RESEARCH ARTICLE

Associations between Adverse Childhood Experiences and Measures of Poor Sleep Health in Adulthood

Yunkeli Lin and Ann Aschengrau*

Department of Epidemiology, Boston University School of Public Health, USA

*Corresponding author: Ann Aschengrau, Department of Epidemiology, Boston University School of Public Health, 715 Albany Street, Boston, MA 02118, USA

Abstract

Background: Sleep health is a multidimensional concept that plays a critical role in both physical and mental well-being. While there is evidence to suggest that sleep health may be linked to long-term trauma associated with adverse childhood experiences (ACEs), most prior studies have focused on only one or two aspects of sleep health.

Methods: We analyzed data from the Cape Cod Health Study to examine the relationship between the number of ACEs and twelve specific types of ACEs on a broad range of poor sleep health indicators in adulthood. These included self-reported diagnoses of sleep apnea or other sleep disorders, short sleep duration, difficulty falling or staying asleep, feeling unrefreshed in the morning, trouble staying awake during the day, breathing pauses during sleep, and loud snoring.

Results: Any ACE history was associated with an increased risk of numerous measures of poor sleep health, including sleep apnea or other sleep disorders, difficulty falling or staying asleep, trouble staying awake, and feeling poorly rested. Individuals with any ACE had a 1.72-fold increased risk of exhibiting three or more poor sleep quality measures (95% CI: 1.22-2.44), while those with four or more ACEs had a higher 2.30-fold increased risk of three or more poor sleep health measures (95% CI: 1.42-3.71). The risk of sleep apnea or other sleep disorders was increased among individuals with a history of peer isolation and rejection (Risk Ratio (RR): 3.92, 95% CI: 2.11-7.30), peer victimization (RR: 3.15, 95% CI: 1.54-6.44), and mental illness in a household member (RR: 2.92, 95% CI: 1.63-5.25). Notable associations with other measures of poor sleep included having an incarcerated household member, peer victimization and isolation, living in a "dangerous" community, and experiencing physical or sexual abuse.

Conclusions: These findings underscore the importance of screening and implementing early interventions to prevent adverse childhood experiences. Identifying individuals at high risk can facilitate trauma-informed care, potentially reducing poor sleep health and its associated health issues during adulthood.

Introduction

Sleep health is a multidimensional construct that encompasses sleep satisfaction, alertness, timing, efficiency, and duration, all of which contribute to physical and mental well-being [1]. Sleep satisfaction refers to an individual's subjective assessment of sleep quality, typically ranging from "good" to "poor." Alertness is the ability to maintain attentive wakefulness throughout the day. Sleep timing involves the specific timing of sleep within the 24-hour day, while sleep efficiency reflects how easily an individual falls asleep and returns to sleep. Sleep duration refers to the total amount of sleep an individual obtains in a 24-hour period. When these dimensions of sleep health are compromised, they are associated with an increased risk of numerous negative health outcomes, including diabetes, hypertension, coronary heart disease, obesity, accidents, and depression [1]. Unfortunately, sleep difficulties are widespread among adults in the United States. According to data from the 2020 National Health Interview Survey, 14.5% of adults reported difficulty falling asleep, while 17.8% experienced trouble staying asleep on most or all days during the past 30 days

[2]. These rates were higher among women, White individuals, and those with lower levels of education.

Poor sleep health may result from current circumstances, such as work-related stress [3]. However, a growing body of evidence suggests that poor sleep health may also be linked to long-term trauma associated with adverse childhood experiences (ACEs). This research has linked ACEs to a heightened risk of various poor sleep quality measures during adulthood [4-10]. However, most of the prior studies have primarily focused on only one or two aspects of sleep health such as sleep duration, trouble falling or staying asleep, or feeling tired even after a good night's sleep [4-7,10].

To provide a more comprehensive understanding of the relationship between adverse childhood experiences and sleep health during adulthood, we analyzed data from the Cape Cod Health Study to explore associations between ACEs and a broader range of sleep health indicators. These included physician diagnoses of sleep apnea or other sleep disorders, as well as self-reports of short sleep duration, difficulty falling or staying asleep, feeling poorly rested in the morning, difficulty staying awake during the day, breathing pauses during sleep, and very loud snoring. We examined both the total number of reported ACEs and twelve specific types of ACEs, as prior research suggests that the impact of ACEs on sleep health may vary not only by their total number but also by their specific nature. Previous studies have most consistently found that individuals who have experienced emotional, physical, or sexual abuse, or who lived with a household member with a mental illness, are at higher risk for poor sleep health [4,5,7,9,10]. Based on these findings, we hypothesized that a higher total number of ACEs would increase the likelihood of poor sleep health, with the risk being especially pronounced among individuals who experienced these specific types of adverse childhood experiences.

Methods

Study population

The present analysis is based on data from the Cape Cod Health Study (CCHS) which was originally conducted to assess the neurotoxic effects of tetrachloroethylene (PCE)-contaminated drinking water in eight towns in the Cape Cod area of Massachusetts, including Barnstable, Bourne, Falmouth, Mashpee, Sandwich, Brewster, Chatham, and Provincetown [11]. Participants were eligible for the CCHS if they were born during 1969-1983 to married women living in these towns that were known to have vinyl-lined asbestos-cement (VL/AC) pipes as part of the water distribution system. The liner in these pipes inadvertently leached the solvent tetrachloroethylene (PCE) into the water supply. This solvent has been linked to birth defects, various types of cancer and neurotoxic effects [11-13]. Participants were identified by matching the maternal address on birth certificates to information from water distribution companies on the locations of the VL/AC pipes.

Enrollment for Phase 1 of the study occurred between 2006 and 2008. Participants were located and sent invitation letters outlining the study's objectives, requesting that they complete a self-administered questionnaire. A total of 1,689 individuals of 5,040 selected individual (40.5%) were successfully located and returned the questionnaire. The Phase 1 questionnaire gathered data on demographic characteristics, health conditions, lifestyle behaviors such as smoking, alcohol and drug use; mental health, and residential histories.

Phase 2 of the study spanned from 2017 to 2020. Participants who had completed the Phase 1 questionnaire and had a complete residential history on Cape Cod (N = 1512) were identified and invited to complete another self-administered questionnaire. Of eligible Phase 1 participants, 694 completed the Phase 2 survey. Reasons for non-participation (N = 818) were categorized as follows: death (N = 6), refusal (N = 26), inability to locate participants (N = 54), lack of response despite multiple contact attempts (N = 718), and missing information on key variables such as sleep quality measures and confounding variables (N = 36), leaving 672 for the present analysis.

Exposure assessment

The Phase 2 survey gathered information on adverse childhood experiences (ACE) using questions adapted from the well-known ACE questionnaire developed by Felliti, et al. [14] and later expanded by Finklehor, et al. [15]. Our questionnaire included thirteen sets of questions about various experiences that may have occurred during the participant's childhood which was defined as occurring before the age of 18 years. These experiences included emotional, physical, and sexual abuse and emotional neglect. Physical abuse was defined as being pushed, grabbed, slapped or hit by a parent or other adult in the household either "sometimes" or "often." Emotional abuse was defined as being insulted, humiliated, put down or afraid of being physically hurt by a parent or other adult in the household either "sometimes" or "often." Sexual abuse was defined as ever being touched or fondled in a sexual way, or having sex with an adult or someone at least five years older than the participant. Emotional neglect was defined as providing a "never" response to at least one of the following questionnaire items: 1) the parent demonstrated affection towards the participant, 2) the parent was capable of alleviating the participant's distress when upset, or 3) the parent appeared to understand the participant's problems and concerns. In this context, "parent" refers to the mother, father, or other individual who served as the primary caregiver for the participant; separate questions were asked for each individual. The nine remaining adverse childhood experiences were separation, divorce or

abandonment of the participant's parents; problematic alcohol and drug use, mental illness and incarceration of a household member; violent treatment of the participant's mother; peer victimization defined as being threatened, insulted or hit by a classmate; peer isolation defined as feeling lonely, rejected or unliked by classmates; low socioeconomic status defined as being on public assistance or having a parent out of work for at least one year; and living in a neighborhood that the participant considered "dangerous" including witnesses of assault. The questionnaire developed by Felitti, et al. has demonstrated well to excellent reliability [16]. Finkelhor, et al. [17] have also shown that their additional adversities-frequent victimization by peers, living in low SES conditions, and residing in a neighborhood perceived as "dangerous" enhanced their overall statistical prediction of health problems.

Outcome assessment

Measures of sleep health were assessed using a series of questions about sleep problems, described in Doran and Aschengrau [18], including a physician diagnosis of sleep apnea or another sleep disorder, and self-reports of short sleep duration, trouble falling or staying asleep, feeling poorly rested in the morning, trouble staying awake during the day, breathing pauses while sleeping, and very loud snoring. Most questions pertained to the past 30 days, whereas the question regarding a diagnosis of sleep apnea or other sleep disorders was framed in terms of the respondent's lifetime. Yes/No responses were employed for questions regarding diagnoses of sleep apnea or another sleep disorder, breathing pauses, and very loud snoring. Issues with falling or staying asleep, feeling poorly rested in the morning, and difficulty remaining awake during the day was assessed using a 4-point Likert scale, with response options of never, rarely, sometimes, and often. Typical sleep duration within a 24-hour period was recorded in hours.

Analysis

All analysis was conducted in RStudio (Version 2023.09.01; RStudio Team, 2023). Risk ratios (RRs) were used to quantify the strength of the relationship between the ACE variables and each sleep health measure. Individuals reporting no ACEs were used as the reference group in all analyses. Ninety-five percent confidence intervals were used to evaluate the statistical stability of the RRs. Participants were categorized according to the number of reported adverse childhood experiences (i.e., any ACE, one ACE, 2-3 ACEs, 4+ ACEs, and no ACEs), and by the type of ACE (e.g., sexual abuse). Likert scaled poor sleep quality measures were dichotomized into two groups: Sometimes and Often *vs.* Never and Rarely. Typical sleep duration in a 24-hour period was dichotomized as less than 7 or 7 or more hours and respondents who reported less than 7 hours of sleep were considered to have short sleep duration

[19]. Finally, a composite sleep quality variable was derived to indicate the number of poor sleep indicators answered in the affirmative, ranging from 0, meaning an absence of any poor sleep indicators, to 7. Due to model convergence issues, the overall number of poor sleep indicators was analyzed as a dichotomous outcome comparing the risk of 3 or more poor sleep health indicators against 0-2.

Adjusted analyses were conducted to address potential confounding factors. Confounding variables were selected based on existing literature regarding the relationship between ACEs and sleep quality and guided by a directed acyclic graph (DAG), which visually represents these relationships. Variables that were ultimately controlled included the participant's assigned sex at birth and age at questionnaire completion; mother's educational level and father's occupational category when the participant was born; and number of older siblings. Race was not controlled because the overwhelming majority of participants were White and exposure to PCE contaminated drinking water was not controlled because its frequency was similar for those with and without ACEs (60 *vs.* 56%).

Results

Among the 672 participants included in the final analysis, 446 reported a history of one or more ACEs, while 226 did not report any ACEs. Table 1 presents the characteristics of participants based on their ACE history. Demographic characteristics were similar across both groups, with the majority being White, female, aged 34 to 45 years, married, and employed at the time of questionnaire completion. Nearly half of the participants had at least one older sibling and a body mass index (BMI) exceeding 25 kg/m². However, participants with any history of ACEs were more likely to smoke cigarettes and less likely to have completed college compared to those without such a history. Furthermore, participants with ACEs were more likely to have mothers with lower educational attainment and fathers in lower occupational positions. They were also more likely to have a higher history of anxiety or panic disorder, depression, and post-traumatic stress disorder.

The prevalence of poor sleeps health measures exhibited considerable variation in our study population. Specifically, the prevalence proportions ranged from 8.3% for sleep apnea or other sleep disorders and 9.7% for breathing pauses during sleep to 25.9% for short sleep duration, 29.2% for difficulty staying awake during the day and 27.1% for loud snoring to 51.0% for difficulty falling or staying asleep and 69.0% for feeling poorly rested in the morning. Overall, 39.9% of participants experienced three or more indicators of poor sleep health.

Table 2 presents both crude and adjusted risk ratios for the sleep health measures in relation to the number

Table 1: Selected characteristics of participants according to reported history of adverse childhood experiences (ACE).

	Any ACE (N = 446)	No ACE (N = 226)
Assigned Sex at Birth		
Male	149 (33.4)	88 (38.9)
Female	297 (66.6)	138 (61.1)
Race		
White	441 (98.9)	225 (99.6)
Other	5 (1.1)	1 (0.4)
Age at questionnaire completion(years)		
34-39	191 (42.8)	89 (39.4)
40-45	192 (43.0)	98 (43.4)
46-50	63 (14.1)	39 (17.3)
Marital status at questionnaire completion		
Married	325 (72.9)	175 (77.4)
Single, Separated or Divorced	121 (27.1)	51 (22.6)
Mother's educational level when the participant was born		
High school graduate or less	169 (37.9)	51 (22.6)
Some college	137 (30.7)	69 (30.5)
College graduate	140 (31.4)	106 (46.9)
Father's occupational category when the participant was born		
White collar	227 (50.9)	137 (60.6)
Blue collar or other	219 (49.1)	89 (39.4)
Number of older siblings		
0	213 (47.8)	119 (52.7)
1	147 (33.0)	64 (28.3)
2 or more	86 (19.3)	43 (19.0)
Participant's educational level at questionnaire completion		
High school graduate or less	31 (7.0)	8 (3.6)
Some college	107 (24.0)	19 (8.5)
College graduate	308 (69.1)	196 (87.9)
Missing	0	3
Participant employment status at questionnaire completion		
Employed	399 (90.3)	202 (90.6)
Not employed	43 (9.7)	21 (9.4)
Missing	4	3
Participant's body mass index (BMI)at questionnaire completion(kg/m^2)		
< 25	213 (47.8)	117 (51.8)
25+	233 (52.2)	109 (48.2)
Participant's history of cigarette smoking		
Ever smoker	190 (42.6)	63 (27.9)
Never smoker	256 (57.4)	163 (72.1)
Participant's history of anxiety or panic disorder[*]		
Yes	163 (36.7)	30 (13.3)
No	281 (63.3)	195 (86.7)
Missing	2	1
Participant's history of depression[*]		
Yes	150 (33.6)	33 (14.2)
No	396 (66.4)	193 (85.8)
Missing	0	1
Participant's history of PTSD[*]		
Yes	53 (11.9)	5 (2.2)
No	393 (88.1)	221 (97.8)

[*]Based on an affirmative answer to the question "Has a doctor or any mental health or healthcare provider ever said that you had….."

Table 2: Poor sleep quality measures according to number of reported Adverse Childhood Experiences (ACE).

	Poor Sleep Quality Category		Crude Risk Ratio (95% CI)	Adjusted* Risk Ratio (95% CI)
Sleep apnea or other sleep disorder	**Yes**	**No**		
Any ACE	44	402	1.86 (1.00, 3.45)	2.10 (1.06, 4.16)
One ACE	6	142	0.76 (0.29, 1.98)	0.64 (0.22, 1.86)
2-3 ACEs	17	146	1.96 (0.96, 4.00)	2.71 (1.17, 6.30)
4+ ACEs	21	112	2.95 (1.50, 5.80)	3.91 (1.70, 8.99)
No ACEs	12	214	1.00 (ref)	1.00 (ref)
Breathing pauses	**Yes**	**No**		
Any ACE	44	402	1.06 (0.65, 1.74)	1.12 (0.63, 1.99)
One ACE	10	139	0.72 (0.35, 1.49)	0.74 (0.33, 1.68)
2-3 ACEs	15	148	0.99 (0.53, 1.86)	1.05 (0.49, 2.22)
4+ ACEs	19	115	1.53 (0.85, 2.73)	2.02 (0.95, 4.31)
No ACEs	21	205	1.00 (ref)	1.00 (ref)
Loud Snoring	**Yes**	**No**		
Any ACE	120	326	0.98 (0.76, 1.27)	1.00 (0.68, 1.47)
One ACE	34	115	0.83 (0.58, 1.20)	0.83 (0.50, 1.37)
2-3 ACEs	41	122	0.92 (0.65, 1.29)	0.88 (0.53, 1.43)
4+ ACEs	45	89	1.22 (0.89, 1.68)	1.42 (0.84, 2.39)
No ACEs	62	164	1.00 (ref)	1.00 (ref)
Short sleep duration	**Yes**	**No**		
Any ACE	122	324	1.18 (0.90, 1.58)	1.18 (0.80, 1.74)
One ACE	36	113	1.05 (0.72, 1.52)	1.00 (0.60, 1.65)
2-3 ACEs	46	117	1.23 (0.87, 1.73)	1.28 (0.79, 2.08)
4+ ACEs	40	94	1.30 (0.91, 1.85)	1.29 (0.76, 2.19)
No ACEs	52	174	1.00 (ref)	1.00 (ref)
Difficulty falling or staying asleep	**Sometimes/Often**	**Rarely/Never**		
Any ACE	252	194	1.40 (1.17, 1.68)	1.88 (1.34, 2.63)
One ACE	77	72	1.28 (1.03, 1.60)	1.51 (0.99, 2.32)
2-3 ACEs	92	71	1.40 (1.14, 1.73)	1.93 (1.26, 2.93)
4+ ACEs	83	51	1.54 (1.25, 1.89)	2.23 (1.39, 3.58)
No ACEs	91	135	1.00 (ref)	1.00 (ref)
Feeling poorly rested in the morning	**Sometimes/Often**	**Rarely/Never**		
Any ACE	328	122	1.17 (1.04, 1.32)	1.60 (1.13, 2.27)
One ACE	107	44	1.15 (0.99, 1.33)	1.49 (0.95, 2.33)
2-3 ACEs	114	52	1.12 (0.97, 1.29)	1.36 (0.87, 2.10)
4+ ACEs	107	29	1.26 (1.10, 1.45)	2.06 (1.23, 3.47)
No ACEs	140	86	1.00 (ref)	1.00 (ref)
Trouble staying awake during the day	**Sometimes/Often**	**Rarely/Never**		
Any ACE	148	298	1.56 (1.18, 2.07)	1.79 (1.22, 2.63)
One ACE	47	102	1.49 (1.05, 2.10)	1.67 (1.03, 2.69)
2-3 ACEs	49	114	1.42 (1.00, 2.00)	1.61 (1.00, 2.59)
4+ ACEs	52	82	1.83 (1.31, 2.54)	2.16 (1.30, 3.61)
No ACEs	48	178	1.00 (ref)	1.00 (ref)
Number of poor sleep quality indicators	**3 or more**	**Less than 3**		
Any ACE	198	248	1.43 (1.15, 1.79)	1.72 (1.22, 2.44)
One ACE	58	91	1.26 (0.95, 1.66)	1.41 (0.90, 2.19)
2-3 ACEs	68	95	1.35 (1.03, 1.76)	1.55 (1.00, 2.40)
4+ ACEs	72	62	1.73 (1.35, 2.23)	2.30 (1.42, 3.71)
No ACEs	70	156	1.00 (ref)	1.00 (ref)

*Adjusted for assigned sex at birth, age at questionnaire completion, maternal educational level, paternal occupation, and number of older siblings.

of reported ACEs. Participants with any history of ACEs exhibited a 2.10-fold increased risk of being diagnosed with sleep apnea or other sleep disorder (95% CI: 1.06-4.16) compared to those without any ACEs. Additionally, the risk of difficulty falling or staying asleep was 1.88-fold higher (95% CI: 1.34-2.63), the risk of trouble staying awake was 1.79-fold higher (95% CI: 1.22-2.63), and the risk of feeling poorly rested in the morning was 1.60-fold higher (95% CI: 1.13-2.27) among participants with any history of ACEs. Overall, a history of ACEs was associated with a 1.72-fold increased risk of exhibiting three or more poor sleep quality measures (95% CI: 1.22-2.44).

Analysis of the relationship between the number of ACEs and the sleep health measures revealed increasing trends in risk across several sleep measures. Notably, a history of four or more ACEs was most strongly associated with all sleep quality measures. Participants with four or more ACEs had a 3.91-fold increased risk of sleep apnea or other sleep disorders (95% CI: 1.70-8.99), a 2.02-fold increased risk of breathing pauses (95% CI: 0.95-4.31), a 1.42-fold increased risk of loud snoring (95% CI: 0.84-2.39), a 1.29-fold increased risk of short sleep duration (95% CI: 0.76-2.19), a 2.23-fold increased risk of difficulty falling or staying asleep (95% CI: 1.39-3.58), a 2.06-fold increased risk of feeling poorly rested in the morning (95% CI: 1.23-3.47), and a 2.16-fold increased risk of trouble staying awake (95% CI: 1.30-3.61) compared to participants with no history of ACEs. In addition, a history of four or more ACEs was associated with a 2.30-fold increased risk of exhibiting three or more poor sleep health measures (95% CI: 1.42-3.71).

Table 3 presents the crude and adjusted risk ratios for thirteen types of ACEs and poor sleep health. The risk ratios for experiencing sleep apnea or other sleep disorder were elevated among individuals who experienced all types of ACEs. Notably, the strongest associations were observed for peer isolation and rejection (adjusted RR: 3.92, 95% CI: 2.11, 7.30), peer victimization (adjusted RR: 3.15, 95% CI: 1.54, 6.44), and mental illness in a household member (adjusted RR: 2.92, 95% CI: 1.63, 5.25). Other noteworthy associations were observed between breathing pauses and sexual abuse (adjusted RR: 2.06, 95% CI: 1.01-4.20), peer victimization (adjusted RR: 2.90, 95% CI: 1.48-5.68), peer isolation and rejection (adjusted RR: 2.29, 95% CI: 1.23-4.25), and living in a "dangerous" community (adjusted RR: 2.51, 95% CI: 0.81-7.77); loud snoring and peer victimization (adjusted RR: 2.51, 95% CI: 1.48-4.25), and living in a "dangerous" community (adjusted RR: 1.95, 95% CI: 0.76-5.01); difficulty falling or staying asleep and having a incarcerated household member (adjusted RR: 2.50, 95% CI: 1.08-5.81), peer victimization (adjusted RR: 2.62, 95% CI: 1.52-4.53), peer isolation or rejection (adjusted RR: 2.00, 95% CI:1.30-3.08), and living in a

"dangerous" community (adjusted RR: 3.23, 95% CI: 1.15-9.09); feeling poorly rested in the morning and physical abuse (adjusted RR: 2.40, 95% CI: 1.14-5.05); trouble staying awake and having a incarcerated household member (adjusted RR: 2.74, 95% CI: 1.28-5.88), peer victimization (adjusted RR: 2.00, 95% CI: 1.20-3.33) and living in a "dangerous" community (adjusted RR: 2.72, 95% CI: 1.11-6.68). Furthermore, a history of physical abuse (adjusted RR: 2.03, 95% CI: 1.14-3.61), having an incarcerated household (adjusted RR: 2.15, 95% CI: 1.00-4.66), peer victimization (adjusted RR: 2.90, 95% CI: 1.72-4.90), and living in a "dangerous" community (adjusted RR: 3.58, 95% CI: 1.34-9.58) were associated with noteworthy increases in the risk of exhibiting three or more poor sleep quality measures.

Discussion

The present study found that a history of one or more ACEs was associated with an increased risk of several indicators of poor sleep quality, including sleep apnea or another sleep disorder, difficulty falling or staying asleep, trouble staying awake and feeling poorly rested in the morning. Furthermore, a history of four or more ACEs further increased the risk of all measures of poor sleep health.

While the risk ratios for experiencing sleep apnea or other sleep disorders were higher among individuals who experienced all types of ACEs, the strongest associations were observed for peer isolation and rejection, peer victimization, and having a household member with a mental illness. Other notable associations that linked specific ACEs to several poor sleep outcomes included having an incarcerated household member, peer victimization, peer isolation, living in a "dangerous" community, and experiencing physical or sexual abuse. Finally, individuals with a history of physical abuse, an incarcerated household member, peer victimization, and living in a "dangerous" community had the highest risk ratios for exhibiting three or more indicators of poor sleep health.

Our results are consistent with previous studies that report a higher number of ACEs are associated with increased risks of poor sleep quality measures [4,5,7,8,10]. Prior research has also identified several specific types of ACEs that are linked to poor sleep health, with the most consistent associations observed for emotional, physical, and sexual abuse, as well as living with a household member with mental illness [4,5,7,9,10]. We also found that physical and sexual abuse, along with mental illness in a household member, were associated with multiple poor sleep measures. However, we also identified associations with additional ACE items suggested by Finkelhor, et al. [17], such as frequent victimization by peers and living in a neighborhood perceived as "dangerous", which have not been evaluated in most prior studies.

Table 3: Poor sleep quality measures according to types of Adverse Childhood Experiences[*].

	Sleep Apnea or Other Sleep Disorder			
	Yes	No	Crude Risk Ratio (95% CI)	Adjusted[**] Risk Ratio (95% CI)
Parental separation, divorce, abandonment				
Yes	173	24	1.81 (1.09, 2.99)	2.01 (1.12, 3.61)
No	443	32	1.00 (ref)	1.00 (ref)
Emotional abuse				
Yes	94	14	1.74 (0.99, 3.07)	1.97 (1.01, 3.84)
No	522	42	1.00 (ref)	1.00 (ref)
Emotional neglect				
Yes	58	9	1.73 (0.89, 3.37)	1.77 (0.80, 3.93)
No	558	47	1.00 (ref)	1.00 (ref)
Physical abuse				
Yes	47	8	1.87 (0.93, 3.75)	1.95 (0.84, 4.54)
No	569	48	1.00 (ref)	1.00 (ref)
Sexual abuse				
Yes	80	10	1.41 (0.74, 2.68)	1.59 (0.75, 3.41)
No	536	46	1.00 (ref)	1.00 (ref)
Problematic alcohol or drug use in a household member				
Yes	161	18	1.30 (0.76, 2.23)	1.30 (0.70, 2.40)
No	455	38	1.00 (ref)	1.00 (ref)
Mental illness in a household member				
Yes	178	28	2.26 (1.38, 3.72)	2.93 (1.63-5.25)
No	438	28	1.00 (ref)	1.00 (ref)
Mother treated violently				
Yes	43	9	2.28 (1.19, 4.39)	2.33 (1.02, 5.35)
No	573	47	1.00 (ref)	1.00 (ref)
Low socioeconomic status				
Yes	110	14	1.47 (0.83, 2.61)	1.72 (0.85, 3.46)
No	506	42	1.00 (ref)	1.00 (ref)
Peer victimization				
Yes	58	13	2.56 (1.45, 4.52)	3.15 (1.54, 6.44)
No	558	43	1.00 (ref)	1.00 (ref)
Peer isolation or rejection				
Yes	91	21	3.00 (1.82, 4.95)	3.92 (2.11, 7.30)
No	525	35	1.00 (ref)	1.00 (ref)

[*] Results based on fewer than five individuals in any category were omitted from the table.
[**]Adjusted for assigned sex at birth, age at questionnaire completion, maternal education, paternal occupation, and number of older siblings.

	Breathing Pauses			
	Yes	No	Crude Risk Ratio (95% CI)	Adjusted[**] Risk Ratio (95% CI)
Parental separation, divorce, abandonment				
Exposed	177	20	1.07 (0.65, 1.77)	1.07 (0.60, 1.92)
Unexposed	430	45	1.00 (ref)	1.00 (ref)
Emotional abuse				
Exposed	94	14	1.43 (0.82, 2.50)	1.68 (0.87, 3.25)
Unexposed	513	51	1.00 (ref)	1.00 (ref)
Emotional neglect				
Exposed	62	5	0.75 (0.31, 1.81)	0.62 (0.23, 1.65)
Unexposed	545	60	1.00 (ref)	1.00 (ref)
Physical abuse				
Exposed	48	7	1.35 (0.65, 2.82)	1.42 (0.59, 3.44)
Unexposed	559	58	1.00 (ref)	1.00 (ref)
Sexual abuse				
Exposed	78	12	1.46 (0.81, 2.63)	2.06 (1.01, 4.20)
Unexposed	529	53	1.00 (ref)	1.00 (ref)
Problematic alcohol or drug use in a household member				
Exposed	163	16	0.90 (0.53, 1.54)	0.86 (0.46, 1.60)
Unexposed	444	49	1.00 (ref)	1.00 (ref)

Mental illness in a household member				
Exposed	190	16	0.74 (0.43, 1.27)	0.87 (0.47, 1.61)
Unexposed	417	49	1.00 (ref)	1.00 (ref)
Low socioeconomic status				
Exposed	107	17	1.57 (0.93, 2.63)	1.68 (0.87, 3.24)
Unexposed	500	48	1.00 (ref)	1.00 (ref)
Peer victimization				
Exposed	56	15	2.54 (1.51, 4.28)	2.90 (1.48, 5.68)
Unexposed	551	50	1.00 (ref)	1.00 (ref)
Peer isolation/rejection				
Exposed	94	18	1.91 (1.16, 3.17)	2.29 (1.23, 4.25)
Unexposed	513	47	1.00 (ref)	1.00 (ref)
Neighborhood considered "dangerous"				
Exposed	16	5	2.58 (1.16, 5.76)	2.51 (0.81, 7.77)
Unexposed	591	60	1.00 (ref)	1.00 (ref)

*Results based on fewer than five individuals in any category were omitted from the table.
** Adjusted for assigned sex at birth, age at questionnaire completion, maternal education, paternal occupation, and number of older siblings.

	Loud Snoring			
	Yes	**No**	**Crude Risk Ratio (95% CI)**	**Adjusted** Risk Ratio (95% CI)
Parental separation, divorce, abandonment				
Exposed	141	56	1.07 (0.82, 1.40)	1.10 (074, 1.63)
Unexposed	349	126	1.00 (ref)	1.00 (ref)
Emotional abuse				
Exposed	74	34	1.20 (0.88, 1.64)	1.41 (0.88, 2.26)
Unexposed	416	148	1.00 (ref)	1.00 (ref)
Emotional neglect				
Exposed	48	19	1.05 (0.70, 1.57)	1.02 (0.56, 1.85)
Unexposed	442	163	1.00 (ref)	1.00 (ref)
Physical abuse				
Exposed	37	18	1.23 (0.82, 1.84)	1.41 (0.75, 2.63)
Unexposed	453	164	1.00 (ref)	1.00 (ref)
Sexual abuse				
Exposed	67	23	0.94 (0.64, 1.36)	1.14 (0.67, 1.94)
Unexposed	423	159	1.00 (ref)	1.00 (ref)
Problematic alcohol or drug use in a household member				
Exposed	136	43	0.85 (0.63, 1.15)	0.78 (0.52, 1.19)
Unexposed	354	139	1.00 (ref)	1.00 (ref)
Mental illness in a household member				
Exposed	149	57	1.03 (0.79, 1.35)	1.23 (0.83, 1.82)
Unexposed	341	125	1.00 (ref)	1.00 (ref)
Mother treated violently				
Exposed	32	20	1.47 (1.02, 2.13)	1.61 (0.86, 3.00)
Unexposed	458	162	1.00 (ref)	1.00 (ref)
Low socioeconomic status				
Exposed	81	43	1.37 (1.03, 1.81)	1.69 (1.07, 2.67)
Unexposed	409	139	1.00 (ref)	1.00 (ref)
Peer victimization				
Exposed	38	33	1.87 (1.41, 2.50)	2.51 (1.48, 4.25)
Unexposed	452	149	1.00 (ref)	1.00 (ref)
Peer isolation or rejection				
Exposed	78	34	1.15 (0.84, 1.57)	1.28 (0.80, 2.03)
Unexposed	412	148	1.00 (ref)	1.00 (ref)
Neighborhood considered "dangerous"				
Exposed	12	9	1.61 (0.97, 2.69)	1.95 (0.76, 5.01)
Unexposed	478	173	1.00 (ref)	1.00 (ref)

*Results based on fewer than five individuals in any category were omitted from the table.
** Adjusted for assigned sex at birth, age at questionnaire completion, maternal education, paternal occupation, and number of older siblings.

	Short Sleep Duration			
	< 7 hours	7 hours or more	Crude Risk Ratio (95% CI)	Adjusted** Risk Ratio (95% CI)
Parental separation, divorce, abandonment				
Exposed	141	56	1.14 (0.87, 1.50)	1.12 (0.76, 1.65)
Unexposed	357	118	1.00 (ref)	1.00 (ref)
Emotional abuse				
Exposed	81	27	0.96 (0.67, 1.37)	0.92 (0.57, 1.50)
Unexposed	417	147	1.00 (ref)	1.00 (ref)
Emotional neglect				
Exposed	45	22	1.31 (0.90, 1.89)	1.37 (0.78, 2.39)
Unexposed	453	152	1.00 (ref)	1.00 (ref)
Physical abuse				
Exposed	36	19	1.38 (0.93, 2.03)	1.41 (0.77, 2.58)
Unexposed	462	155	1.00 (ref)	1.00 (ref)
Sexual abuse				
Exposed	64	26	1.14 (0.80, 1.62)	1.25 (0.75, 2.08)
Unexposed	434	148	1.00 (ref)	1.00 (ref)
Problematic alcohol or drug use in a household member				
Exposed	131	48	1.05 (0.79, 1.40)	1.03 (0.69, 1.54)
Unexposed	367	126	1.00 (ref)	1.00 (ref)
Mental illness in a household member				
Exposed	156	50	0.91 (0.69, 1.21)	0.91 (0.62, 1.35)
Unexposed	342	124	1.00 (ref)	1.00 (ref)
Mother treated violently				
Exposed	34	18	1.38 (0.92, 2.05)	1.36 (0.73, 2.53)
Unexposed	464	156	1.00 (ref)	1.00 (ref)
Incarceration of a household member				
Exposed	20	9	1.21 (0.69, 2.11)	1.31 (0.57, 3.00)
Unexposed	478	165	1.00 (ref)	1.00 (ref)
Low socioeconomic status				
Exposed	83	41	1.36 (1.02, 1.82)	1.36 (0.87, 2.13)
Unexposed	415	133	1.00 (ref)	1.00 (ref)
Peer victimization				
Exposed	43	28	1.62 (1.18, 2.24)	1.79 (1.06, 3.01)
Unexposed	455	146	1.00 (ref)	1.00 (ref)
Peer isolation/rejection				
Exposed	82	30	1.04 (0.74, 1.46)	0.99 (0.62, 1.59)
Unexposed	416	144	1.00 (ref)	1.00 (ref)
Neighborhood considered "dangerous"				
Exposed	13	8	1.49 (0.85, 2.62)	1.51 (0.60, 3.83)
Unexposed	485	166	1.00 (ref)	1.00 (ref)

*Results based on fewer than five individuals in any category were omitted from the table.

** Adjusted for assigned sex at birth, age at questionnaire completion, maternal education, paternal occupation, and number of older siblings.

	Difficulty Falling or Staying Asleep			
	Sometimes/Often	Never/Rarely	Crude Risk Ratio (95% CI)	Adjusted** Risk Ratio (95% CI)
Parental separation, divorce, abandonment				
Exposed	93	104	1.05 (0.89, 1.23)	1.06 (0.75, 1.49)
Unexposed	236	239	1.00 (ref)	1.00 (ref)
Emotional abuse				
Exposed	42	66	1.24 (1.05, 1.48)	1.55 (1.01, 2.37)
Unexposed	287	277	1.00 (ref)	1.00 (ref)
Emotional neglect				
Exposed	32	35	1.03 (0.81, 1.31)	0.99 (0.59, 1.66)
Unexposed	297	308	1.00 (ref)	1.00 (ref)
Physical abuse				
Exposed	20	35	1.27 (1.03, 1.58)	1.61 (0.90, 2.89)
Unexposed	309	308	1.00 (ref)	1.00 (ref)
Sexual abuse				
Exposed	40	50	1.10 (0.90, 1.35)	1.08 (0.68, 1.70)
Unexposed	289	293	1.00 (ref)	1.00 (ref)
Problematic alcohol or drug use in a household member				
Exposed	73	106	1.23 (1.06, 1.43)	1.52 (1.07, 2.17)

Unexposed	256	237	1.00 (ref)	1.00 (ref)
Mental illness in a household member				
Exposed	83	123	1.26 (1.09, 1.47)	1.58 (1.12, 2.22)
Unexposed	246	220	1.00 (ref)	1.00 (ref)
Mother treated violently				
Exposed	19	33	1.27 (1.02, 1.58)	1.71 (0.94, 3.11)
Unexposed	310	310	1.00 (ref)	1.00 (ref)
Incarceration of a household member				
Exposed	8	21	1.45 (1.14, 1.83)	2.50 (1.08, 5.81)
Unexposed	321	322	1.00 (ref)	1.00 (ref)
Low socioeconomic status				
Exposed	56	68	1.09 (0.91, 1.31)	1.12 (0.74, 1.69)
Unexposed	273	275	1.00 (ref)	1.00 (ref)
Peer victimization				
Exposed	21	50	1.44 (1.22, 1.71)	2.62 (1.52, 4.53)
Unexposed	308	293	1.00 (ref)	1.00 (ref)
Peer isolation or rejection				
Exposed	38	74	1.38 (1.17, 1.61)	2.00 (1.30, 3.08)
Unexposed	291	269	1.00 (ref)	1.00 (ref)
Neighborhood considered "dangerous"				
Exposed	5	16	1.52 (1.18, 1.95)	3.23 (1.15, 9.09)
Unexposed	324	327	1.00 (ref)	1.00 (ref)

*Results based on fewer than five individuals in any category were omitted from the table.

** Adjusted for assigned sex at birth, age at questionnaire completion, maternal education, paternal occupation, and number of older siblings.

	Feeling Poorly Rested in the Morning			
	Sometimes/Often	**Never/Rarely**	**Crude Risk Ratio (95% CI)**	**Adjusted** ** **Risk Ratio (95% CI)**
Parental separation, divorce, abandonment				
Exposed	59	138	1.02 (0.91, 1.14)	1.05 (0.72, 1.52)
Unexposed	149	326	1.00 (ref)	1.00 (ref)
Emotional abuse				
Exposed	25	83	1.14 (1.01, 1.28)	1.55 (0.96, 2.52)
Unexposed	183	381	1.00 (ref)	1.00 (ref)
Emotional neglect				
Exposed	14	53	1.16 (1.02, 1.33)	1.79 (0.96, 3.34)
Unexposed	194	411	1.00 (ref)	1.00 (ref)
Physical abuse				
Exposed	9	46	1.23 (1.09, 1.40)	2.40 (1.14, 5.05)
Unexposed	199	418	1.00 (ref)	1.00 (ref)
Sexual abuse				
Exposed	24	66	1.07 (0.94, 1.23)	1.23 (0.74, 2.04)
Unexposed	184	398	1.00 (ref)	1.00 (ref)
Problematic alcohol or drug use in a household member				
Exposed	51	128	1.05 (0.94, 1.17)	1.15 (0.79, 1.69)
Unexposed	157	336	1.00 (ref)	1.00 (ref)
Mental illness in a household member				
Exposed	50	156	1.15 (1.04, 1.27)	1.54 (1.05, 2.25)
Unexposed	158	308	1.00 (ref)	1.00 (ref)
Mother treated violently				
Exposed	11	41	1.16 (0.99, 1.34)	1.75 (0.87, 3.51)
Unexposed	197	423	1.00 (ref)	1.00 (ref)
Low socioeconomic status				
Exposed	27	97	1.17 (1.05, 1.30)	1.75 (1.08, 2.83)
Unexposed	181	367	1.00 (ref)	1.00 (ref)
Peer victimization				
Exposed	16	55	1.14 (0.99, 1.31)	1.68 (0.93, 3.04)
Unexposed	192	409	1.00 (ref)	1.00 (ref)
Peer isolation or rejection				
Exposed	25	87	1.15 (1.03, 1.29)	1.70 (1.05, 2.76)
Unexposed	183	377	1.00 (ref)	1.00 (ref)

*Results based on fewer than five individuals in any category were omitted from the table.

** Adjusted for assigned sex at birth, age at questionnaire completion, maternal education, paternal occupation, and number of older siblings.

	Trouble Staying Awake During the Day			
	Sometimes/Often	Never/Rarely	Crude Risk Ratio (95% CI)	Adjusted** Risk Ratio (95% CI)
Parental separation, divorce, abandonment				
Exposed	133	64	1.17 (0.91, 1.50)	1.20 (0.83, 1.74)
Unexposed	343	132	1.00 (ref)	1.00 (ref)
Emotional abuse				
Exposed	71	37	1.22 (0.91, 1.63)	1.27 (0.81, 1.98)
Unexposed	405	159	1.00 (ref)	1.00 (ref)
Emotional neglect				
Exposed	45	22	1.14 (0.79, 1.64)	1.12 (0.64, 1.94)
Unexposed	431	174	1.00 (ref)	1.00 (ref)
Physical abuse				
Exposed	31	24	1.57 (1.13, 2.17)	1.82 (1.03, 3.24)
Unexposed	445	172	1.00 (ref)	1.00 (ref)
Sexual abuse				
Exposed	56	34	1.36 (1.01, 1.82)	1.49 (0.93, 2.40)
Unexposed	420	162	1.00 (ref)	1.00 (ref)
Problematic alcohol or drug use in a household member				
Exposed	119	60	1.22 (0.95, 1.56)	1.27 (0.87, 1.85)
Unexposed	357	136	1.00 (ref)	1.00 (ref)
Mental illness in a household member				
Exposed	140	66	1.15 (0.90, 1.47)	1.19 (0.83, 1.98)
Unexposed	336	130	1.00 (ref)	1.00 (ref)
Mother treated violently				
Exposed	31	21	1.43 (1.00, 2.04)	1.60 (0.88, 2.90)
Unexposed	445	175	1.00 (ref)	1.00 (ref)
Incarceration of a household member				
Exposed	14	15	1.84 (1.27, 2.67)	2.74 (1.28, 5.88)
Unexposed	462	181	1.00 (ref)	1.00 (ref)
Low socioeconomic status				
Exposed	81	43	1.24 (0.94, 1.64)	1.28 (0.83, 1.98)
Unexposed	395	153	1.00 (ref)	1.00 (ref)
Peer victimization				
Exposed	40	31	1.59 (1.18, 2.13)	2.00 (1.20, 3.33)
Unexposed	436	165	1.00 (ref)	1.00 (ref)
Peer isolation or rejection				
Exposed	69	43	1.41 (1.07, 1.84)	1.57 (1.02, 2.41)
Unexposed	407	153	1.00 (ref)	1.00 (ref)
Neighborhood considered "dangerous"				
Exposed	10	11	1.84 (1.20, 2.82)	2.72, (1.11, 6.68)
Unexposed	466	185	1.00 (ref)	1.00 (ref)

*Results based on fewer than five individuals in any category were omitted from the table.

** Adjusted for assigned sex at birth, age at questionnaire completion, maternal education, paternal occupation, and number of older siblings.

	Number of Poor Sleep Quality Indicators			
	3 or more	Less than 3	Crude Risk Ratio (95% CI)	Adjusted** Risk Ratio (95% CI)
Parental separation, divorce, abandonment				
Exposed	109	88	1.18 (0.97, 1.43)	1.24 (0.88, 1.76)
Unexposed	295	180	1.00 (ref)	1.00 (ref)
Emotional abuse				
Exposed	55	53	1.29 (1.03, 1.60)	1.53 (1.00, 2.34)
Unexposed	349	215	1.00 (ref)	1.00 (ref)
Emotional neglect				
Exposed	37	30	1.14 (0.86, 1.51)	1.13 (0.67, 1.90)
Unexposed	367	238	1.00 (ref)	1.00 (ref)
Physical abuse				
Exposed	23	32	1.52 (1.19, 1.94)	2.03 (1.14, 3.61)
Unexposed	381	236	1.00 (ref)	1.00 (ref)
Sexual abuse				

Exposed	47	43	1.24 (0.97, 1.57)	1.45 (0.92, 2.30)
Unexposed	357	225	1.00 (ref)	1.00 (ref)
Problematic alcohol or drug use in a household member				
Exposed	100	79	1.15 (0.94, 1.41)	1.22 (0.86, 1.75)
Unexposed	304	189	1.00 (ref)	1.00 (ref)
Mental illness in a household member				
Exposed	115	91	1.16 (0.96, 1.41)	1.33 (0.94, 1.88)
Unexposed	289	177	1.00 (ref)	1.00 (ref)
Mother treated violently				
Exposed	24	28	1.39 (1.06, 1.82)	1.63 (0.91, 2.93)
Unexposed	380	240	1.00 (ref)	1.00 (ref)
Incarceration of a household member				
Exposed	12	17	1.50 (1.09, 2.07)	2.15 (1.00, 4.66)
Unexposed	392	251	1.00 (ref)	1.00 (ref)
Low socioeconomic status				
Exposed	58	66	1.44 (1.18, 1.76)	1.80 (1.19, 2.73)
Unexposed	346	202	1.00 (ref)	1.00 (ref)
Peer victimization				
Exposed	25	46	1.75 (1.43, 2.14)	2.90 (1.72, 4.90)
Unexposed	379	222	1.00 (ref)	1.00 (ref)
Peer isolation or rejection				
Exposed	51	61	1.47 (1.21, 1.80)	1.94 (1.28, 2.94)
Unexposed	353	207	1.00 (ref)	1.00 (ref)
Neighborhood considered "dangerous"				
Exposed	6	15	1.84 (1.38, 2.45)	3.58 (1.34, 9.58)
Unexposed	398	253	1.00 (ref)	1.00 (ref)

*Results based on fewer than five individuals in any category were omitted from the table.

** Adjusted for assigned sex at birth, age at questionnaire completion, maternal education, paternal occupation, and number of older siblings.

The precise mechanisms by which ACEs contribute to poor sleep quality in adulthood remain incompletely understood. However, they may involve long-lasting changes in how the hypothalamic-pituitary-adrenal axis responds to stress, as well as disruptions in neurodevelopment during childhood (Hulme et al., 2011; Berens et al., 2017). These changes may directly impact the sleep-wake cycle, causing sleep disturbances, or indirectly affect sleep by increasing the risk of psychiatric conditions such as depression and post-traumatic stress disorder (PTSD) (Berens et al., 2017). In our study, the prevalence of depression and PTSD was 27.3% and 8.6%, respectively, with higher rates observed among participants with a history of ACEs (Table 1). However, due to limited data on the temporal relationship between these psychiatric conditions and the onset of poor sleep, a meaningful mediation analysis could not be performed. Furthermore, other potential mediators could not be explored due to insufficient available data.

Several limitations of the present study should be considered when interpreting our results, including misclassification, residual confounding, and selection bias. First, exposure misclassification due to inaccurate reporting of ACEs likely resulted in bias towards the null. Participants were on average 40.9 years old when they completed the study questionnaire about their childhood experiences, and so their memories could be inaccurate due to the long recall period. Their reports of ACEs might also be inaccurate for other reasons such as

repressed memories. Unfortunately, our only source of information about these experiences was self-reports, and so their accuracy could not be verified.

Second, this study relies on self-reported measures of sleep health, which may be prone to misclassification bias. However, the potential for substantial misclassification is unlikely, as the prevalence of poor sleep health measures in our study population is higher than national estimates [2]. Additionally, diagnoses of sleep apnea or other sleep disorders, as indicated by healthcare providers, were also self-reported. These diagnoses are likely underreported, given that over 80% of sleep apnea cases are undiagnosed [20].

Another limitation of this study is that diagnoses of sleep apnea and other sleep disorders cannot be distinguished in the CCHS Phase II data, as they were both captured by a single questionnaire item. As a result, it is not possible to draw direct conclusions about the association between ACEs and diagnosed sleep apnea alone, although sleep apnea is more common than other diagnosable sleep disorders. Additionally, due to the high rate of undiagnosed sleep apnea, analyzing diagnosed cases may not provide an accurate estimate of the association. This study found that a higher number of ACEs, as well as several specific types of ACEs, were associated with an increased risk of breathing pauses during sleep-a hallmark symptom of sleep apnea. Future research may consider evaluating sleep apnea and other sleep disorders, such as RLS and narcolepsy

separately, along with their associated symptoms, to more accurately characterize these associations.

While we controlled for confounding variables using the extant literature and our DAG as a guide, residual confounding was possible from unmeasured predictors of ACEs. Furthermore, many ACEs were highly correlated, and the number of individuals who experienced only one ACE was small and so it was not possible to determine the independent effect of each ACE.

The final study limitation was potential selection bias stemming from the low questionnaire response rate. Although this issue reduced the sample size, the following evidence suggests it did not bias the observed associations. First, potential participants were not informed of the specific hypotheses under investigation when invited to take part in the study. Second, many characteristics of Phase 2 participants (N = 694) and non-participants (N = 818) were similar, including age (mean age in years: 40.9 for participants *vs.* 40.5 for non-participants), race (99.1% of participants and 98.0% of non-participants were white), marital status (66.1% of participants *vs.* 69.1% of non-participants were married or cohabitating) and employment status (88.3% of participants *vs.* 90.3% of non-participants were employed), and early life exposure to PCE-contaminated drinking water (63.3% of participants *vs.* 64.3% of non-participants). Thus, it is unlikely that enrollment in the study was related to ACE history and poor sleep quality measures. However, participants were more likely to come from families with higher socioeconomic status, as indicated by higher proportions of college-educated mothers (36.5% *vs.* 27.2%) and fathers in white-collar jobs (53.9% *vs.* 46.0%), which limits the generalizability of the findings.

In summary, the results of this study suggest that the risk of poor sleep health during adulthood increases with the number of adverse childhood experiences and is elevated for most types of ACEs. Future research would benefit from incorporating the additional ACEs proposed by Finkelhor, et al. [17] and examining the role of mediators in a large, prospective cohort study. Moreover, as the current study primarily involved White college graduates, future studies should aim to include racially and socioeconomically diverse participants to enhance generalizability.

In the meantime, these findings highlight the importance of comprehensive and coordinated screening efforts to identify and prevent adverse experiences in childhood. Additionally, greater awareness is needed among medical and educational professionals about the long-term health impacts of ACEs. By identifying individuals at higher risk due to ACEs, healthcare providers can implement effective risk-reduction strategies, trauma-informed interventions, and support systems, potentially preventing poor sleep health and its associated health complications.

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