

## The Bidirectionality of Attention-Deficit, Hyperactivity Disorder and Adverse Childhood Experiences: A Review

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### Abstract

Adverse childhood experiences (ACEs) have been found to be correlated with numerous health outcomes. Examining its correlation with Attention - deficit, hyperactivity disorder (ADHD) is essential to clinical practice adding to the knowledge base of child development. The objective of this review is to systematically review the bidirectionality of ADHD and ACEs. All relevant articles examining the association between ADHD and ACEs studying youth ages zero to seventeen within the last five years were included. Articles were identified using PsycInfo, Scopus, Cochrane and PubMed databases. The primary outcomes were parent-reported ADHD diagnosis and ACE scores. Ten articles (n = 392,419) were included. There is a significant association between ADHD and ACEs and were found to have bidirectional effects. Children with ADHD were more likely to have experienced ACEs and children who experienced ACEs were more likely to have an ADHD diagnosis. Higher scores of ACEs were correlated with increased likelihood of ADHD diagnosis as well. The bidirectional effect of ADHD and ACEs points to essential clinical practice of thorough screenings and multi-modal therapeutic treatments. Of the ten articles included in this review, none were RCTs pointing to a need for further research in this topic area. All studies were disparate in their outcome measures; therefore, it proved difficult to draw significant conclusions from the data. A recommendation would be conducting a large scale study that uses common outcome measures for ACEs such as the one used in the original ACE study.

**Keywords:** ADHD; Adverse Childhood Experiences; Attention Deficit Hyperactivity Disorder; ACEs

### Abbreviations

ACEs: Adverse Childhood Experiences are Abbreviated As; Attention-Deficit, Hyperactivity Disorder is Abbreviated as ADHD. American Indian and Alaska Native Abbreviated as AI/AN. HD: Household Dysfunction is Abbreviated as.

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## Introduction

Adverse childhood experiences (ACEs) were initially studied to determine how they impact the manifestation of health outcomes. ACEs were found to predict alcoholism, heart disease, cancer, liver disease, obesity and numerous other health issues [12]. More recently, ACEs have been applied to the study of mental health outcomes such as Attention deficit, hyperactivity disorder (ADHD). ADHD is a common mental health diagnosis amongst youth with a continued rise in prevalence over the years [16,22]. Current prevalence is estimated at 9.4% with boys (12.9%) more likely to be diagnosed than girls (5.6%) [7]. One current theory postulating that ADHD stems from factors of genetics and environment suggests that children who experience ACEs may have a higher prevalence of ADHD [25]. Additionally, children who have experienced traumatic events in childhood frequently meet criteria for ADHD diagnosis [16, 13]. Current recommendations include multimodal therapies to address comorbid conditions, including trauma, and ADHD symptoms [10]. However, there are no specific guidelines for the treatment of comorbid trauma and ADHD leaving it up to the provider to include a mix of psychotherapies, psychosocial interventions and pharmacological treatment as they deem necessary [23].

To date, studies have started to look into the association of ADHD and ACEs although the definitions of ACEs and ADHD have been broadly defined to include externalizing behaviors, stressful life events and adversity [3,14,16,20,24,33]. Findings thus far have found positive associations between childhood traumatic events and symptoms of ADHD; however, these studies are confounded by other factors such as traumatic brain injuries, oxidative stress, intermittent explosive disorder and irritability when examining associations between ACEs and ADHD [2,3,15,18]. Previous studies conducted have focused on a wide age range amongst youth and adult populations [30, 3]. Research focused on adults was dependent on retrospective reports of ACEs and ADHD to determine their associations [13,30].

There have been a few studies specifically focused on the association between ADHD and ACEs amongst minors [22]. The studies done were conducted to address the gaps in the literature and guide clinical practice for professionals working with minors. Such gaps in literature included limited studies on the impact of ACEs on ADHD, type of ACE influences on ADHD prevalence and longitudinal studies measuring different developmental stages. Studies also wanted to address the inclusion of more household dysfunction types of ACEs and a focus on multiracial and minority populations.

The intent of this study was to conduct a systematic review on the most recent literature to determine the relationship between ACEs and ADHD in youth. The focus of the review is narrowed to the scope of childhood diagnosed ADHD and identified ACEs. The review is also extending the association to include the impact of ADHD on ACEs as it has been minimally studied.

## Methods

### Inclusion criteria

Studies were included if they highlighted the impact of ACEs on ADHD prevalence and diagnosis and vice versa in youth ages zero to seventeen. The review focused on the following terminologies: parent-reported ADHD diagnosis in childhood and identified ACEs. Articles that did not include these terminologies were excluded. The publication date range was also limited to within the last five years in order to focus on most up to date literature.

### Definitions of ADHD and ACEs

#### ADHD

ADHD is defined as having a persistent pattern of inattention and/or hyperactivity-impulsivity interfering with life functioning [9]. Studies examined were different in their utility of the diagnostic criteria based on time of youth's diagnosis. Participants could have been

diagnosed utilizing DSM-IV or DSM-V criteria as the latter was published in 2013. The main differences were a reduction of six to five symptoms needed to meet criteria for those ages seventeen and older, onset of symptoms before age twelve and functional impairment needing to only reduce quality of life instead of being clinically significant [11].

### ACEs

The studies reviewed varied in how many ACEs were included and how they operationally defined each ACE. The intent behind the original ACE study was to expand the literature base focusing on the impact of childhood abuse on adult medical health [12]. The nine sub-types of ACEs were chosen as a comprehensive measure of trauma addressing the gaps in previous studies solely examining one aspect of trauma at a time [12]. The three general areas of trauma included were abuse, neglect and household dysfunction. They entailed physical abuse, emotional abuse, sexual abuse, emotional neglect, physical neglect, mental illness in the household, incarcerated relative(s), caregiver(s) treated violently, substance abuse and divorce. The original ACE questionnaire pulled from the Conflict Tactics Scale (CTS), Wyatt Sex History Questionnaire (WSHQ), 1988 National Health Interview Survey, Behavioral Risk Factor Surveys, Third National Health and Nutrition Examination Survey, Diagnostic Interview Schedule of the National Institute of Mental Health (NIMH) and Health Appraisal Clinic questionnaire [12]. Studies in this review varied in terms of their outcome measure.

Since the original ACE study, the definition of ACEs have expanded to include community factors such as socioeconomic hardship and neighborhood violence as shown in table 1 [22].

### Types of participants

Participants included youth ages zero to seventeen with ADHD diagnosis who have been exposed to ACEs. Sample sizes of studies evaluated varied from 1,231 to 131,774.

### Types of outcome measures

The primary outcome measures were parent-reported ADHD diagnosis by a professional and ACE scores measured by various scales and surveys (Table 1). ADHD was primarily measured through interviews or surveys asking parents/caretakers if their child had been diagnosed with ADHD by a healthcare professional before. An answer of yes to this question defined the youth as having an ADHD diagnosis. One study did include the NIMH Diagnostic Interview Schedule for Children Version IV to assess for ADHD [22]. Three studies measured child maltreatment type of ACE with the Conflict Tactics Scale, both original and CTS-PC. Composite International Diagnostic Interview-Short Form (CIDI-SF) was utilized in two studies to measure household dysfunction type of ACE. In comparison to the original ACE study, all studies here used self-formulated surveys/interviews (based on technical expert panels, previous studies and Behavioral Risk Factor Surveillance System ACE module to obtain information about ACEs). Studies reviewed used a combination of types of scales such as Sexual Victimization Scale (SVS), Family Psychiatric Screening Instruments for Epidemiologic Studies (FHE), Survey of Exposure to Community Violence (SECV), Behavioral Risk Factor Surveillance System ACE module (BRFSS) and Child Behavior Checklist (CBC). Two studies included surveys conducted with the child while the rest only conducted surveys with the caregiver/parent.

Study (authors, year)	Type of Study	Number of Subjects	Age of Subjects (years)	Population	Ethnicity	Outcome Measures	Findings
Lugo-Can-delas., <i>et al.</i> 2021	Longitudinal	2,123	5-15	Children and Adolescents	Ethnicity not delineated	NIMH DISC-IV, CTS, SVS, FHE, SECV, inter-views with child and caregiver	Inattentive ADHD predicts subsequent ACEs.
Brown., <i>et al.</i> 2016	Cross-sectional	76,227	4-17	Children and Adolescents	64.71% White, 9.36% Black, 12.67% Hispanic, 10.45% Other	telephone surveys with caregiver	Significant association bw ACEs and ADHD.
Jimenez., <i>et al.</i> 2017	Observational	1572	5-9	Children	35% White, 48% African American, 17% Other, 25% Latino	CTS-PC, CIDI-SF, interviews with caregiver	ACE exposure associated with ADHD dx at age 9.
Weller., <i>et al.</i> 2021	Retrospective, cross-sectional	1231	12-17	Adolescents	Ethnicity not delineated	caregiver completed surveys	Household dysfunction ACE associated with ADHD in multiracial adolescents.
Hunt., <i>et al.</i> 2017	Longitudinal	4898	0-9	Children	21% White, 50% Black, 29% other race or ethnicity	CTS-PC, CIDI-SF, caregiver interviews, caregiver surveys, CBC	Additional ACEs associated with greater odds of ADHD diagnosis. Black children had higher ACEs and ADHD.
Walker., <i>et al.</i> 2021	Retrospective	40075	3-17	Children and Adolescents	52.5% White, 12.7% Black, 24.5% Hispanic, 10.3% Other	Caregiver surveys	Additional ACEs associated with greater odds of ADHD dx.
Crouch., <i>et al.</i> 2021	Retrospective	42068	3-17	Children and Adolescents	51.6% White, 13.2% African American, 42.7% Hispanic, 10.5% Other	Caregiver and child/ adolescent surveys	Four or more ACEs associated with ADHD prevalence.
Zarei., <i>et al.</i> 2021	Retrospective	131774	0-17	Children and Adolescents	Ethnicity not delineated	Caregiver surveys, BRFSS	Household dysfunction ACEs associated with ADHD.
Kenney and Singh, 2016	Cross-sectional	62834	0-17	Children and Adolescents	2.3% AI/AN, 97.7% White	Caregiver surveys	ACEs associated with ADHD prevalence in AI/A N youth.
Bomysoad and Francis, 2020	Cross-sectional	29,617	12-17	Adolescents	78% White, 6.7% Black, 0.8% AI/AN, 5.5% Asian, 0.4% NH/PI, 8.8% Other	Caregiver surveys	Graded association between ACEs and ADHD.

**Table 1:** Studies Included in review.

A. Gender was not included as it was a fairly even ratio.

### Search strategy for identification of studies

Four electronic databases were searched: PubMed, Scopus, Cochrane and PsycInfo from the dates of September 3, 2021 until December 17, 2021. The search terms utilized were variations of topic specific terms combined with the Boolean (AND). The terms utilized for the database PubMed were (“ACEs” AND “ADHD”), (“Attention deficit hyperactivity disorder” AND “Adverse childhood experiences”), (“Adverse childhood” AND “Attention deficit”). The terms inputted into the PsycInfo database were (“ACEs” and “ADHD”). The terms inputted into Scopus were (“ACEs” and “ADHD”). The terms inputted for Cochrane were (“ADHD” AND “ACEs”) and (“Attention deficit hyperactivity” and “Adverse childhood”). The terms utilized for the database PsycInfo were (“ADHD” AND “ACEs”) and (“Attention deficit hyperactivity” and “Adverse childhood”).

Articles’ references were cross-checked for relevance to the research question.

Selection of studies

Both authors inspected the citations identified from the searches. The retrieved articles were assessed by the authors in accordance with inclusion criteria mentioned above. Risk of bias was adjusted for criteria of defined ADHD diagnosis and ACEs. This reduced the operant number of articles to ten.

Results of the search

The initial search strategy yielded 1,910 results of which fifteen were considered relevant and appraised. Of the fifteen, five articles were excluded due to not meeting inclusion criteria of age range. Ten studies with 392,419 participants met inclusion criteria (Figure 1). Nine out of ten studies were retrospective conducting secondary data analysis on other studies and surveys. Six studies focused on children and adolescents, two studies on children and seven examined adolescents primarily. One study looked at the impact of ADHD on ACEs while nine studies looked at the impact of ACEs on ADHD (Table 1). Three studies were longitudinal in design following the caregiver and child for periods of three years, four years and nine years [17,19,22].

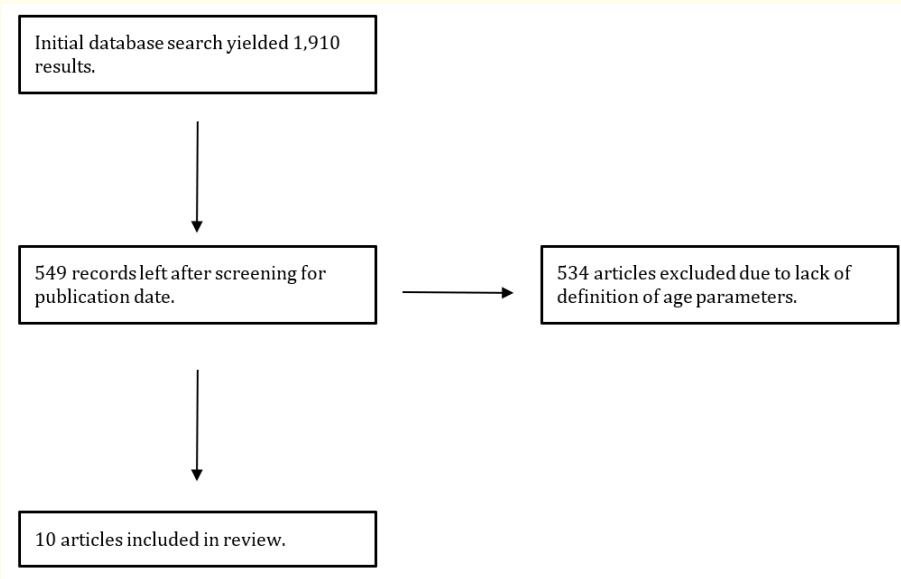


Figure 1: Selection of Studies.

Results and Discussion

Populations studied

One study pulled from a community sample while the rest utilized nation-wide surveys from the Fragile Families and Child Well-Being Study (FFCWS) or National Survey of Children’s Health (NSCH). The study pulling from the Boricua Youth Study (BYS) only looked at Puerto Rican families in South Bronx, NY and San Juan, PR [22]. The FFCWS intentionally oversampled births to unmarried mothers 3:1 [17]. Weller, *et al.* only utilized data on multiracial adolescents from the NSCH as they were looking into the impact of ACEs and ADHD

on adolescents who identified with more than one race. One study narrowed their focus to look at health outcomes amongst American Indian and Alaska Native (AI/AN) youth from the NSCH database [21]. Its use of telephone surveys posed a potential barrier for AI/AN populations as their access could have been limited [21].

The specifications of populations studied limits the generalizability of the findings across the US population. Although the NSCH attempted to sample more children across the US, the nature of the study lends to volunteerism bias as participants had to choose to fill out mailed surveys or answer telephone surveys. The NSCH also oversampled children ages zero to five and those with special needs resulting in a skewed population sample of the US [32].

## Bidirectionality of ADHD and ACEs

### ADHD and ACEs

Children with parent-reported ADHD diagnosis were found to have had high prevalence of ACE exposure [22]. One of the ten studies found a positive correlation between parent-reported ADHD diagnosis and ACE exposure. Lugo-Candelas, *et al.* found parent-reported ADHD to be predictive of a higher number of ACEs compared to youth without ADHD as shown in table 2 (OR 1.63). Lugo-Candelas, *et al.* further examined subtypes of ADHD and found inattentive ADHD to be predictive of subsequent ACEs in children and adolescents (OR 2.00).

Study	Study of subgroup	Variable	OR	95% CI
Lugo-Candelas, <i>et al.</i> 2021	Predicting new ACEs	ADHD	1.63	1.12-2.37
		Inattentive ADHD	2.00	1.09-3.66
Brown, <i>et al.</i> 2016	Socioeconomic hardship	ADHD	1.39	1.21-1.59
	Divorce		1.34	1.16-1.55
	Familial mental illness		1.55	1.26-1.90
	Neighborhood violence		1.47	1.23-1.75
	Incarceration		1.39	1.12-1.72
	1 ACE		1.60	1.38-1.87
	2 ACEs		2.16	1.81-2.57
	3 ACEs		3.09	2.46-3.88
	4 or more ACEs		3.97	3.29-4.8
Jimenez, <i>et al.</i> 2017	2 ACEs before age 5	ADHD at age 9	2.10	1.3-3.3
	3 ACEs before age 5		2.60	1.5-4.7
	1 ACE bw ages 5-9		1.90	1.2-3
	2 ACEs bw ages 5-9		2.10	1.2-3.8
	3 ACEs bw ages 5-9		2.20	1.1-4.3
Weller, <i>et al.</i> 2021	Household dysfunction	ADHD	0.54	0.38-0.69
Hunt, <i>et al.</i> 2017	2 ACEs	ADHD at age 9	1.62	1.12-2.34
	3 ACEs		1.66	1.10-2.49
	4 ACEs		2.30	1.54-3.43
	2 ACEs	ADHD at age 9 in Black children	2.57	1.43-4.61
	3 ACEs		2.57	1.38-4.79
	4 ACEs		3.35	1.79-6.27

Walker, <i>et al.</i> 2021	1 ACE	ADHD	1.39	1.14-1.69
	2 ACEs		1.92	1.53-2.39
	3 ACEs		2.72	2.19-3.37
	Divorce		1.22	1.02-1.46
	Incarceration		1.56	1.22-2.01
	Familial Mental Illness		1.72	1.38-2.12
	Poverty		1.31	1.09-1.58
Crouch, <i>et al.</i> 2021	4 or more ACEs	ADHD	2.16	1.72-2.71
Zarei, <i>et al.</i> 2021	1 HD ACE	ADHD	1.81	1.64-2.00
	2 HD ACE		3.16	2.81-3.57
	3 HD ACE		5.36	4.78-6.00
Bomysoad and Francis, 2020	1 ACE	ADHD	1.43	1.15-1.80
	2 ACEs		1.91	1.47-2.49
	3 ACEs		2.80	2.04-3.78
	4 or more ACEs		4.14	3.12-5.48

**Table 2:** Statistics of findings.

A. Kenney and Singh's statistical findings reported as PRRs in text.

### ACEs and ADHD

Youth exposed to ACEs were found to have increased ADHD prevalence [4,5,17,19,21,28,29,32]. Nine of the ten studies found ACEs to be positively associated with ADHD diagnosis. Brown, *et al.*, Kenney and Singh, Bomysoad and Francis and Walker, *et al.* concluded a graded relationship between increased ACE exposure and ADHD diagnosis. Brown, *et al.* found youth with ACE scores of one (OR 1.60), two (OR 2.16), three (OR 3.09) and four or more (OR 3.97) to more likely have moderate to severe ADHD. Walker, *et al.* found similar results of youth with ACE scores of one (OR 1.39), two (OR 1.92) and three (OR 2.72) to predict ADHD diagnosis. Correspondingly, Kenney and Singh found youth with ACE scores of two or less (PRR = 2.01) and scores of three or more (PRR = 2.3) associated with increased ADHD prevalence. Similarly, Bomysoad and Francis associated ACE scores of one (OR 1.43), two (OR 1.91), three (OR 2.80) and four or more (OR 4.14) with ADHD diagnosis.

ACE exposure by age of nine was highly correlated with an ADHD diagnosis at that age [17,19]. Hunt, *et al.* found two (OR 1.62), three (OR 1.66) and four ACEs (OR 2.30) to have increased predictability of ADHD diagnosis by age nine. More specifically, Jimenez, *et al.* found youth experiencing two (OR 2.10) and three (OR 2.60) ACEs before age five to have higher odds of predicting ADHD diagnosis than one (OR 1.90), two (OR 2.10) or three (OR 2.20) ACEs experienced between ages five and nine.

### Household dysfunction type of ACE

Weller, *et al.* (OR 0.54) and Zarei, *et al.* found household dysfunction type of ACE to be significantly correlated with parent-reported ADHD diagnosis. Zarei, *et al.* additionally found an increased number of household dysfunction type ACE at one (OR 1.81), two (OR 3.16) and three (OR 5.36) scores leading to higher odds of ADHD prevalence. When looking at the impact of ADHD diagnosis on type of ACE, Brown, *et al.* found household dysfunction subtypes of socioeconomic hardship (OR 1.39), divorce (OR 1.34), familial mental illness (OR 1.55), neighborhood violence (OR 1.47) and incarceration (OR 1.39) to be significantly correlated with ADHD. Similarly, Walker, *et al.* also concluded divorce (OR 1.22), incarceration (OR 1.56), familial mental illness (OR 1.72) and poverty (OR 1.31) to be significant predictors of ADHD diagnosis in youth.



### Impact of race and ethnicity

Hunt, *et al.* found Black children had higher numbers of ACEs and ADHD diagnoses. They additionally found their ACEs and ADHD had higher correlation compared to non-black children at the two (OR 2.57), three (OR 2.57) and four ACEs (OR 3.35) levels.

### Risk of bias in included studies

Articles found could not be comprehensive of all available data on the topic as publication bias prevents publication of non-statistically significant studies. The reliance on parent-report of a child's ADHD diagnosis by a doctor lends to potential social desirability bias as researchers did not require documentation or proof of diagnosis. Some studies did not examine the full seven subtypes of ACEs leading to the possibility of other factors to underlie the findings. Even with studies examining all seven subtypes of ACEs, other confounding factors could influence findings such as physical health status and other co-occurring mental health conditions [5].

### Discussion

The conclusion of this review points to the bidirectional association between ADHD and ACEs. The findings from this review point to further support for additional assessment of ACEs when conducting ADHD assessments and vice versa. As the effect of divorce, incarceration, familial mental illness and socioeconomic hardship types of ACEs were found to have a high impact on ADHD prevalence, practitioners should be more cognizant of these factors during assessment of ACEs and ADHD. At present time, these are not highly factored in community-based practice and treatment. Factorization into treatment would consider interventions targeted at the household level to address those ACE factors. It should become standard care for clinicians and healthcare providers to screen for either ADHD or ACEs if one or the other presents in youth. The American Academy of Pediatrics has already updated their recommended ADHD assessment guidelines to involve ACEs; however, this is not a practice widely implemented across healthcare settings [31].

The value of assessing for ADHD and ACEs concurrently points to further assessment training needed for clinicians and healthcare professionals utilizing standard metrics. As findings found ACEs prevalent by the age of five and ADHD diagnosis by age nine, training professionals to use standardized assessments by age five could lead to preventative treatment measures mentioned above implemented at an early age. A new more comprehensive assessment measure would help determine true prevalence rates of ADHD diagnosis in the community. The Centers for Disease Control and Prevention offers free, accessible training on how to screen for ACEs [1]. Committing to taking the same established, accessible training would yield similar baseline knowledge aiding the effort to prevent and treat ACEs.

Based on the conclusion of this review, a multimodal therapy model is needed to address youth affected by ACEs and ADHD. The impact of ACEs and ADHD on multiracial and minority youth points to treatment models needing to be culturally competent and inclusive [21,29]. Additionally, the higher association ACEs and ADHD had with Black and AI/AN youth requires disparities to be addressed on the local, state and nationwide level. Therapy based in addressing trauma would assist with ACEs while building organization and executive functioning skills would be beneficial for ADHD symptoms.

### Limitations

Major limitations of this review included limited studies specific to this topic and lack of randomized controlled trials. Further, a large portion of the studies were retrospective in design, pulling from secondary data utilizing national health surveys from previous years. Methodologic design variability affected the validity of this review. An additional limitation was not having a third reviewer cross check the two reviewers. Utilizing the Cochrane risk of bias tool, this study has possible incomplete access bias due to having accessed a limited database therefore not accounting for all possible publications during the target years examined [6].



### Strengths of the review

A strength of the review was discovering the database's outcome measures are all disparate, making it difficult to draw significant conclusions from the data. It would be beneficial to look into a standardization for the subject matter further developing the field and research. One article did measure the reliability of one outcome measure which was the household dysfunction type of ACE [29]. Its model of analyzing this type of ACE could be replicated to standardize measuring other types of ACEs.

### Conclusion

This review further reinforces the bidirectional relationship between ADHD and ACEs. Its findings also highlight the importance of early screenings and implementation of multi-modal therapeutic treatments for youth with combined ADHD and ACEs. Due to the disparate measures utilized in the included studies, future research is recommended on this topic.

Future studies utilizing a design for lower risk of bias and higher validity would yield more significant results. Such studies should involve the use of randomized controlled trials and a standardized metric to measure all nine subtypes of ACEs, such as the one utilized in the original ACE study by Felti. An updated standardized metric for ACEs has started to emerge with a few studies looking into the predictive power of current screeners [26,29]. A single, standardized metric would be beneficial to control the measurement of the ACE variable contributing to the validity of studies' findings. Additionally, future studies could help answer the question of whether early ACEs cause or impact in any way the manifestation of ADHD in youth. Isolating the type of ACE during analysis could further point to the impact of specific ACEs on ADHD. For example, analyzing the identified features of household dysfunction mentioned above (divorce, incarceration, familial mental illness and socioeconomic hardship), would validate the impact of those factors on ADHD diagnosis.

There was a disproportionate number of studies addressing the association of ACEs and ADHD compared to the inverse. Further examining the impact of a youth's ADHD diagnosis on ACEs could help answer questions of temporal order and whether the ADHD diagnosis could exacerbate traumas in the home environment. As parents may have more difficulty parenting a child with ADHD, more focus on parenting and family resilience could serve as a protective factor on ACEs. Future research should look into the preventative factor of familial resilience on ACEs as parenting stress and familial resilience have been found to mediate and lessen the impact of ACEs on a child's ADHD [27].

### Impact of COVID-19

Future studies on this topic may be done in the midst or on the heels of the pandemic. The pandemic has contributed to various effects on the home environment, some minor, others substantial. With caregivers and minors spending more time together in the home, conflicts and tensions could be exacerbated. Studies examining the home environment could affect the validity of future studies due to the exigent circumstances the pandemic has created.

### Bibliography

1. Adverse Childhood Experiences Resources [Violence Prevention|Injury Center|CDC (2021).
2. Barra Steffen., *et al.* "ADHD Symptom Profiles, Intermittent Explosive Disorder, Adverse Childhood Experiences, and Internalizing/Externalizing Problems in Young Offenders". *European Archives of Psychiatry and Clinical Neuroscience* (2020).
3. Bielas, Hannes., *et al.* "The Associations of Cumulative Adverse Childhood Experiences and Irritability with Mental Disorders in Detained Male Adolescent Offenders". *Child and Adolescent Psychiatry and Mental Health* 10 (2016): 34.

4. Bomysoad Rachel N and Lori A Francis. "Adverse Childhood Experiences and Mental Health Conditions Among Adolescents". *The Journal of Adolescent Health: Official Publication of the Society for Adolescent Medicine* 67.6 (2020): 868-870.
5. Brown Nicole M., *et al.* "Associations Between Adverse Childhood Experiences and ADHD Diagnosis and Severity". *Academic Pediatrics* 17.4 (2017): 349-355.
6. Boutron Isabelle., *et al.* "Chapter 7: Considering Bias and Conflicts of Interest among the Included Studies". *Cochrane Training* (2022).
7. CDC. "Data and Statistics About ADHD | CDC". Centers for Disease Control and Prevention (2020).
8. Crouch Elizabeth., *et al.* "Examining the Relationship Between Adverse Childhood Experiences and ADHD Diagnosis and Severity". *Academic Pediatrics* 21.8 (2021): 1388-1394.
9. Diagnostic and Statistical Manual of Mental Disorders, 5th, edition. American Psychiatric Publishing (2013).
10. Dulcan M. "Practice Parameters for the Assessment and Treatment of Children, Adolescents, and Adults with Attention-Deficit/Hyperactivity Disorder. American Academy of Child and Adolescent Psychiatry". *Journal of the American Academy of Child and Adolescent Psychiatry* 36.10 (1997): 85S-121S.
11. Epstein Jeffery N and Richard EA Loren. "Changes in the Definition of ADHD in DSM-5: Subtle but Important". *Neuropsychiatry* 3.5 (2013): 455-458.
12. Felitti VJ., *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". *American Journal of Preventive Medicine* 14.4 (1998): 245-258.
13. Fuller-Thomson Esme and Danielle A Lewis. "The Relationship between Early Adversities and Attention-Deficit/Hyperactivity Disorder". *Child Abuse and Neglect* 47 (2015): 94-101.
14. Holmes Hilary., *et al.* "Adverse Childhood Experiences-Household Stressors and Children's Mental Health: A Single Centre Retrospective Review". *BMJ Paediatrics Open* 5.1 (2021): e001209.
15. Horn Sarah R., *et al.* "Childhood Adversity, Mental Health, and Oxidative Stress: A Pilot Study". *PLoS ONE* 14.4 (2019): e0215085.
16. Humphreys Kathryn L., *et al.* "Stressful Life Events, ADHD Symptoms, and Brain Structure in Early Adolescence". *Journal of Abnormal Child Psychology* 47.3 (2019): 421-432.
17. Hunt Tenah KA., *et al.* "Adverse Childhood Experiences and Behavioral Problems in Middle Childhood". *Child Abuse and Neglect* 67 (2017): 391-402.
18. Jackson Dylan B., *et al.* "Adverse Childhood Experiences and Traumatic Brain Injury among Adolescents: Findings from the 2016-2018 National Survey of Children's Health". *European Child and Adolescent Psychiatry* (2021).
19. Jimenez Manuel E., *et al.* "Adverse Childhood Experiences and ADHD Diagnosis at Age 9 Years in a National Urban Sample". *Academic Pediatrics* 17.4 (2017): 356-361.
20. Kelly Michelle M and Kati Li. "Poverty, Toxic Stress, and Education in Children Born Preterm". *Nursing Research* 68.4 (2019): 275-284.
21. Kenney Mary Kay and Gopal K Singh. "Adverse Childhood Experiences among American Indian/Alaska Native Children: The 2011-2012 National Survey of Children's Health". *Scientifica* (2016): 7424239.

22. Lugo-Candelas Claudia., *et al.* "ADHD and Risk for Subsequent Adverse Childhood Experiences: Understanding the Cycle of Adversity". *Journal of Child Psychology and Psychiatry, and Allied Disciplines* 62.8 (2021): 971-978.
23. Pliszka Steven and AACAP Work Group on Quality Issues. "Practice Parameter for the Assessment and Treatment of Children and Adolescents with Attention-Deficit/Hyperactivity Disorder". *Journal of the American Academy of Child and Adolescent Psychiatry* 46.7 (2007): 894-921.
24. Richard-Lepouriel Hélène., *et al.* "Impulsivity and Its Association with Childhood Trauma Experiences across Bipolar Disorder, Attention Deficit Hyperactivity Disorder and Borderline Personality Disorder". *Journal of Affective Disorders* 244 (2019): 33-41.
25. Tsai Meng-Che., *et al.* "Effects of Childhood Adversity and Its Interaction with the MAOA, BDNF, and COMT Polymorphisms on Sub-clinical Attention Deficit/Hyperactivity Symptoms in Generally Healthy Youth". *Children* 7.9 (2020): 122.
26. Turner Daniel., *et al.* "The Association between Adverse Childhood Experiences and Mental Health Problems in Young Offenders". *European Child and Adolescent Psychiatry* 30.8 (2021): 1195-1207.
27. Uddin Jalal., *et al.* "Parenting Stress and Family Resilience Affect the Association of Adverse Childhood Experiences with Children's Mental Health and Attention-Deficit/Hyperactivity Disorder". *Journal of Affective Disorders* 272 (2020): 104-109.
28. Walker Courtney S., *et al.* "Defining the Role of Exposure to ACEs in ADHD: Examination in a National Sample of US Children". *Child Abuse and Neglect* 112 (2021): 104884.
29. Weller Bridget E., *et al.* "Adverse Childhood Experiences and Mental Health Conditions among Multiracial Adolescents". *Ethnicity and Health* (2021): 1-15.
30. Windle Michael., *et al.* "A Multivariate Analysis of Adverse Childhood Experiences and Health Behaviors and Outcomes among College Students". *Journal of American College Health* 66.4 (2018): 246-251.
31. Wolraich Mark L., *et al.* "Clinical Practice Guideline for the Diagnosis, Evaluation, and Treatment of Attention-Deficit/Hyperactivity Disorder in Children and Adolescents". *Pediatrics* 144.4 (2019): e20192528.
32. Zarei Kasra., *et al.* "Adverse Childhood Experiences Predict Common Neurodevelopmental and Behavioral Health Conditions among U.S. Children". *Children* 8.9 (2021): 761.
33. Zwicker Alyson., *et al.* "Neurodevelopmental and Genetic Determinants of Exposure to Adversity among Youth at Risk for Mental Illness". *Journal of Child Psychology and Psychiatry, and Allied Disciplines* 61.5 (2020): 536-544.

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