matsick JL, et al. Women, men, and the bedroom: Methodological and conceptual insights that narrow, reframe, and eliminate gender differences in sexuality. Curr Dir Psychol Sci 2011;20:296–300.
[40] Thakur N, Hessler D, Koita K, et al. Pediatrics adverse childhood experiences and related life events screener (PEARLS) and health in a safety-net practice. Child Abuse Negl 2020;108:104685.