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**Exploring Parent Adverse Childhood Event Influence on Weight and Development of
Offspring**

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Abstract

Background: The purpose of this literature review is to explore the impact of parental adverse childhood events on weight and development in their offspring. This includes occurrences of offspring obesity, delays in social and cognitive development, and secondary factors that could have affected development or weight in childhood.

Purpose: To support a more holistic and trauma-informed approach to nursing care, a systematic review was conducted examining the relationship between parent ACEs and offspring development and health status.

Method: A literature review was conducted over 20 peer reviewed articles found on CINAHL Complete, PubMed and MEDLINE (Ebsco) databases.

Results: A summary of the literature suggests an association between parent ACEs and offspring overall health impacts.

Conclusion: The influence of parent ACEs on parenting styles and parent-child interactions, elicits an array of negative impacts on offspring health outcomes. A lack of relevant studies specifically examining the relationship between parent ACEs and offspring weight status supports the need for more relevant studies and implementation of interventions based on research outcomes.

Introduction

Adverse childhood experiences (ACEs) are psychosocial stressors and traumas experienced by children that have a significant impact on later health and wellbeing (Lê-Scherban et al., 2018). Many ACEs screening tools have identified the aforementioned to include physical, sexual, or verbal abuse, physical or emotional neglect, separation or divorce of parents, having a family member with mental illness, who abused drugs and/ or alcohol, or was incarcerated, and having witnessed a family member being abused. This literature review will present multiple retrospective cohort and qualitative and quantitative studies that have analyzed numerous groups of children that have been impacted weight and/or developmental- wise, in consideration of parental ACE scores.

Substantial research to date shows that childhood maltreatment is an environmental risk factor for the later development of many disorders, including for the children of parents who suffered from abuses (Seteanu et al., 2021). For example, parent ACEs may affect children through behavioral mechanisms, such as by leading to increased exposure to tobacco or other substances or by affecting health care use (Chilton et al., 2015). ACEs are robustly linked to a myriad of adult mental health disorders, which are in turn associated with impaired parenting (Chilton et al., 2011). ACEs have also been explicitly linked with dysfunctional parent-child interactions and with parenting attitudes and behaviors (Chilton et al., 2015). Finally, parent ACEs may contribute to vulnerable living conditions, such as food insecurity, poverty, and homelessness, as well as higher risk of ACEs among the children themselves (Chilton et al., 2015). The potential outstanding effects of ACES are supported by research revealing an

increased risk of adverse health outcomes among children of parents who experienced chronic trauma, yet, there is little to no literature examining whether parent ACEs are related to the health of their children, specifically regarding obesity and developmental status beyond infancy.

To better understand the effects of parental ACEs on offspring health outcomes, research was conducted specifically seeking insight into weight and developmental effects. As there was little to no research found on this topic, future research efforts are needed to highlight the importance of building our knowledge of risk and protective factors in relation to parental ACEs and offspring weight and development so that interventions can be appropriately developed and tailored to meet the needs of the family unit.

Methods

This review covers studies conducted within the past seven years, in order to supplement the lack of relevant studies found within the past five years. These studies include parent ACE scores and its effects on offspring obesity, developmental delays, and other aspects of childhood development. These became the terms investigated during the literary search.

Information Services

Utilizing the library database provided by the University of Arkansas, the majority of the literary search was done using medically focused databases including CINAHL Complete, MEDLINE Complete (Ebsco), and PubMed Databases. These search engines were found in the Nursing and Health Sciences, Nursing Research methods category of the University of Arkansas

Library's catalog. Additional searches were completed on The American Academy of Pediatrics and American Association of Nurse Practitioners' websites.

Search Strategy

To advance the search for academic journals and studies, the help of Dr. Tony Stankus, the nursing research guide, was utilized to organize the literature search. To keep findings uniform and consistent, the same search terms were used among all databases. These search terms included "Parent ACEs," "offspring weight," and "offspring development." CINAHL Complete resulted in 2 articles; MEDLINE Complete (Ebsco) resulted in 3 articles; PubMed Advanced Search resulted in 38 full text articles. 2 articles were found on the American Academy of Pediatrics website, as well as 2 articles found within the Journal of the American Association of Nurse Practitioners. From these outcomes, 20 resources were successfully identified for use in this literature review.

Inclusion/ Exclusion Criteria

Although less than 50 studies fell under the search criteria, not all were selected. To be included in this review, each study had to have met a certain standard. Using the PICO (population, intervention, comparison, outcome) model of nursing research inquiry, each study had to have included parent-child dyads, with an emphasis on how parent ACEs affected child/ offspring health outcomes and/ or development. Interventions measured included data collection that highlighted offspring weight and/ or developmental effects. Due to the lack of studies found specifically measuring these aspects, inclusion criteria was expanded to include studies also

measuring other psychosocial or developmental delays in childhood. This helped to expand the number of studies used in this literature review as well as point out other numerous effects that may secondarily impact weight and/ or development in offspring of parents with ACEs. All of the studies utilized questionnaires and surveys as a method of data collection, with a few implementing in-person interviews in tandem with an ACE score questionnaire. Data broadly compared effects on offspring in parents with ACEs to those without. In most studies, comparison was also made between the amount of ACEs measured. For instance, between <2 or >3 parent ACEs measured. This comparison oftentimes pointed out disparities in the severity of offspring impacts. Outcomes had to have taken account of the collected data and presented interventions to be made for future success of offspring wellbeing and development.

Data Extraction

As many of the studies were organized in a similar way, the information presented was categorized for easy comparison. To help organize each study found, a Synthesis Table was made with the following categories: Design/ Method, Sample and Setting, Study Instruments, Measurement, Data Analysis, and Findings. Having a Synthesis Table layout made comparison of each study organized and eased the process of data extraction.

Search Results

The PubMed search platform yielded the most results, with a total of 38 peer-reviewed articles published within the last 5 years. After filtering these results to Full Text, Academic Journals, and English Language, this successfully provided many of the studies used within this

review. Results of articles found when searching “parent ACEs,” and “offspring development” drastically decreased when searching “parent ACEs,” and “offspring weight,” or “offspring obesity.” The results yielded 2 articles for “offspring weight,” and 0 articles for “offspring obesity.” This pointed out a significant gap in literature regarding parent ACEs and effects on offspring weight/ obesity. Publication years were all within the last 5 years, with an exception for one study measuring caregiver adverse childhood experiences and reports of low food security, i.e. weight impacts on offspring/ children looked after by caregivers with reported ACEs (Chilton et al., 2015).

Characteristics of Included Studies

Out of the 20 studies included in this literature review, over 500 adult participants were screened for adverse childhood events and around 1,000 offspring, aged 12 months to 25 years were assessed for resulting psychosocial dysfunction, weight impacts, and developmental delays. Settings of studies were mostly limited to The United States. Although the negative effects of ACEs on family units is undoubtedly a global occurrence, the lack of relative studies taking place outside of the United States points out a need for future global research efforts. Many studies utilized qualified and specific questionnaires, such as The Philadelphia ACE survey questionnaire, The Ages and Stages questionnaire: social-emotional (ASQ:SE), which measures social-emotional functioning at 12 months of age, The Devereux Early Childhood Assessment (DECA), and the US Household Food Security Survey Model (HFSSM), which measures household and child food security, as well as other survey or questionnaire methods of data collection that measured ACE scores and offspring overall health. In addition to a measurement

of ACEs, Folger et al. (2021) utilized a resilience questionnaire and The Edinburgh Postnatal Depression Scale (EPDS), which measures elevated maternal depressive symptoms. Similarly, Chilton et al. (2015), initiated a Childhood Stress interview in participant's homes that consisted of demographic, quantitative and open-ended questions.

A wide array of statistical measurement tools were used in data analysis. Qualitative data found within the studies that utilized surveys and questionnaires, were measured through direct linear regression analysis, hierarchical regression analysis, correlation analysis, and Chi-Squared tests. Many studies used SAS through Windows operating systems to run their statistical analysis. In Chilton et al. (2015), participant interviews lasting between 1.5 to 4.5 hours were transcribed verbatim and entered into a qualitative software system that assists in management and analysis. Extensive analysis measures taken with each study allowed researchers to conclude and summarize their findings accurately and assuredly.

Results

Physical Health Conditions

While the intergenerational effect of ACEs on physical health conditions, including weight status, are less studied, a multitude of studies were found that report on the negative impact of adverse childhood experiences on direct person health outcomes. ACEs have been linked to several physical health consequences across multiple body systems, including cardiovascular disease, chronic lung diseases, headaches, autoimmune disease, and sleep disturbances (Kalmakis et al., 2015). ACEs were also associated with early mortality, obesity in adult and pediatric populations, smoking, and sleep disturbances (Kalmakis et al., 2015).

The association between ACEs and obesity in children and adolescents lacks empirical evidence, so the consistent association is less clear. Suglia et al. (2020) examined the intergenerational transmission of childhood adversity in parents and their children's BMI in the Hispanic community. This study reported that as the number of parental ACEs increased, unstandardized effect estimates and confidence intervals suggest that BMI percentile was higher among male offspring, however, this association did not reach statistical significance among girls, as the number of parent ACEs increased, female offspring BMI percentiles were lower (Suglia et al., 2020). These differential findings may be related to the age at which BMI was assessed, suggesting that adversities may affect children differently across age groups, as children aged 8-16 years of age participated in this prospective cohort study. Parental BMI, mental health, and current family functioning may shape parental feeding styles that could promote obesogenic or food restricting behaviors in their children (Suglia et al., 2020). Schiff et al. (2021) further reflects on this by noting that physical abuse was associated with a lower likelihood of obesity among females, while sexual abuse was associated with a lower likelihood of obesity among males. Obesity in childhood and adolescence may lead to lifelong struggles with self-esteem, body dysmorphia, and increases the risk of diabetes and other comorbidities (Huang et al., 2015).

The dysregulation of emotions and behaviors in adolescence which may lead to destructive external and internal behaviors could explain the associations between childhood physical or sexual abuse and eating disorders such as anorexia nervosa or bulimia behaviors that directly impact BMI. Contraversely, results of singularity impacts of ACEs on weight status in children and adolescents determined that ACEs were associated with being overweight, obese, or severely obese, but not underweight (Davis et al., 2019). Similar results were found in the Hanć

et al. (2021) study, which revealed associations of ACEs with both underweight and obesity. ACE types: victim violence, stressful family problems, and long separation from parents, additionally revealed associations with adolescent obesity, with the death of a family member being the only ACE associated with underweight (Hanć et al., 2021).

In parent-child dyads in Pennsylvania, the prevalence of poor child health behaviors was high: 89% of children ate <5 servings of fruits and vegetables per day, 48% drank soda within the past month, 55% did 30 minutes of physical activity <7 days per week, and 32% watched excessive television in the past month (Lê-Scherban et al., 2018). Maladaptive and risky health behaviors in children and adolescents of parents with ACEs is an important health issue that may perpetuate negative health patterns in the next generation, as adolescents are at a stage in life where they may become parents themselves.

Developmental Disruptions and Impacts

Parental ACEs can have a negative impact on early offspring social-emotional functioning as well as increase the risk for offspring early life adversity, and potentially increase developmental vulnerabilities related to insecure attachment and/ or neurobiological responses (Folger et al., 2018). Across all studies found on the impacts of parent ACEs on offspring development, negative associations were identified, with social-emotional development being the most cited and profound. Folger et al. (2018) discusses the impact of parental ACEs on offspring development in parent-child dyads in the Portland, Oregon, metropolitan area. These findings concluded that for each additional maternal ACE (>1), there was an 18% increase in the risk for a suspected developmental delay, with a similar trend observed for each additional parental ACE

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(Folger et al., 2018). Additionally, maternal ACEs >2 or >3 were associated with significant increases in the risk for offspring suspected developmental delays, while paternal ACEs >2 were associated with a nearly 4 times higher risk of suspected developmental delay (Folger et al., 2018). The trends on parent ACEs and specific domains of development were also identified, including communication, gross motor, fine motor, problem solving, and personal-social. While maternal ACEs were associated with a significantly increased risk for suspected developmental delay in the domain of problem solving, the exposure of >3 ACEs, versus <3, were associated with a significantly increased risk for suspected developmental delay in the domains of communication and gross and fine motor skills (Folger et al., 2018). Domain specific analysis for paternal ACEs was not concluded due to limited sample size (Folger et al., 2018). Cprek et al. (2020) additionally identifies a dose-response relationship between children's ACE score and their risk of delay with the risk of delay increasing as ACEs increased.

Treat et al. (2017) defines executive functioning as skills that are a critical component of children's healthy development and are associated with planning, decision making, inhibitory control, self-regulation, attention shifting, and working memory. Results from analyses made in this study indicated that higher parent ACE scores predicted poorer child working memory and parents who are harsh in their interactions with children may provide fewer opportunities for practice and development of this skill (Treat et al., 2017). Many studies found similar conclusions between parent ACEs and negative impacts on various aspects of their children's development. For instance, Seteanu et al. (2021) determined that paternal ACEs have an impact on the wellbeing of older children (18-25 years of age), and a positive father-child relationship

can predict a reduced risk of engagement in risky social behaviors during adolescence (Treat et al., 2017). While this study did not find the association between maternal ACEs and child psychopathology significant, Folger et al. (2017) suggests that maternal exposure to interpersonal trauma was associated with a greater risk for delayed social-emotional development in offspring, as evidenced by reported indicators and scores on the Ages and Stages (ASQ:SE) questionnaire. Mediators and protective factors to parent interpersonal trauma effects on offspring evaluated were the Interpersonal Support Evaluation List (ISEL-12), which measures social support as a protective factor against interpersonal stress (Folger et al., 2017), and the Resiliency questionnaire that measures protective characteristics related to the individual, family, and community (Folger et al., 2018).

Discussion

Although there were slight variations in clinical results and degree of effect for parent ACEs and offspring weight status and development, the literature suggests an overall degree of impact. Children are in a stage of life where parent interactions are a major source of influence on psychosocial worldview, therefore, clear associations can be made between negative parent interactions and negative impacts on a child's health status.

Limitations presented in the studies included in this literature review include small sample sizes, and the use of subjective questionnaires and self-reporting measures, which could have contributed to a reluctance in reporting adversities. Future research efforts could promote participant confidentiality by utilizing available technology to submit questionnaire data through

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ID numbers, or other means of anonymity. Many studies measuring weight status did not configure trends in weight over time, but calculated BMI at a singular point in time, and in children and adolescents of differing ages and stages in life. In addition to data collection through ACE questionnaires, the impacts of ACEs on health status could be measured through other biological indicators such as genetic testing for developmental status or obesity trending for weight status. Only 2 of the studies included in this review measured resilience and protective factors which take into account environmental impacts that help mitigate or alleviate the impact of ACEs. Difficulties in finding relevant studies looking at associations between parent ACEs and offspring weight status indicates a need for future research efforts on this topic. Because of this, secondary articles examining childhood ACEs and weight impacts during adolescence were utilized to supplement current findings and gaps in the literature.

The nursing profession cannot afford to ignore the overwhelming evidence between ACEs and negative health outcomes, and effort should be made by nurses to know of and inquire about ACEs. Additionally, future research efforts concluded on ACEs may help to supplement a gap in knowledge or combat preconceived opinions about intergenerational trauma effects on families. Due to the potentially sensitive nature of ACE questionnaire content about individuals and families, this may prove to be a barrier in ACE inquiry and trauma-informed care. The role of family and pediatric nurse practitioners (FNP) are especially impacted by these findings as many NPs in primary practice often have an established and ongoing relationship with patients, and are therefore well suited to ask about childhood adversity. Implementing ACE screening in primary care practice would help to eliminate or lessen stigmas and shame surrounding trauma,

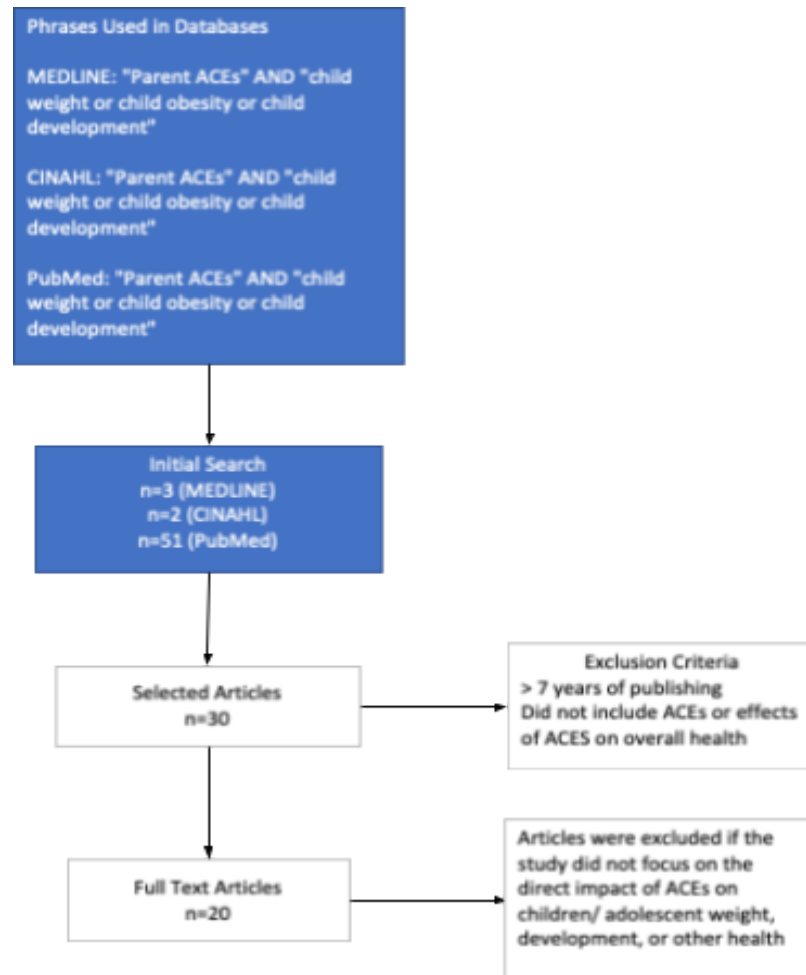
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as well as promote a therapeutic nurse-client relationship in which patients feel safe to disclose sensitive histories.

Appendix A: Flow Chart of Search Results



Appendix B: Synthesis Table of Article Findings

Table of Evidence

First Author (Year)	Design/ Method	Sample & Setting	Study Instruments	Measurement	Data Analysis	Findings
Miccoli (2022)	Retrospective Cohort Observational Study	All parents and children participating in the Early Head Start (EHS) Home Visiting Program in Olmsted County, Rochester, MN from 2014 to 2019	ACEs Screen Devereux Early Childhood Assessment Second-Edition (DECA) The Brigance Early Childhood Screens	Families were informed of the ACEs screening at a home visit by an EHS home visitor and subsequently were given and/or read an ACEs explanation pamphlet.	Descriptive statistics of participant demographics and screening results were produced using Microsoft Excel and the statistical software JMP (John's Macintosh Project Pro Version 14, SAS Institute Inc, Cary, NC, USA).	Brigance screen included 3 domains: adaptive/cognitive, language, and physical. Out of the 70 children evaluated with Brigance, 20% of them were determined to have developmental delay in at least one of these domains. Overall, parental ACEs score of 4 or more was associated with failing at least one domain on

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						<p>the Brigance screen ($P = .02$). High parental ACEs score was associated with an increased rate of failing adaptive/cognitive ($P = .05$) domain. However, there was no statistically significant difference in language ($P = .37$) or physical domains ($P = .16$).</p>
Lê-Scherban (2018)	Cross-sectional Study	Parent-child dyads of children aged <18 years with both 2012 HHS child proxy survey and Philadelphia ACE Survey	Parent ACEs Child Health Outcomes Covariates	The Philadelphia ACE Survey Questionnaire was used to assess both conventional ACEs, which are childhood	All analyses were performed by using SAS 9.3 (SAS Institute, Inc, Cary, NC).	In unadjusted logistic regression models, the parent conventional ACE score was related to higher odds of poor

		information ($N = 377$)		experiences related to abuse, neglect, and family dysfunction, as well as an additional set of expanded ACE items used to measure community-based childhood stressors.		health for all 3 measures of child health status. For each additional ACE experienced, the results were as follows: odds ratio [OR] = 1.21 (95% confidence interval [CI]: 1.07–1.37) for good, fair, or poor health status; OR = 1.28 (95% CI: 1.10–1.50) for obesity; and OR = 1.17 (95% CI: 1.03–1.33) for asthma diagnosis.
Folger (2018)	Retrospective Cohort Study	Parent-child dyads within a private pediatric primary care practice in the Portland,	ACEs Scale Questionnaire Resilience Questionnaire	The Ages and Stages Questionnaire: Edition 3 (ASQ-III) was used to	Multivariable Poisson regression with robust error variance was used to model	For each additional maternal ACE, there was an 18% increase in the risk for a

		Oregon, metropolitan area	Edinburgh Postnatal Depression Scale Ages and Stages Questionnaire: Edition 3 Early Intervention	measure child developmental status at 24 months of age. The ASQ-III is a standardized screening tool completed by parents and contains 25 items to assess the developmental domains of communication , fine and gross motor skills, personal-social function, and problem solving.	the dichotomous outcome of suspected developmental delay. The analyses were performed in SAS version 9.4 (SAS Institute, Inc, Cary, NC).	suspected developmental delay. Maternal ACEs ≥ 2 or ≥ 3 were associated with significant increases in the risk for offspring suspected developmental delay. ≥ 2 paternal ACEs (versus 0–1 ACEs) was associated with a nearly 4 times higher risk of suspected developmental delay. However, there was no effect on child developmental risk when comparing paternal ACEs of ≥ 3 to ACEs of <3.
Folger (2017)	Retrospective	1172	Edinburgh	Data were	Odds ratios and	Children in

	<p>Cohort Study</p>	<p>mother-child dyads who participated in a multi-site, early childhood home visiting program. Children were born January 2007 to June 2010 and data were collected at enrolment (prenatal/birth) through 12-months of age</p>	<p>Postnatal Depression Scale</p> <p>Interpersonal support evaluation list (ISEL-12)</p> <p>Home observation for measurement of the environment (HOME)</p> <p>Ages and stages questionnaire: social-emotional (ASQ:SE)</p>	<p>collected at enrolment in home visiting and at multiple time points throughout service; home visitors routinely entered data into a web-based database. Maternal interpersonal trauma was measured using an 11-item trauma inventory that was administered to mothers within 3-months of home visiting enrolment. The inventory included items from the Kiddie-SADS-</p>	<p>95% confidence intervals were calculated to estimate the odds of suspected maternal depression and delayed child social-emotional development following interpersonal trauma exposure.</p>	<p>poverty are more susceptible to environmental insults that contribute to developmental disparities, and the added layer of maternal interpersonal trauma exposure further escalates this risk. Poor social-emotional development in early childhood can have cascading effects on child behavior into elementary school.</p>
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				PL, a semi-structured interview		
Chilton (2015)	Semi-structured audio-recorded in-person interviews that included (i) quantitative measures of maternal and child health, adverse childhood experiences (range: 0–10)	Thirty-one mothers of children <4 years old who reported low or very low household food security	US Household Food Security Survey Module (HFSSM) Kemper three-item screen of maternal depressive symptoms ACEs Screen	The Childhood Stress interview consisted of demographic, quantitative and open-ended questions. The quantitative portion of the interview was carried out first, and included questions on demographics, health status, economic circumstances, public assistance participation, employment characteristics and adverse childhood experiences.	Interviews were transcribed verbatim and entered into ATLAS.ti, a qualitative software system that assists in management and analysis.	Reports of physical and emotional abuse were significantly associated with very low food security at the household level and food insecurity at the child level.

<p>Seteanu (2021)</p>	<p>Retrospective Cohort Study</p>	<p>The sample included 162 participants, specifically, 54 families consisting of mother, father, and their children (18–25), who completed a battery of psychological tests.</p>	<p>The Childhood Experiences Survey DSM-5 Self-Rated Level 1 Cross-Cutting Symptom Measure (CCSM) Measure of Parental Style The parents' marital satisfaction was measured by asking both parents how they evaluate their relationship in the last 20 years.</p>	<p>The instrument was administered online using a snowball sampling procedure and took approximately 15–20 minutes to complete.</p>	<p>For the first hypothesis, to test if ACE predicted psychopathology while controlling for age, education, and income, direct linear regression analyses were conducted. For the second hypothesis, correlations between the variables were performed. Hierarchical multiple regression analyses were used to evaluate the third hypothesis and, specifically, to determine if parents' ACE, negative</p>	<p>For the first hypothesis, the regression model was significant, explaining 31.2% of the variance in psychopathological symptoms, $R^2 = .31$. Therefore, with the increased number of ACEs, psychopathological symptoms increased as well. Additionally, the control variable <i>age</i> had a negative effect on this variable, meaning that younger participants reported more psychopathological symptoms</p>
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					parenting, and parents' marital satisfaction predict adult children's psychopathological symptoms.	than their parents.
Treat (2017)	Retrospective Cohort Study	This study looked at over 17,000 participants' exposure to childhood abuse, neglect, and household dysfunction. Participants were recruited from three Tulsa Educare sites.	ACE Score Questionnaire Bavelok's AAPI-2	Consenting caregivers were asked to complete a 20-minute survey during drop off or pick up at the childcare center. Parent consent to child assessment was given at this time. The child assessments took place in the mornings at the childcare centers in a private space outside of the classroom.	Linearity of the data was assessed by visual inspection of partial regression plots and studentized residuals and normality was assessed by visual inspection of Q-Q plots. Independence of residuals assumption was met as assessed by a Durbin-Watson value of 2.264.	Parent ACE scores were negatively correlated ($r = -.39$, $p < .001$) with children's working memory scores. Children's scores for inhibitory control were negatively correlated ($r = -.33$, $p < .05$) with harsh parenting. Children's

					<p>Multicollinearity was assessed by tolerance values and no values were greater than 0.1. Studentized deleted residuals values were not greater than 3 and Cooks' values were within safe limits.</p>	<p>cognitive flexibility scores were moderately negatively correlated with harsh parenting ($r = -.29$, $p = <.10$). EF task performance and age was correlated with all EF tasks, although only marginally with inhibitory control.</p>
Davis (2018)	Cross-sectional survey	Middle and high school (Grades 8, 9, and 11) students consisting of 85% (105,759 participants) of the school districts in Minnesota	MSS (Minnesota Student Survey) Multinomial Logistic Regression	The questionnaire was given that included yes/no questions of self-reported exposure to 6 Aces (psychological abuse, physical	Differences in weight status was examined separately by key demographic characteristics (sex, race/ethnicity, etc.) while also	Being female, experiencing poverty, and living in a nonmetropolitan area were significantly associated with higher ACEs. Being male,

		2016		abuse, sexual abuse, familial substance abuse, domestic violence, and parental incarceration), height, and weight.	using multinomial logistic regression to examine the effect of Aces on weight status controlling for the demographic characteristics.	older, experiencing poverty, living in a nonmetropolitan area, and ACEs were significantly associated with higher BMI.
Soares (2017)	Retrospective cohort study	Pregnant women who are residents in the Avon area of the United Kingdom with an expected delivery date between April 1, 1991, and December 31, 1992 (4,444 participants) , and all children born alive in hospitals in the urban area of the city of Pelotas, Southern Brazil, between January	Aces Scale Questionnaire Sensitivity Analysis Body Mass Index Waist Circumference Fat Mass Index	The children were given the questionnaire (including Aces of physical abuse, sexual abuse, domestic violence, parental separation or divorce, separation from parents, and maternal mental health) and BMI, WC, and FMI were measured at 15 years old and	The analysis was restricted to those individuals with complete data on all ACEs, and multiple imputation by chained equations was used in both cohorts. Unadjusted linear regression analyses were used, examining associations of individual ACEs and the ACE	In the UK study, domestic violence was associated with higher BMI and WC at 15 years, and parental separation was associated with higher android fat at 18 years. In the Brazil study, physical neglect was associated with a lower BMI by 0.58 kg/m ² (95% CI: -1.14 to -0.02) at age

		1, 1993, and December 31, 1993 (3,924 participants).		18 years old.	score with adiposity measures.	15.
Suglia (2019)	Prospective cohort study	Child participants (601 participants) of the Hispanic Community Children's Health Study/Study of Latino Youth (HCHS/SOL Youth) and their biological parents who were participants in HCHS/SOL and the HCHS/SOL Sociocultural Ancillary Study.	Health questionnaires Anthropomorphic Measurements ACEs Questionnaire	Children's BMI was calculated from children's height and weight measured at the HCHS/SOL Youth clinic, and parental ACEs were reported retrospectively using the ACE questionnaire.	The association between the sum count of parental ACEs as well as types of adversity exposures , and children's BMI in separate linear regression models were assessed. Structural equation modeling was used to test the direct and indirect associations between parent's ACEs and their children's BMI, through parental BMI, parental food and	Parent's ACEs were associated with the BMI of their children. Parent's ACEs were associated with lower BMI among girls, but didn't reach statistical significance among boys.

					physical activity monitoring, parental depressive symptoms, poor family functioning.	
Heerman (2021)	Secondary analysis	The US Census Bureau initially identified households that were likely to have a child living in the home, stratified by state. (30,023,428 participants)	NSCH Survey that contained ACE Questionnaire	The survey was conducted in both English and Spanish and administered online and by mail. The US Census Bureau initially identified households that were likely to have a child living in the home, stratified by state.	The analyses were conducted using survey weights provided in the NSCH data set and post-estimation techniques were used to present results in two formats.	Children who were Hispanic or Black, non-Hispanic experienced a higher total number of ACEs compared to White, non-Hispanic children. Children who experienced higher numbers of ACEs also had higher prevalence of childhood overweight and obesity.
Hanć (2021)	Cross sectional study	503 participants between 6 and	ACEs Questionnaire	Parents were informed about	A two-way ANOVA was	ACEs were significantly

		12 years and being a student of elementary school located in Poznań.	Anthropometer Medical scale Questionnaire of SES	the study through visits to 11 randomly selected elementary schools. Interested parents received the questionnaires and tools to measure height and weight.	used to assess the effects of interaction between sex, SES indicators and ACEs on z scores BMI.	related to both obesity and underweight, in unadjusted analysis, and when sex and SES indices, such as size of place of residence, people per room in household, and parental education were controlled.
Schiff (2021)	Retrospective cohort study	Cases from Child Protective Services investigations of families that were closed between February 2008 and April 2009 nationwide were used (3170 participants).	NSCAW II study	Data was collected 4 months, 18 months and 36 months after the close of an investigation. The final sample of children was representative of the national population of children birth	STATA survey commands were applied to obtain unbiased estimates of population parameters. Fixed effects logistic regression was used to control for the unmeasured stable	Youth at higher cumulative scores of ACE were at greater odds of obesity compared to youth at lower scores. For all youth, neglect as a single event was associated with greater odds of obesity.

				to 17 years of age in families being investigated for allegations of maltreatment	heterogeneity and multicollinearity of children characteristics.	
Ziv (2018)	Cross sectional study	30 preschool children enrolled in the TNP and their caregiver	<p>ACEs Questionnaire</p> <p>Child's Positive Social Behavior Questionnaire</p> <p>Child Behavior Problems Questionnaire</p> <p>Quality of Relationship with Child Questionnaire</p> <p>Locus of Control Questionnaire</p>	The primary caregiver was interviewed to obtain information about their own and their child's exposure to ACEs and completed questionnaires about their child's behavior, their relationship with the child and their locus of control.	A series of bivariate (in cases where age was not associated with the examined outcome) or partial (in cases where age was related to the measured outcome), Pearson correlation was used.	Caregiver's exposure to ACE was significantly associated with negatively associated with the child's attitude towards learning and with the child's persistence. The caregiver's level of exposure to ACE was also associated with a number of outcomes as reported by the caregiver.
Haltom (2019)	Descriptive Survey Study	The study was conducted in a pediatric	Finding Your ACE Score Questionnaire	This study used the written "Finding Your	Data were analyzed using SPSS version	A total of 86.7% of participants experienced

		<p>hospital. Subjects (n=15) met the inclusion criteria for the study if they were parents or caretakers of a child who was a suspected victim of abuse or neglect. A consultation to a specialized pediatric medical team that evaluates children who are suspected victims of abuse or neglect.</p>	<p>Demographic Questionnaire</p>	<p>ACE Score” questionnaire to determine the ACE scores of parents or caretakers whose child was a suspected victim of abuse or neglect.</p>	<p>25. Descriptive statistics were used to describe the sample and prevalence of ACE items. Demographic characteristics were collapsed (dichotomized) to explore the differences in total ACE scores by sex, age (18–24 vs. 25+), race (white vs. black or African American), education (high school or less vs. some or completed college), and annual income (<\$20,000 vs. >\$20,000). The Mann–Whitney <i>U</i> test was used to test for differences</p>	<p>some form of exposure to ACEs. A total of 73.3% of participants experienced divorced or separated parents. A total of 33.3% of participants experienced specific ACE exposure to substance abuse and lack of family support. Participants with an annual income of less than \$20,000 reported higher ACE scores than those with higher income levels.</p>
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					between groups.	
Cprek (2020)	Cross Sectional Study	Of the 847,881 households contacted, 187,422 reported age-eligible children living in the home, yielding 95,677 child-level interviews across the US. The overall response rate for the survey was 23.0%	Parents' Evaluation of Developmental Status (PEDS) Parent Education ACEs Questionnaire	The research team utilized data from the 2011/12 National Survey of Children's Health (NSCH), which is a cross sectional, phone interview survey assessing national and state-level prevalence of physical, emotional, and behavioral health measures in children ages 0–18 years	Chi square analyses were performed between all independent, dependent, and control variables. Multiple logistic regression was used to analyze the relationship between total ACE score and the child's risk of being developmentally, socially, or behaviorally delayed, controlling for poverty, race, and parental education. All analyses were conducted using SAS Version 9.4.	Chi square analysis of delay risk and sex, age, race, income, and parental education were all statistically significant (p<0.05). Thirty percent of boys were found to have moderate to high risk of delay, compared to 23.8% of girls.

<p>Madigan (2017)</p>	<p>Retrospective Cohort Study</p>	<p>Participants were 501 community mother-infant dyads recruited shortly after the birth and followed up at 18 months.</p>	<p>Maternal ACES Path Analysis Childhood Experience of Violence Questionnaire Center for Epidemiologic Studies Depression Scale</p>	<p>Mothers retrospectively reported on their adverse childhood experiences. The main outcome measures were parent-reported infant physical health and emotional problems.</p>	<p>Analyses were carried out using a combination of SPSS v 20 and Mplus v 7.2. Logistic regression was used to examine the relation of individual adverse childhood experience variables to the presence of any biomedical or psychosocial risk</p>	<p>Four or more adverse childhood experiences were related to a 2- and 5-fold increased risk of experiencing any biomedical or psychosocial risk, respectively.</p>
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