



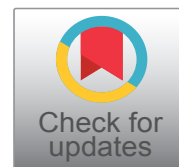
## RESEARCH ARTICLE

## Childhood Adversity and Attempted Suicide Prior to Adulthood

Alan R King\*

Professor, Psychology Department, University of North Dakota, USA

\*Corresponding author: Alan R King, Professor, Psychology Department, University of North Dakota, PO Box: 8380, Grand Forks, ND 58202-8380, USA, Tel: 701-777-3644



### Abstract

**Background:** Suicide attempts occurring early in development were thought to constitute a special concern regarding the slope of mood disorder developmental trajectories.

**Objective:** This analysis examined relationships between childhood adversities and the odds of suicide attempt(s) prior to age 17.

**Participants and setting:** Survey respondents ( $N = 2072$ ) sampled from Amazon's Mechanical Turk described the extent of their childhood and adolescent exposure to childhood maltreatment and other developmental adversities.

**Methods:** The sample was differentiated into subsets with versus without suicide attempt(s) prior to age 17.

**Results:** The odds of suicide attempt(s) prior to age 17 were significantly ( $p < 0.001$ ) higher for respondents reporting childhood sexual abuse ( $OR = 5.0$ ), physical abuse ( $OR = 4.9$ ), emotional abuse ( $OR = 3.7$ ), peer bullying ( $OR = 3.1$ ), parental neglect ( $OR = 1.6$ ), and maternal battering ( $OR = 2.15$ ). All adversities but exposure to maternal battering accounted for unshared variance in suicide attempts prior to age 17. Adverse Childhood Experiences Questionnaire exposure counts were associated incrementally with early suicide attempts. Efforts were made to differentiate between additive and interactive adversity risks. While significant adversity interactions were found, they tended to be modest in size and scope. The risks posed by single and dual adversity exposures seemed to limit the potential for substantial interactive effects.

**Conclusion:** The odds of early suicide attempt(s) were markedly higher in this sample among respondents exposed to childhood adversity.

### Keywords

Adolescent suicide, Childhood adversity, Sexual abuse, Physical abuse, Emotional abuse, Maternal battering

### Introduction

Childhood maltreatment has been designated a DSM-5 (American Psychiatric Association [1]; Risk and Prognostic Factors) risk factor for many psychiatric disorders. Sexual (CSA), physical (CPA), and emotional (EA) abuse have merited heightened attention given their broad maladjustment linkages (CSA, CPA, EA) [2-4]. The Adverse Childhood Experiences (ACE) questionnaire [5-7], [Supplemental Material](#)) generates an aggregated count of lifetime exposures to child abuse (CSA, CPA, and/or EA), neglect (physical and/or emotional), and household dysfunctions (parental divorce, domestic violence, and/or family alcoholism, mental illness, or incarceration).

ACE counts have been associated with a range of medical [5,6,8,9] and psychological [10,11] disorders. The relative importance of polyvictimization effects also warrants attention [10,12-16]. These ACE-maladjustment associations have tended to be graded with a plateau after four or more exposures [5,8,11,17]. Both longitudinal [18] and cross-sectional [19,20] findings have shown that even unitary exposures pose substantial risks.

### Suicidality and Childhood Adversity

Suicide is a leading cause of adolescent death in the United States [21], and unsuccessful attempts

predispose future self-destructive acts [22]. Lifetime prevalence of suicidal ideation (5.6 to 14.3%) and attempts (1.9 to 8.7%) have been estimated from national epidemiologic data (Centers for Disease Control and Prevention; [23]). Prevalence rates for suicide attempts are higher among adolescents, women, and those with mood disorders. High school students have been shown to report alarming rates of suicidal ideation (17%) and attempts (7%) with the preceding year [24].

### Maltreatment literature

Different lines of evidence suggest that child abuse elevates the risk of suicidal ideations and acts [25-32]. Research has focused extensively on the impacts of CSA and CPA. World Health Surveys from 21 countries [33,34] show higher rates of planned suicide attempts over the prior year among victims of either CSA ( $OR = 2.3$ ) or CPA ( $OR = 2.3$ ) victims. A prospective study of Canadian children from age 6 to 24 [35] found that boys exposed to CPA ( $OR = 2.8$ ) and girls victimized by co-occurring physical and sexual abuse ( $OR = 5.4$ ) were at significantly ( $p < 0.001$ ) higher risk of suicide attempt(s) prior to age 18. Structured interviews ( $N = 34,653$ ) of noninstitutionalized American residents (National Epidemiologic Survey on Alcohol and Related Conditions; [36]) found significantly ( $p < 0.005$ ) higher odds of lifetime suicide attempt(s) among victims of CSA ( $OR = 6.43$ ), CPA ( $OR = 6.21$ ), EA ( $OR = 4.23$ ), emotional neglect ( $OR = 4.19$ ), or physical neglect ( $OR = 4.62$ ). Structured interviews, parental reports, and record checks were used in an 18-year longitudinal analysis of 659 families to establish associations between both CSA ( $OR = 7.22$ ) and CPA ( $OR = 5.10$ ) with suicide attempt(s) by early adulthood [37]. British citizens at age 45 with CSA ( $OR = 3.55$ ) or CPA ( $OR = 3.07$ ) histories were found to have significantly ( $p < 0.001$ ) higher rates of suicidal ideation prior to age 16 [38]. Meta-analytic research [39] has summarized these odds ratios as follows: CSA ( $OR = 3.41$ ); CPA ( $OR = 2.18$ ); EA ( $OR = 2.21$ ); emotional neglect ( $OR = 1.93$ ); physical neglect ( $OR = 1.79$ ); and polyvictimization ( $OR = 3.38$ ). Data from seven longitudinal studies provided a similar CSA summary estimate ( $OR = 2.43$ ). A different meta-analysis [40] summarized risks of completed adolescent suicide secondary interpersonal violence exposure ( $OR = 1.99$ ), dating violence ( $OR = 1.65$ ), or bullying ( $OR = 2.39$ ). A systematic review of collateral influences on CSA and CPA findings in suicide research has suggested that age, sex, and race/ethnicity have modest impacts on the observed associations [41].

### ACE literature

Suicidal ideations and lifetime suicide attempts are more common among survey respondents who report higher ACE exposure counts [42-46]. ACE counts as low as two have been associated with two- to five-fold elevations in trait extremes of depressivity, emotional lability, and anxiousness [16]. One retrospective analysis of medical

patients ( $N = 17,337$ ) found elevated risks as high as  $OR = 31$  for seven or more exposures [44]. The ACE associations in this sample were mediated by mood disturbance and substance abuse. Suicide deaths among members of a Swedish birth registry ( $N = 548,721$ ) was traced prospectively from age 15 to 24 [47]. Graded association were found between attempted suicide and adversity counts (one,  $RR = 1.1$ ; two,  $RR = 1.9$ ; three,  $RR = 2.6$ ).

### Conceptual considerations

Adversity effects can be theoretically deconstructed into their main (direct), additive, mediated (indirect), and interactive impacts. These stress or scan impact adjustment through both their total number and idiosyncratic co-occurrences (interactions). Studies often focus on unitary forms of abuse with statistical controls applied for co-occurring adversities. Additive effects have been explored using the ACE metric or other comparable exposure counts. Interaction effects have proven more difficult to examine and replicate in the childhood adversity literature [10,48-50].

### Study hypotheses

Four hypotheses were tested: H1) Childhood adversities were expected to be associated with higher odds of suicide attempt(s) prior to age 17; H2) CSA and/or CPA was expected to account disproportionately for the variance in suicide attempt(s) relative to other adversity exposures (maternal battering, emotional abuse, peer bullying, and parental neglect); H3) Adversity exposure (ACE) counts were expected to increment risk of early suicide attempt(s) in an additive and graded manner; H4) Selected adversity interactions were expected to magnify suicide risks above those observed for simple main effects.

### Method

#### Participants and procedure

This sample was generated from Amazon's Mechanical Turk crowd sourcing research platform [51-53]. This was an IRB-approved project with informed consent required for participation. Exclusions ( $n = 742$ , 26.4%) were made prior to analysis of the final sample ( $N = 2,072$ ). Respondents were excluded if they were reluctant ("*rather not say*") to respond to either of the two suicide history survey questions ( $n = 116$ ). Respondents were excluded if there was an inconsistency in their response between these same items ( $n = 242$ ). Online proxy/VPN detection software (<https://iphub.info>) was relied upon as a best practice [54] to exclude users from outside of the United States ( $n = 31$ ) or dubious internet locales identified by robot detection software ( $n = 113$ ). Respondents were excluded ( $n = 39$ ) for their failure to identify a palindrome ("*word spelled the same way both forward and backward*") in a multiple choice item early in the survey. An attention check embedded in the middle of the survey asked respondents to identify

the first letter of the English alphabet ( $n = 6$ ). The palindrome and attention checks were positioned at the top and middle of the survey. A final survey item asked respondents if “*we should trust that your responses represented an honest reflection of your life history?*” Respondents were excluded ( $n = 195$ ) if they indicated either “*not really, my responses were semi-random*” or “*no, I didn’t read most of the items and my responses were almost entirely random*”).

This final sample varied in gender (Men,  $n = 588$ , 28.4%; Women,  $n = 1,484$ , 71.6%), age ( $M = 35.01$ ,  $SD = 12.00$ , Range = 18-87), and ethnicity (White, 75.4%; Hispanic, 6.1%; Asian, 5.4%, African American, 7.8%; Multi-Racial, 4.0%; Other, 1.3%). Non-Hispanic White respondents were disproportionate to their national representation (United States Census Bureau [55]: White, 60.1%; Black, 13.4%; Hispanic, 16.5%; Asian, 5.9%; American Indian, 1.3%; Multi-Racial, 2.8%). Subset of these respondents contributed to three other analyses (citations redacted) focused on adversity links to different criterion measures.

## Materials

### History of attempted suicide

Self-report survey items have been used in prior studies to identify respondents with lifetime suicide attempts [56]. Support has been generated for the accuracy of self-reports regarding histories of suicidality [57,58] and childhood maltreatment [59]. This study differentiated the sample into respondents with versus without histories of suicide attempt(s) prior to age 17. The attempted adolescent suicide group was defined by affirmative responses to two separate items spaced apart in the survey (*Have you ever attempted suicide? Did you ever attempt suicide before the age of 17?*).

### ACE questionnaire

The ten adversities of the ACE Questionnaire ([5-7], Supplemental Material) have been examined as risk indicators for an impressive range of medical [5,6,8,9,60] and psychological [11,44] disorders. The ACE samples exposure prior to age 17 to emotional abuse, physical abuse, sexual abuse, emotional neglect, physical neglect, parental separation or divorce, maternal battering, household member alcohol or drug addiction, household member depression or other mental illness, and/or household member imprisonment. Odds ratio meta-analyses [61] have tended to reflect graded relationships between higher ACE counts and collective criterion measures (ACE > 0,  $OR = 1.36$ ; ACE > 1,  $OR = 1.71$ ; ACE > 2,  $OR = 2.18$ ; ACE > 3,  $OR = 3.57$ ). Test-retest kappa estimates for the ACE questionnaire have been shown to range from moderate to good for most adversities [62]. The ACE count was shown in these studies to be temporally stable ( $\kappa = 0.64$ ) with no major age or gender variations in these reliability findings.

## Sexual abuse & assault self-report (CSA<sub>LONG</sub>)

The CSA and CPA inventories [63] were made available by the Consortium of Longitudinal Studies on Child Abuse and Neglect (LONGSCAN) project coordinated at the University of North Carolina. Sexually abused children and adolescents were asked to recall acts perpetrated against him or her. Minor wording modifications were made for adult sampling purposes (i.e., “genitalia” instead of “sexual parts”; “rape” in place of “put a part of his body inside your private parts. One sample item was worded as follows: “*Has anyone ever put their mouth on your genitalia or made you put your mouth on their genitalia?*” Separate scores were generated for childhood (“prior to age 13”) and adolescent (“between ages 13 and 16”) victimization using the 11-item indices and a four-point frequency index (0 = never; 1 = once; 2 = twice; 3 = multiple). A total CSA<sub>LONG</sub> score was calculated from the two recording periods. The CSA<sub>LONG</sub> and CPA<sub>LONG</sub> LONGSCAN indices have been shown to be maladjustment high risk indicators in a series of studies [48,64,65].

## Physical abuse self-report (CPA<sub>LONG</sub>)

Physical abuse described in this index was perpetrated by “a parent or step-parent” with victim ages between the ages of 5 and 16. One sample item was worded as follows: “*Did a parent or step-parent try to choke, drown, or smother you?*” This scale relied on 12 items using a four-point frequency index (0 = never; 1 = once; 2 = twice; 3 = multiple).

## Maternal battering (BAT)

This four-item customized index [66] was used to identify the frequencies (0 = never; 1 = once or twice; 2 = sometimes; 3 = very often) that acts of kicking, biting, pushing, shaking, grabbing, slapping, hitting, or threats or use of a weapon were witnessed toward a mother as perpetrated by a father or boyfriend prior to age 17.

## Family emotional abuse (FEA<sub>VEQ</sub>)

The VEQ-R [64] provided a measure of family emotional abuse in the form of exposure to acts of parental or sibling yelling, cursing, and/or threats of physical violence directed toward the respondent or between parents. FEA<sub>VEQ</sub> scores do not include acts of actual physical violence.

## Physical/Emotional neglect (NEG<sub>AE</sub>)

The 8-item Neglect subscale of the Assessing Environments III [67,68] inventory samples parental physical and/or emotional neglect using a four-point frequency index (“never” to “frequently”). The items were restricted to ages 5 through 16 with their wordings and four-point frequency index (“never” to “frequently”) retained. Alphas for paternal ( $\alpha = 0.84$ ) and maternal ( $\alpha = 0.80$ ) neglect were established previously [68]).

**Table 1:** Binary logistic regression links to suicide attempt(s) prior to age 17.

Predictor	B	SE	Wald	df	p	Exp (B)
<b>Dimensional maltreatment indicators</b>						
CSA <sub>LONG</sub>	0.433	0.059	54.37	1	< 0.001	1.54
CPA <sub>LONG</sub>	0.179	0.078	5.87	1	0.015	1.20
BAT	0.021	0.061	0.12	1	0.727	1.02
FEA <sub>VEQ</sub>	0.332	0.064	26.68	1	< 0.001	1.39
NEG <sub>AE</sub>	0.133	0.062	4.57	1	0.033	1.14
BULL	0.214	0.059	12.94	1	< 0.001	1.24
Respondent age	-0.038	0.070	29.16	1	< 0.001	0.69
<b>Dichotomized maltreatment indicators</b>						
CSA <sub>LONG</sub>	1.152	0.143	64.48	1	< 0.001	3.16
CPA <sub>LONG</sub>	0.701	0.071	16.72	1	< 0.001	2.02
BAT	0.183	0.158	1.34	1	0.248	1.20
FEA <sub>VEQ</sub>	0.752	0.152	24.53	1	< 0.001	2.12
NEG <sub>AE</sub>	0.157	0.138	1.30	1	0.254	1.17
BULL	0.570	0.149	14.54	1	< 0.001	1.77
Respondent age	-0.334	0.066	25.90	1	< 0.001	0.39

**Note:** CSA<sub>LONG</sub> = Acts of childhood sexual abuse; CPA<sub>LONG</sub> = Acts of childhood physical abuse; BAT = Exposure to acts of maternal battering; FEA<sub>VEQ</sub> = Acts of family emotional abuse; NEG<sub>AE</sub> = Acts of parental neglect; BULL = Acts of physical bullying. Standardized scores used for all predictors. Maltreatment classifications were dichotomized using distribution percentile (Elevated > 85<sup>th</sup>; Normative ≤ 85<sup>th</sup>).

### The personal experiences checklist (PECK)

The nine-item Physical Bullying subscale of the PECK [69] was used to estimate the extent to which respondents were subjected to acts of bullying (hitting, punching, kicking, shoving, wrecking belongings) prior to age 17. These items were scaled on a five-point frequency metric (never; rarely; sometimes; most days; everyday). Psychometric support for the internal consistency ( $\alpha = 0.91$ ), test-retest (two week) reliability ( $r = 0.77$ ), and concurrent validity of this subscale was generated in the normative analysis cited above.

### Results

The frequency of lifetime suicide attempt(s) in this sample (22.4%) varied in number (*one*,  $n = 200$ ; 9.7%; *two*,  $n = 114$ , 5.5%; *multiple*,  $n = 150$ , 7.2%). The adversity indices included in this study were internally consistent (Supplemental Material) with co-occurrences ranging from 4.0% (neglect and bullying) to 6.5% (physical and emotional abuse) within the sample. Aggregated adversity counts were as follows: 0 ( $n = 1,037$ , 50.0%); 1 ( $n = 564$ , 27.2%); 2 ( $n = 226$ , 10.9%); 3 ( $n = 119$ , 5.7%); 4 ( $n = 84$ , 4.1%), 5 ( $n = 33$ , 1.6%), and 6 ( $n = 9$ , 0.4%). Some respondents described victimization by only one form of maltreatment. Suicide risks varied within this unitary exposure groups (CSA<sub>LONG</sub>,  $n = 92$ ,  $OR = 2.58$ ,  $p < 0.001$ ; CPA<sub>LONG</sub>,  $n = 23$ ,  $OR = 2.58$ ,  $p < 0.001$ ; BAT,  $n = 76$ ,  $OR = 1.52$ ,  $p = 0.155$ ; FEA<sub>VEQ</sub>,  $n = 65$ ,  $OR = 2.19$ ,  $p = 0.010$ ; NEG<sub>AE</sub>,  $n = 212$ ,  $OR = 0.85$ ,  $p = 0.490$ ; & BULL,  $n = 96$ ,  $OR = 2.68$ ,  $p < 0.001$ ).

Self-reported suicide attempt(s) prior to age 17

were more common among respondents exposure to each ACE Questionnaire item (Supplemental Material). Binary logistic regression indicated that only half of those items (documented in table footnote) accounted for unshared variance in the criterion. Significant suicide attempt differences were found as well for respondents with elevated (Elevated > 85<sup>th</sup>; Normative ≤ 85<sup>th</sup>) scores on the dimensional maltreatment indicators. Separate binary logistic regression models were generated from the dimensional and dichotomized (Elevated > 85<sup>th</sup>; Normative ≤ 85<sup>th</sup>) adversity indicators (Table 1). All but one of those factors (maternal battering) accounted for unshared variance in suicide attempt(s).

Respondents indicating exposure to a single form of maltreatment provided an opportunity to compare suicide attempts between respondents with a unitary, rather than co-occurring, form of maltreatment. Parental neglect (NEG<sub>AE</sub>) as a unitary form of maltreatment generated a lower frequency of prior suicide attempts than sexual (CSA<sub>LONG</sub>,  $n = 28.14$ ,  $p < 0.001$ ), physical (CPA<sub>LONG</sub>,  $n = 4.88$ ,  $p = 0.027$ ), or emotional (FEA<sub>VEQ</sub>,  $n = 6.93$ ,  $p = 0.008$ ) abuse. Parental neglect (NEG<sub>AE</sub>) was linked to a higher suicide rate than peer bullying (BULL,  $n = 2.72$ ,  $p = 0.002$ ), and the sexual abuse (CSA<sub>LONG</sub>) was associated with a higher frequency of past suicide attempts than maternal battering (BAT,  $n = 7.37$ ,  $p = 0.007$ ). The suggested risks posed these unitary adversities were summarized as follows: CSA<sub>LONG</sub>/CPA<sub>LONG</sub>/FEA<sub>VEQ</sub> > NEG<sub>AE</sub>; NEG<sub>AE</sub> > BULL; and CSA<sub>LONG</sub> > BAT.

Cell sizes for the single and co-occurring adversities (Figure 1A) ranged from 80 (NEG<sub>AE</sub> & BAT) to 135 (CPA<sub>LONG</sub>

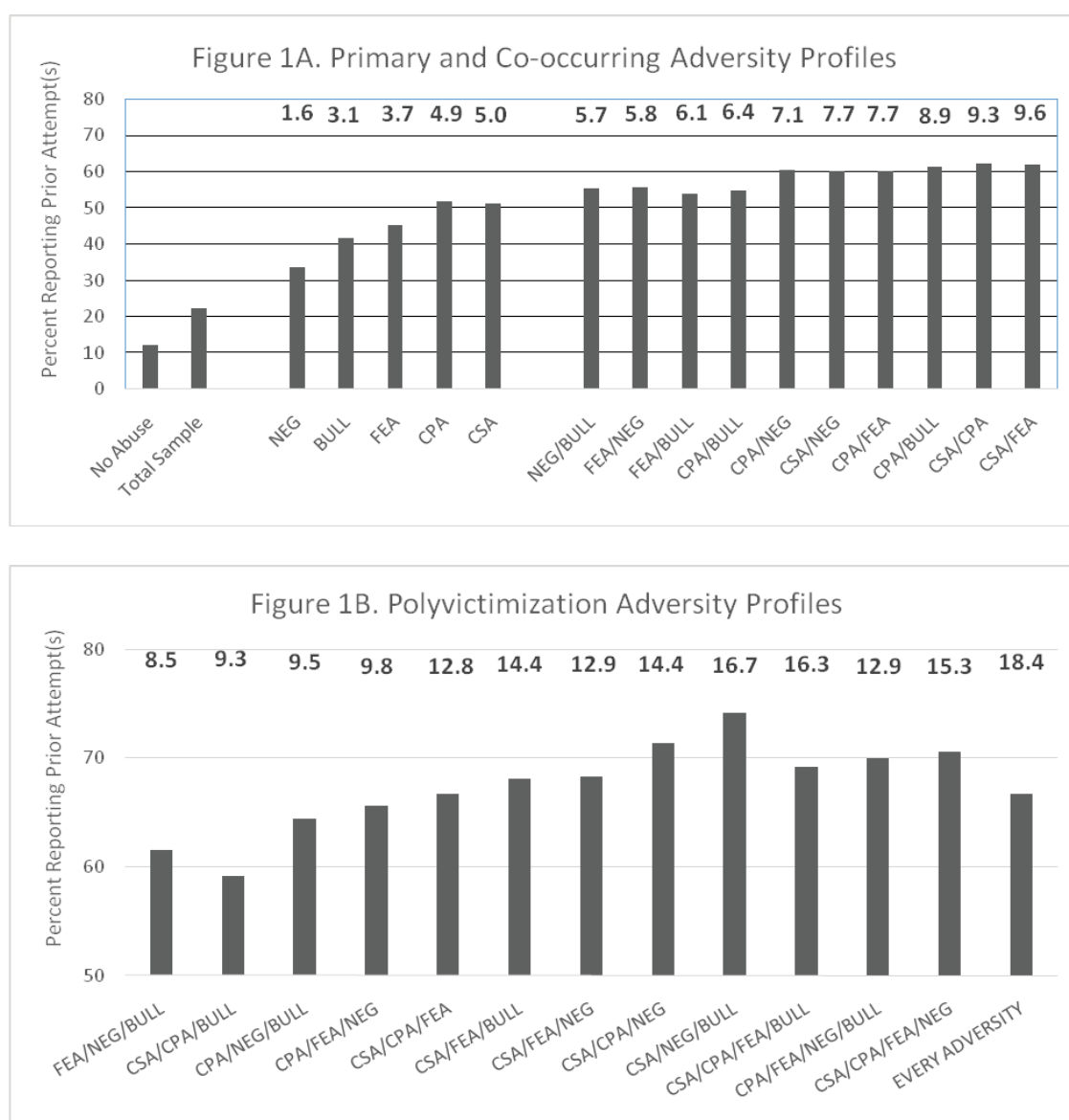


& FEA<sub>VEQ</sub>). Cell sizes for the 13 polyvictimization cohorts of Figure 1B were smaller (left to right in succession): 39, 66, 45, 61, 69, 47, 41, 49, 31, 39, 29, 34, and 18 (all five adversities). Bars indicate the percentage of each adversity cohort who reported suicide attempt(s) prior to age 17. Each adversity exposure/cluster (Figure 1) was associated with a statistically ( $p < 0.001$ ) higher frequency and odds ratio than that observed within the respective comparison group with normative classification(s). The *No Abuse* and *Total Sample* cohorts were included as additional reference points for readers.

The ACE Questionnaire count corresponded with significantly higher ( $p < 0.001$ ) frequencies of early suicide attempt(s) for every threshold (left Figure 2). These odds ratios were calculated through the contrast

of respondents above versus below the specified threshold. This same pattern was found for a count of the number of elevations ( $> 85^{\text{th}}$  percentile) on the dimensional maltreatment indices (right Figure 2). Further examination indicated that these ACE and dimensional counts were not steeply graded in their associations with the criterion measure. The difference between ACE or dimensional counts of 0 vs. 1, and 1 vs. 2, were significant ( $p < 0.001$ ), but none of the higher counts constituted a significant difference from its preceding threshold (e.g., 3 vs. 2 or 4, 4 vs. 3 or 5, 5 vs. 4 or 6, etc.).

Efforts were made to assess the extent to which sexual, physical and emotional abuse may have interacted in their linkages to suicide attempt(s) prior to



**Figure 1:** Suicide attempt(s) prior to age 17 by adversity source profile.

**Note:** CSA (CSA<sub>LONG</sub>) = Acts of childhood sexual abuse; CPA (CPA<sub>LONG</sub>) = Acts of childhood physical abuse; FEA (FEA<sub>VEQ</sub>) = Acts of family emotional abuse; NEG (NEG<sub>AE</sub>) = acts of parental neglect; BULL = Acts of physical bullying. Maltreatment classifications were dichotomized by distribution percentile (Elevated  $> 85^{\text{th}}$ ; Normative  $\leq 85^{\text{th}}$ ). No Abuse = Normative classification on all six forms of adversity; Every Adversity = Elevated risk on all six forms of adversity. Odds ratios (top of bar) for prior suicide attempt(s) were based on contrast between the maltreatment cell and remaining sample subset without the specified adversities.

**Table 2:** Binary logistic regression interaction analyses and suicide attempt(s) prior to Age 17.

Predictor	B	SE	Wald	df	p	Exp (B)
<b>Dimensional maltreatment indicators</b>						
CSA <sub>LONG</sub>	0.603	0.064	88.83	1	< 0.001	1.83
CPA <sub>LONG</sub>	0.469	0.080	34.55	1	< 0.001	1.60
FEA <sub>VEQ</sub>	0.399	0.068	34.82	1	< 0.001	1.49
CSA <sub>LONG</sub> × CPA <sub>LONG</sub>	0.216	0.046	22.14	1	< 0.001	1.19
CSA <sub>LONG</sub> × FEA <sub>VEQ</sub>	0.006	0.062	0.010	1	0.920	1.06
CPA <sub>LONG</sub> × FEA <sub>VEQ</sub>	0.096	0.052	3.40	1	0.068	1.09
CPA <sub>LONG</sub> × CPA <sub>LONG</sub> × FEA <sub>VEQ</sub>	0.029	0.028	1.06	1	0.302	1.03
Respondent age	-0.385	0.067	32.84	1	< 0.001	1.32
<b>Dichotomized maltreatment indicators</b>						
CSA <sub>LONG</sub>	1.53	0.179	73.45	1	< 0.001	4.64
CPA <sub>LONG</sub>	1.16	0.256	20.76	1	< 0.001	3.20
FEA <sub>VEQ</sub>	1.02	0.199	26.25	1	< 0.001	2.78
CSA <sub>LONG</sub> × CPA <sub>LONG</sub>	0.644	0.409	2.49	1	0.115	1.91
CSA <sub>LONG</sub> × FEA <sub>VEQ</sub>	0.676	0.444	2.31	1	0.129	1.97
CPA <sub>LONG</sub> × FEA <sub>VEQ</sub>	0.112	0.402	0.078	1	0.780	1.12
CPA <sub>LONG</sub> × CPA <sub>LONG</sub> × FEA <sub>VEQ</sub>	0.307	0.679	0.204	1	0.651	1.36
Respondent age	-0.337	0.065	26.86	1	< 0.001	1.29

**Note:** CSA<sub>LONG</sub> = Acts of childhood sexual abuse; CPA<sub>LONG</sub> = Acts of childhood physical abuse; BAT = Exposure to acts of maternal battering; FEA<sub>VEQ</sub> = Acts of family emotional abuse; NEG<sub>AE</sub> = Acts of parental neglect; BULL = Acts of physical bullying. Standardized scores used for all predictors. Maltreatment classifications were dichotomized using distribution percentile (Elevated > 85<sup>th</sup>; Normative ≤ 85<sup>th</sup>). The CSA × CPA interaction was conceptually simple (CSA↓, CPA↓, 15%, *n* = 1,615; CSA↑, CPA↓, 44%, *n* = 191; CSA↓, CPA↑, 43%, *n* = 142; CSA↑, CPA↑, 62%, *n* = 124).

age 17. Separate binary logistic regression models were tested using these three forms of childhood abuse along with their interaction terms (Table 2). These main effects did not differ markedly from those generated in the preliminary regression analyses (Table 1). A conceptually simple sexual by physical abuse interaction was found indicating that their combination was associated with higher rates than either alone (CSA↓, CPA↓, 15%, *n* = 1,615; CSA↑, CPA↓, 44%, *n* = 191; CSA↓, CPA↑, 43%, *n* = 142; CSA↑, CPA↑, 62%, *n* = 124).

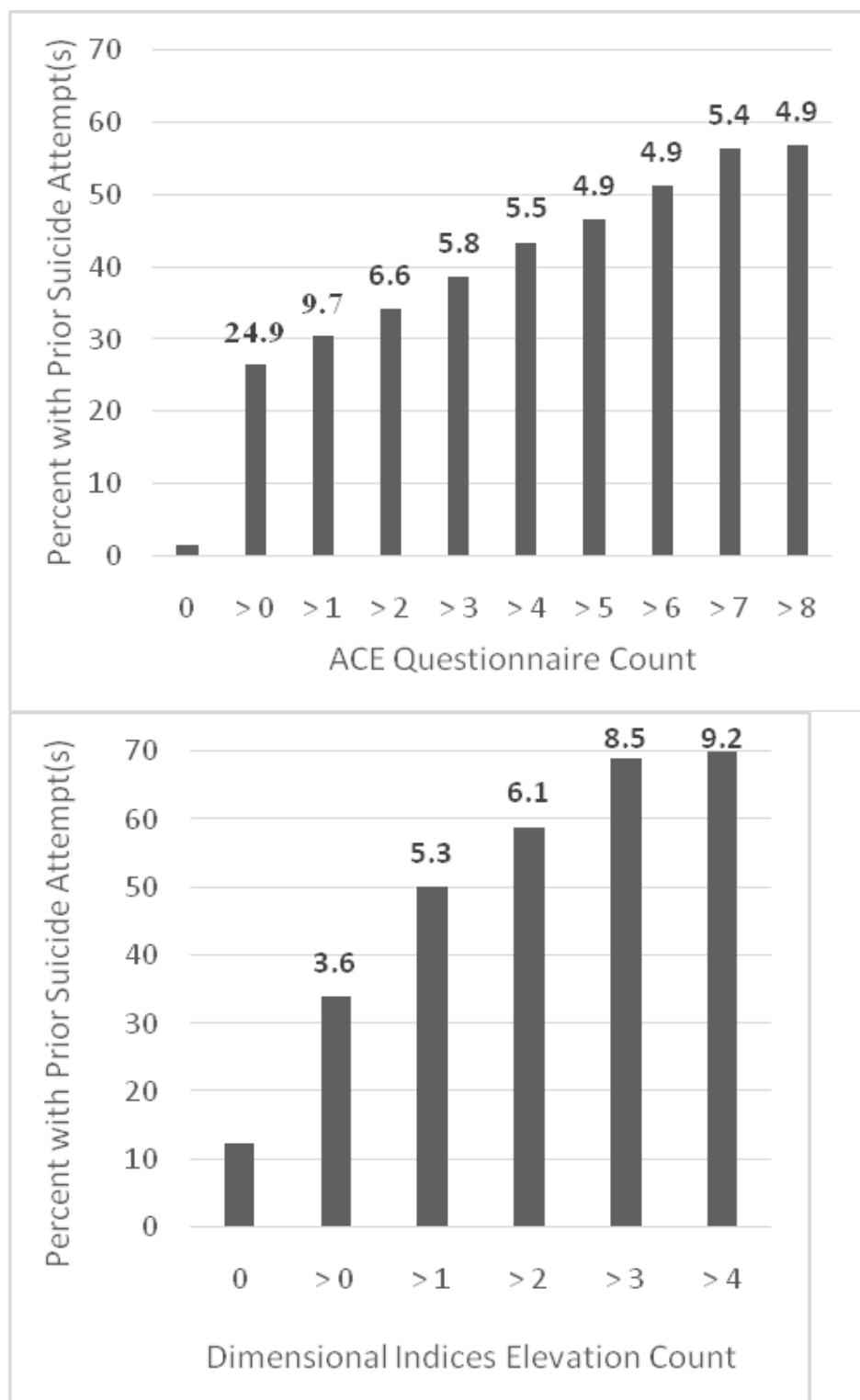
## Discussion

Suicide attempts occurring early in development pose a special concern to families with ripple effects that may extend through adulthood. Childhood maltreatment research can rely on retrospective self-reports to identify relationships between these life stressors and suicidality. Sample exclusions were made to maximize survey responses that were intentional (non random) and discriminant. A prediction was made at the outset of analysis (first hypothesis) that prior findings regarding maltreatment and suicidality would be replicated across the range of adversity clusters examined in this study. Figure 1 and Figure 2 illustrated the robustness of these relationships across adversity source. The odds ratios for the maltreatment main effects were higher than, but generally consistent with, prior meta-analytic findings [39,40]. These findings extended these nexuses to additional adversity clusters and suicide attempts

occurring during adolescence. As in prior studies, polyvictimization risks were especially pronounced with a peak for respondents reporting exposure to all five forms of childhood maltreatment (*OR* = 18.4).

The second hypothesis proposed that maltreatment sources were not equal in the risks they posed to suicide attempt(s) prior to age 17. This sample was large enough to identify respondent subsets who acknowledged unitary forms of maltreatment. These unitary subgroups provided a control for co-occurring forms of abuse. In this sample CSA, CPA and FEA posed a maximum concern regarding early suicide attempt(s) beyond the more limited associations provided with neglect, maternal battering, and/or peer bullying. An unexpected finding was the lack of association between youthful suicidality and exposure to maternal battering in regression analyses that controlled for co-occurring abuse. While associations between the witnessing of maternal battering and suicidality were significant, these impacts were largely shared with other forms of maltreatment. Unreported collateral analyses substituted the VEQ-R domestic violence subscale with the BAT index and achieved similar null results.

Higher ACE counts incremented the odds of suicide attempt(s) prior to age 17 in a graded function anticipated by prior accounts [42-44,46,47]. While these results supported the third hypothesis, the slopes between ACE counts and criterion measures may be



**Figure 2:** Suicide attempt(s) prior to age 17 by ACE (left) and Dimensional (right) elevation counts.

**Note:** Each of the nine ACE (left) and five dimensional (right) thresholds above constituted significant ( $p < 0.001$ ) suicide risk elevations in contrast to the remainder of the sample (odds ratios above bar). ACE increments were only significant for scores of 0 versus 1 ( $OR = 5.76$ ,  $p < 0.001$ ) and 1 vs. 2 ( $OR = 2.04$ ,  $p = 0.009$ ). Dimensional elevation count increments were only significant for scores of 0 vs. 1 ( $OR = 2.07$ ,  $p < 0.001$ ) and 1 vs. 2 ( $OR = 2.55$ ,  $p < 0.001$ ).

misleading. Common reference to the “graded” nature of the relationship reflects a typical finding that higher counts are associated incrementally with greater odds of the maladjustment symptom cluster. Figure 2 (left) illustrated that the value of the ACE as a risk indicator lies largely in its early count. The difference in risk between respondents with 0 versus greater than 0

was substantial. Higher counts become progressively less relevant in their incremental risk. For example, attempted suicide(s) prior to age 17 were more frequent with scores of 1 than 0 ( $OR = 5.76$ ), and 1 than 2 ( $OR = 2.04$ ), but not 2 and 3 or upper increments. These associations were larger than those reported in a Swedish prospective analysis of suicide attempts from

age 15 to 24 [47]. While odds ratios were maximized by poly adversity, early suicide risk did not appear to increment progressively by additional exposures after two co-occurring stressors. A similar slope was found in Figure 2 (right) regarding the count of dimensional maltreatment indices. Grading has been a term used in past adversity exposure count research to imprecisely suggest risks that are incremented consistently throughout the entire count range.

An important remaining question in adversity research regards the extent to which risks aggregate in an additive or interactive manner (fourth hypothesis). The ACE Questionnaire literature has suggested that the impacts are additive (graded) with discounted concern about the nature of unique adversity combinations. Dichotomized adversity counts neglect the potential impact of rich abuse interactions. The hypothesis that co-occurring CSA and CPA would pose greater hardship than their unitary effects has certain intuitive appeal. The same might be said about the risks posed of co-occurring physical abuse and exposure to maternal battering. Would not selected adversity combinations constitute qualitatively harsher phenomenological experiences that exceed their additive impact? The present sample was large enough to assess selected maltreatment interactions. These models were tested using both dimensional and categorical indicators. A single conceptually simple CSA by CPA interaction was found. Suicide risks were relatively higher for respondents reporting both forms of abuse. The unitary impacts of CSA (44%) and CPA (43%) left modest room for their interactive impact (CSA + CPA, 62%). Subsequently, weak support was found that maladjustment clusters would convey interactive effects that substantially amplified their unitary impacts. Poly adversity clusters of two or more stressors appeared to maximize the risk posed by suicide attempts prior to age 17.

The ACE Questionnaire has expanded adversity research in both medical and psychological science. ACE items are conceptualized as functionally equivalent with risks aggregating over aggregated exposures. CSA and CPA are weighed equally with other adversities such as family alcoholism or incarceration with idiosyncratic co-occurrences left largely undelineated in the literature. Attention should be given as well to the rapid rise in maladjustment risks that accompany co-occurring adversities. A strength of the metric remains in its simplicity and the inexplicable emerging finding that selected adversity-outcome combinations may not be more consequential than others. The “cost” of ACE item equivalence seems reasonable in the event that outcome variance associated with the various adversities is shared as a general factor. Replicable interaction effects in adversity research might detract from the appeal of the ACE count as a high risk indicator. Maltreatment interactions seemed limited in both their breadth and effect sizes.

## Funding Source

This project was funded by The Joyce and Aqueil Ahmad Endowment within the College of Arts & Sciences at the University of North Dakota.

## Informed Consent

This project was approved by the institutional review board of the University of North Dakota (IRB-201903-238). Informed consent was obtained from all respondents in this survey study.

## Contributor Statement

Alan King conceptualized and designed the study, carried out all analyses, reviewed and revised the manuscript, and was accountable for all aspects of work ensuring the integrity and accuracy of the manuscript as submitted.

## Declaration of Conflicting Interests

The author declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

## References

1. American Psychiatric Association (2013) Diagnostic and statistical manual of mental disorders. Arlington, VA.
2. Chen LP, Murad MH, Paras ML, Colbenson KM, Sattler AL, et al. (2010) Sexual abuse and lifetime diagnosis of psychiatric disorders: Systematic review and meta-analysis. *Mayo Clin Proc* 85: 618-629.
3. Norman RE, Byambaa M, De R, Butchart A, Scott J, et al. (2012) The long-term health consequences of child physical abuse, emotional abuse, and neglect: A systematic review and meta-analysis. *PLoS Med* 9: e1001349.
4. Fernandes V, Osório FL (2015) Are there associations between early emotional trauma and anxiety disorders? Evidence from a systematic literature review and meta-analysis. *Eur Psychiatry* 30: 756-764.
5. Dong M, Anda RF, Felitti VJ, Dube SR, Williamson DF, et al. (2004) The interrelatedness of multiple forms of childhood abuse, neglect, and household dysfunction. *Child Abuse Negl* 28: 771-784.
6. Felitti VJ, Anda RF, Nordenberg D, Williamson DF, Spitz AM, et al. (1998) Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults: The adverse childhood experiences (ACE) study. *Am J Prev Med* 14: 245-258.
7. Stevens JE (2012) Got your ACE score?
8. Hillis SD, Anda RF, Felitti VJ, Nordenberg D, Marchbanks PA (2000) Adverse childhood experiences and sexually transmitted diseases in men and women: A retrospective study. *Pediatrics* 106: E11.
9. Kalmakis KA, Chandler GE (2015) Health consequences of adverse childhood experiences: A systemic review. *J Am Assoc Nurse Pract* 27: 457-465.
10. King AR (2020) The ACE Questionnaire and lifetime physical aggression. *JAMT* 30: 1-18.
11. van der Feltz-Cornelis CM, Potters EC, van Dam A, Koorndijk RP, Elfeddali I, et al. (2019) Adverse childhood



- experiences (ACE) in outpatients with anxiety and depressive disorders and their association with psychiatric and somatic comorbidity and revictimization. Cross-sectional observational study. *JAD* 246: 458-464.
12. Finkelhor D, Dzuiba-Leatherman J (1994) Victimization of children. *Am Psychol* 49: 173-183.
  13. Finkelhor D, Ormrod RK, Turner HA (2007) Polyvictimization and trauma in a national longitudinal cohort. *Dev Psychopathol* 19: 149-166.
  14. Finkelhor D, Ormrod R, Turner H, Holt M (2009) Pathways to poly-victimization. *Child Maltreat* 14: 316-329.
  15. King AR (2021) Childhood adversity links to self-reported mood, anxiety, and stress-related disorders. *JAD* 292: 623-632.
  16. King AR (2021) PID-5 trait indicators of emotional instability and childhood adversity antecedents. *Psychol Rep* 125: 310-327.
  17. Levenson JS, Grady MD (2016) The influence of childhood trauma on sexual violence and sexual deviance in adulthood. *Traumatology* 22: 94-103.
  18. Negri S (2020) ACEs are not equal: Examining the relative impact of household dysfunction versus childhood maltreatment on mental health in adolescence. *Soc Sci Med* 245: 112696.
  19. Bright MA, Knapp C, Hinojosa MS, Alford S, Bonner B (2016) The comorbidity of physical, mental, and developmental conditions associated with childhood adversity: A population based study. *Matern Child Health J* 20: 843-853.
  20. Mersky JP, Topitzes J, Reynolds AJ (2013) Impacts of adverse childhood experiences on health, mental health, and substance use in early adulthood: A cohort study of an urban, minority sample in the US. *Child Abuse Negl* 37: 917-925.
  21. Plemmons G, Hall M, Douppnik S, Gay J, Brown C, et al. (2018) Hospitalization for suicide ideation or attempt: 2008-2015. *Pediatrics* 141: e20172426.
  22. Asarnow JR, Berk M, Zhang L, Wang P, Tang L (2017) Emergency department youth patients with suicidal ideation or attempts: Predicting suicide attempts through 18 months of follow-up. *Suicide and Life Threatening Behavior* 47: 551-566.
  23. Nock MK, Borges G, Bromet EJ, Cha CB, Kessler RC, et al. (2008) Suicide and suicidal behavior. *Epidemiol Rev* 30: 133-154.
  24. Kann L, McManus T, Harris WA, Shanklin SL, Flint KH, et al. (2018) Youth risk behavior surveillance-United States, 2017. *MMWR* 67: 1-114.
  25. Briere J, Evans D, Runtz M, Wall T (1988) Symptomatology in men who were molested as children: A comparison study. *Am J Orthopsychiatry* 58: 457-461.
  26. Devries KM, Mak JY, Child JC, Falder G, Bacchus LJ, et al. (2014) Childhood sexual abuse and suicidal behavior: A meta-analysis. *Pediatrics* 133: e1331-e1344.
  27. Fergusson DM, Boden JM, Horwood LJ (2008) Exposure to childhood sexual and physical abuse and adjustment in early adulthood. *Child Abuse Negl* 32: 607-619.
  28. Fergusson DM, Horwood LJ, Ridder EM, Beautrais AL (2005) Subthreshold depression in adolescence and mental health outcomes in adulthood. *Arch Gen Psychiatry* 62: 66-72.
  29. Joiner Jr TE, Sachs-Ericsson NJ, Wingate LR, Brown JS, Anestis MD, et al. (2007) Childhood physical and sexual abuse and lifetime number of suicide attempts: A persistent and theoretically important relationship. *Behav Res Ther* 45: 539-547.
  30. Lopez-Castroman J, Melhem N, Birmaher B, Greenhill L, Kolko D, et al. (2013) Early childhood sexual abuse increases suicidal intent. *World Psychiatry* 12: 149-154.
  31. Molnar BE, Berkman LF, Buka SL (2001) Psychopathology, childhood sexual abuse and other childhood adversities: Relative links to subsequent suicidal behaviour in the US. *Psychological Medicine* 31: 965.
  32. Paolucci EO, Genuis ML, Violato C (2001) A meta-analysis of the published research on the effects of child sexual abuse. *J Psychol* 135: 17-36.
  33. Borges G, Nock MK, Abad JMH, Hwang I, Sampson NA, et al. (2010) Twelve month prevalence of and risk factors for suicide attempts in the WHO World Mental Health Surveys. *J Clin Psychiatry* 71: 1617.
  34. Bruffaerts R, Demyttenaere K, Borges G, Haro JM, Chiu WT, et al. (2010) Childhood adversities as risk factors for onset and persistence of suicidal behaviour. *Br J Psychiatry* 197: 20-27.
  35. Brezo J, Paris J, Vitaro F, Hebert M, Tremblay RE, et al. (2008) Predicting suicide attempts in young adults with histories of childhood abuse. *Br J Psychiatry* 193: 134-139.
  36. Hoertel N, Franco S, Wall MM, Oquendo MA, Wang S, et al. (2015) Childhood maltreatment and risk of suicide attempt: A nationally representative study. *JCP* 76: 916-923.
  37. Johnson JG, Cohen P, Gould MS, Kasen S, Brown J, et al. (2002) Childhood adversities, interpersonal difficulties, and risk for suicide attempts during late adolescence and early adulthood. *Arch Gen Psychiatry* 59: 741-749.
  38. Stansfeld SA, Clark C, Smuk M, Power C, Davidson T, et al. (2017) Childhood adversity and midlife suicidal ideation. *Psychol Med* 47: 327-340.
  39. Angelakis I, Austin JL, Gooding P (2020) Association of childhood maltreatment with suicide behaviors among young people: A systematic review and meta-analysis. *JAMA Netw Open* 3: e2012563.
  40. Castellví P, Miranda-Mendizábal A, Parés-Badell O, Almenara J, Alonso I, et al. (2017) Exposure to violence, a risk for suicide in youths and young adults. Meta-analysis of longitudinal studies. *Acta psychiatr Scand* 135: 195-211.
  41. Miller AB, Esposito-Smythers C, Weismore JT, Renshaw KD (2013) The relation between child maltreatment and adolescent suicidal behavior: A systematic review and critical examination of the literature. *Clin Child Fam Psychol Rev* 16: 146-172.
  42. Corcoran P, Gallagher J, Keeley HS, Arensman E, Perry IJ (2006) Adverse childhood experiences and lifetime suicide ideation: A cross-sectional study in a non-psychiatric hospital setting. *Ir Med J* 99: 42-45.
  43. De Ravello L, Abeita J, Brown P (2008) Breaking the cycle/mending the hoop: Adverse childhood experiences among incarcerated American Indian/Alaska native women in New Mexico. *Health Care for Women International* 29: 300-315.
  44. Dube SR, Anda RF, Felitti VJ, Chapman DP, Williamson DF, et al. (2001) Childhood abuse, household dysfunction and the risk of attempted suicide throughout the life span: Findings from the Adverse Childhood Experiences Study. *JAMA* 286: 3089-3096.
  45. Ford K, Bellis MA, Hughes K, Barton ER, Newbury A (2020)

- Adverse childhood experiences: A retrospective study to understand their associations with lifetime mental health diagnosis, self-harm or suicide attempt, and current low mental wellbeing in a male Welsh prison population. *Health Justice* 8: 1-13.
46. Friestad C, Åse-Bente R, Kjelsberg E (2014) Adverse childhood experiences among women prisoners: Relationships to suicide attempts and drug abuse. *IJSP* 60: 40-46.
  47. Björkenstam C, Kosidou K, Björkenstam E (2017) Childhood adversity and risk of suicide: Cohort study of 548 721 adolescents and young adults in Sweden. *BMJ* 357.
  48. King AR, Kuhn SK, Strega C, Russell TD, Kolander T (2019) Revisiting the link between childhood sexual abuse and adult sexual aggression. *Child Abuse Negl* 94: 1-10.
  49. Littleton HL, Grills AE, Drum KB (2014) Predicting risky sexual behavior in emerging adulthood: Examination of a moderated mediation model among child sexual abuse and adult sexual assault victims. *Violence Vict* 29: 981-998.
  50. Thibodeau ME, Lavoie F, Hébert M, Blais M (2017) Childhood maltreatment and adolescent sexual risk behaviors: Unique, cumulative and interactive effects. *Child Abuse Negl* 72: 411-420.
  51. Buhrmester M, Kwang T, Gosling S (2011) Amazon's mechanical turk: A new source of inexpensive, yet high-quality, data? *PPS* 6: 3-5.
  52. Kennedy R, Clifford S, Burleigh T, Jewell R, Waggoner P, et al. (2018) The shape of and solutions to the MTurk quality crisis. *SSRN*.
  53. Paolacci G, Chandler J, Ipeirotis P (2010) Running experiments on Amazon Mechanical Turk. *JDM* 5: 411-419.
  54. Burleigh T, Kennedy R, Clifford S (2018) How to screen out VPS and international respondents using Qualtrics: A protocol. *SSRN*.
  55. United States Census Bureau (2019) U.S. Department of Commerce.
  56. Huth-Bocks AC, Kerr DC, Ivey AZ, Kramer AC, King CA (2007) Assessment of psychiatrically hospitalized suicidal adolescents: Self-report instruments as predictors of suicidal thoughts and behavior. *JAACAP* 46: 387-395.
  57. Kaplan ML, Asnis GM, Sanderson WC, Keswani L, de Lecuona JM, et al. (1994) Suicide assessment: Clinical interview vs. self-report. *J Clin Psychol* 50: 294-298.
  58. Osman A, Bagge CL, Gutierrez PM, Konick LC, Kopper BA, et al. (2001) The Suicidal Behaviors Questionnaire-Revised (SBQ-R): Validation with clinical and nonclinical samples. *Assessment* 8: 443-454.
  59. Fergusson DM, Horwood LJ, Boden JM (2011) Structural equation modeling of repeated retrospective reports of childhood maltreatment. *Int J Methods Psychiatr Res* 20: 93-104.
  60. Zarse EM, Neff MR, Yoder R, Hulvershorn L, Chambers JE, et al. (2019) The adverse childhood experiences questionnaire: Two decades of research on childhood trauma as a primary cause of adult mental illness, addiction, and medical diseases. *Cogent Medicine* 6.
  61. Petrucci K, Davis J, Berman T (2019) Adverse childhood experiences and associated health outcomes: A systematic review and meta-analysis. *Child Abuse Negl* 97: 104127.
  62. Dube SR, Williamson DF, Thompson T, Felitti VJ, Anda RF (2004) Assessing the reliability of retrospective reports of adverse childhood experiences among adult HMO members attending a primary care clinic. *Child Abuse Negl* 28: 729-737.
  63. Barnett D, Manly J, Cicchetti D (1993) Defining child maltreatment: The interface between policy and research. In: Cicchetti D, Toth SL, *Advances in applied developmental psychology: Child abuse, child development and social policy*. Ablex Publishing Corp, Norwood, NJ, 7-74.
  64. King AR, Russell TD (2017) Psychometric properties of the violent experiences questionnaire. *Child Abuse Negl* 67: 64-75.
  65. Mangold A, King AR (2020) Relationships between experiences of sibling physical abuse and lifetime aggression using statistical controls for poly-victimization. *JFV* 36: 235-247.
  66. Chou PH, Koenen KC (2019) Associations between childhood maltreatment and risk of myocardial infarction in adulthood: Results from the National Epidemiologic Survey on Alcohol and Related Conditions. *J Psychiatr Res* 116: 172-177.
  67. Berger AM, Knutson JF (1984) The assessing environments III: A questionnaire for assessing punitive and abuse-related childhood histories. University of Iowa.
  68. Gauthier L, Stollak G, Messe L, Aronoff J (1996) Recall of childhood neglect and physical abuse as differential predictors of current psychological functioning. *Child Abuse Negl* 20: 549-559.
  69. Hunt C, Peters L, Rapee RM (2012) Development of a measure of the experience of being bullied in youth. *Psychol Assess* 24: 156-165.