

## Relationship between Adverse Childhood Experiences and Resiliency among College Students

Glory Okwori

College of Public Health, East Tennessee State University, U.S.

### ABSTRACT

**Background:** Adverse childhood experiences (ACEs) are associated with negative outcomes, however, there are factors that can mitigate the effects from exposure to ACEs. This study examined the prevalence of adverse childhood experiences (ACEs), characteristics of resilient individuals and the association between ACE scores, resiliency and other factors among college students.

**Subjects and Method:** A cross-sectional survey was completed in 2018. Frequencies were calculated for the number and types of ACE experienced by participants. Bivariate relationships between characteristics of participants and resilience were examined using Chi-square tests. The independent relationship between ACE scores and resiliency factors was examined using ordinal logistic regression. The dependent variable was ACE score. An ordinal logistic regression model examined the relationship between conventional ACE scores and resilience levels and other factors.

**Results:** There were 570 study participants. Seventy-one percent of study participants had experienced at least one conventional ACE, and 98% had experienced at least one expanded ACE. Individuals with high resilience had lower

conventional ACE scores and better health. Females (OR= 1.67; 95% CI= 1.14 to 2.45) were more likely to have higher conventional ACE scores. Participants living in suburban areas compared to rural areas (OR= 0.61; 95% CI: 0.43 to 0.85), and children raised with both parents compared to single parents (OR= 0.17; 95% CI= 0.12 to 0.25) were less likely to have higher conventional ACE scores. Gender (OR= 0.54; 95% CI= 0.35 to 0.82) and general health status (OR= 1.50; 95% CI= 1.05 to 2.13) were the only significant predictors of the expanded ACE scores.

**Conclusion:** Findings identify important resilient traits such as relationships, self-control, internal beliefs, and initiative, as well as asportray the high prevalence of ACEs and the importance of resilience as a protective factor in reducing ACEs.

**Keywords:** adverse childhood experiences, resilience, mitigate

**Correspondence:**

Glory Okwori. East Tennessee State University. 1276 Gilbreath Dr., Box 70300, Johnson City, TN. Email: okwori@etsu.edu.

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### BACKGROUND

Adverse Childhood Experiences (ACEs) are complex population health issues with notable detrimental outcomes. The seminal study by Felitti and Anda defined ACEs as 10 types of childhood abuse, neglect and family dysfunction or exposure to toxic stress occurring before age 18 (Felitti *et al.*, 1998). ACEs can alter the body chemistry of

children and alter the brain structure. Prolonged exposure to stress from ACEs may lead to recurring abnormal regulation of the autonomic nervous system and the stress response system and to persistent increases in inflammatory response (Anda *et al.*, 1999; Dube *et al.*, 2002, 2003). This can cause impaired decision making, loss of

memory, learning difficulties and behavioral problems (Shonkoff *et al.*, 2012).

The original ACE study found linkages between ACEs and depression, alcoholism, smoking, drug abuse, heart disease and obesity (Anda et al., 1999; Dube et al., 2002, 2003). The rates of dropout from school and poverty were significantly higher for individuals with three or more ACEs (Brogden and Gregory, 2019). Individuals are also more vulnerable to serious conditions later in life, and the sequelae of ACEs occur in adulthood (Felitti et al., 1998; Danese et al., 2009; Fuller-Thomson and Brennenstuhl, 2009). Also, ACEs have been linked to decreased health-related quality of life (HRQOL) and increased utilization of healthcare services (Edwards et al., 2007).

Some limitations of the original study by Anda and Felitti have been identified as follows: the narrow operationalization of the ACE measure does not adequately represent the social distribution of adversities, the misrepresentation of adversities across childhood by highlighting adult outcomes, and failure to include protective measures. Thus, it was stated that future research should take account of these limitations in order to fully comprehend how protective measures, social context and adversity interact to affect behavior and health (McEwen and Gregerson, 2019).

Although the consequences of ACEs may seem disparaging, there are protective factors that can help to increase resiliency and reduce the effects of exposure to ACEs. Conditions of chronic stress lead to an accumulation of toxic stress when protective factors are weak or lacking which can negatively affect children's development and consequently their life trajectories (Center on the Developing Child at Harvard University, 2016). Protective factors, especially supportive relationships and caring

adults, are imperative in counterbalancing the negative effects of ACEs (National Scientific Council on the Developing Child, 2015). Despite extreme stressors, resilient individuals are able to recover and function well at school and work. Research examining the impact of resilience on children exposed to traumatic or adverse events is limited (Gartland *et al.*, 2019). Future studies on protective factors such as resilience on survivors of childhood trauma are needed to understand the impact of these adverse events and provide understanding into how to improve functioning for individuals (Howell and Miller-Graff, 2014).

To fully understand the pathways through which childhood adversity occurs, ACEs must be correctly classified among multiple contexts. In a study by Cronholm et al., the authors noted that relying on the conventional ACEs as defined by the seminal ACE study would have underrepresented the prevalence of ACEs, and the study helped to identify additional ACEs to incorporate the interplay among personal, family and community factors (Cronholm *et al.*, 2015).

Research on ACEs has emphasized that adult community samples and studies using younger populations are needed to depict causal mechanisms in the association between ACEs and long-term outcomes. Hence, research on college students can expand studies on the ACEs pathway into younger years and evaluate a population with unique needs and characteristics (Khrapatina and Berman, 2017; Arnett, 2019). Furthermore, the relationship between resilience and self-rated health has not been adequately studied and exploring this relationship for individuals who have experienced ACEs will link ACEs, resilience and health throughout the lifespan (Pérez-Zepeda *et al.*, 2016). The objectives of this study are to examine the characteristics

associated with resiliency and the relationship between ACE scores, resiliency and health measures among university students.

## SUBJECTS AND METHOD

### 1. Study Design

This study utilized a cross-sectional survey designed to assess ACEs, resilience and health status at East Tennessee State University (ETSU). The data were collected through electronic surveys programmed through Checkbox software. The ACEs and resilience survey was created from existing, validated surveys including the Centers for Disease and Control and Prevention (CDC) – Kaiser ACE study, Philadelphia ACE study and health status questions from the CDC HRQOL module, as well as the Devereux Adult Resilience Survey (DARS). The survey took about 20 minutes to complete.

### 2. Population and Sample

This study surveyed students (aged  $\geq 18$  years) at ETSU during the fall semester of 2018. The survey was advertised via email communicated through the ETSU Vice-President's office and participants were recruited through the email. ETSU is a mid-sized, regional university whose mission involves educating rural, first-generation college students and the underserved.

### 3. Study Variables

The outcome variable in this study was the total ACE score. The independent variable and protective factor in this study was resilience. Additional variables examined included HRQOL questions related to self-rated health such as general health status, physical unhealthy days, mental unhealthy days, and painful days that impeded one's ability to function. Other variables included gender, residence, family structure and employment.

### 4. Operational Definition of Variables

Participants received 1 point per question if they responded yes to the ACE questions. The aggregate ACE separate scores were calculated as the sum of "yes" responses across the questions that pertain to the conventional ACE scale (10 questions) and the expanded ACE scale (5 questions), respectively. ACE scores were categorized utilizing traditional Kaiser coding: 0 Conventional ACEs, 1–3 Conventional ACEs, and  $\geq 4$  Conventional ACEs. Expanded ACE scores had the following categories: 0 Expanded ACEs, 1–2 Expanded ACEs, and  $\geq 3$  Expanded ACEs (Cronholm *et al.*, 2015). The ACE scale has been shown to have good test reliability and retrospective reporting (Dube *et al.*, 2004).

The questions regarding resilience were dichotomized reflecting whether or not individuals had these characteristics, and 1 point was awarded for each affirmative response. The maximum total score overall was 23 points. Resiliency was categorized as low ( $< 18$ ) versus high ( $\geq 18$ ) resilience. This was based on comparing scoring for other ACEs resiliency scales which showed an 80% or higher as indicating high resilience since scoring was not provided for DARS (Smith *et al.*, 2013; Young-Wolff *et al.*, 2019).

General health status was defined by asking participants whether their overall health was excellent, very good, good, fair or poor. Physical unhealthy days and mental unhealthy days were defined by asking participants how many days during the past month was their physical health or mental health bad which was categorized as either none or 1 or more days. Painful days were defined by asking participants how many days during the past month did pain make it difficult to perform their usual activities which was dichotomized to reflect

whether or not participants experienced 1 or more painful days.

Family structure was operationalized as a dichotomous variable reflecting whether or not children lived with a single parent or more than one parent. Employment was operationalized as a dichotomous variable reflecting whether or not students worked for more than or less than 20 hours a week.

### 5. Study instrument

The original (conventional) ACE study questionnaire consisted of 10 yes/no questions about adverse childhood experiences before age 18 and included 10 total categories: 3 categories of abuse (physical, emotional and sexual), 2 categories of neglect (physical and emotional) and 5 categories of family and household dysfunction (parental separation, incarceration, substance abuse, mental illness and battered mother) (Dube *et al.*, 2001). The expanded ACE scale includes questions on community-level adversity (witnessing violence, discrimination, bullying, foster care and adverse neighborhood experience) (Cronholm *et al.*, 2015).

Resilience was measured using a 23-item scale known as the DARS consisting of four subscales. This survey assesses the following domains: relationships, internal beliefs, initiative and self-control. The DARS has shown adequate psychometric properties such as adequate convergent validity and internal consistency (Ball and Mackrain, 2008). In the current study, Cronbach's alpha for the DARS was 0.86. Total scoring is usually not provided, and there are no suggested guidelines. The purpose of the DARS is to provide knowledge on areas of personal strengths and need (Mackrain, 2013). Thus, each of the subscales were also analyzed to provide more specific information.

### 6. Data Analysis

Descriptive summaries of ACE scores and types of ACEs were generated. Key characteristics of high resilient study participants were examined. Pearson's chi-square tests or Fisher's exact tests were utilized for categorical variables. Univariate ordinal logistic regression was used to examine the independent relationship between total ACE scores, resiliency, health measures and certain demographic characteristics since the dependent variable was classified according to the order of its magnitude. An ordinal logistic regression model was constructed to evaluate the relationship between total resilience and total conventional ACE scores after controlling for health measures and sociodemographic characteristics. The most widely used ordinal logistic regression model in biomedical and epidemiological practice is the proportional odds model (Ananth and Kleinbaum DG, 1997). Assumptions testing was conducted, and a partial proportional odds model was used (Lall *et al.*, 2002; O'Connell, 2011). Thus, all covariates in the model had a proportional odds structure except for general health status which had a different parameter for each response function.

Data from three participants were excluded because over 40% of items were left unanswered. Analyses were conducted on complete cases considering the fact that a missing rate of less than 5% is inconsequential and analysis is less likely to be biased when less than 10% of the data are missing (Schafer, 1999; El-Masri and Fox-Wasylyshyn, 2005). All analyses were conducted using SAS (Version 9.4. SAS Institute Inc., Cary, NC, USA).

### 7. Research Ethics

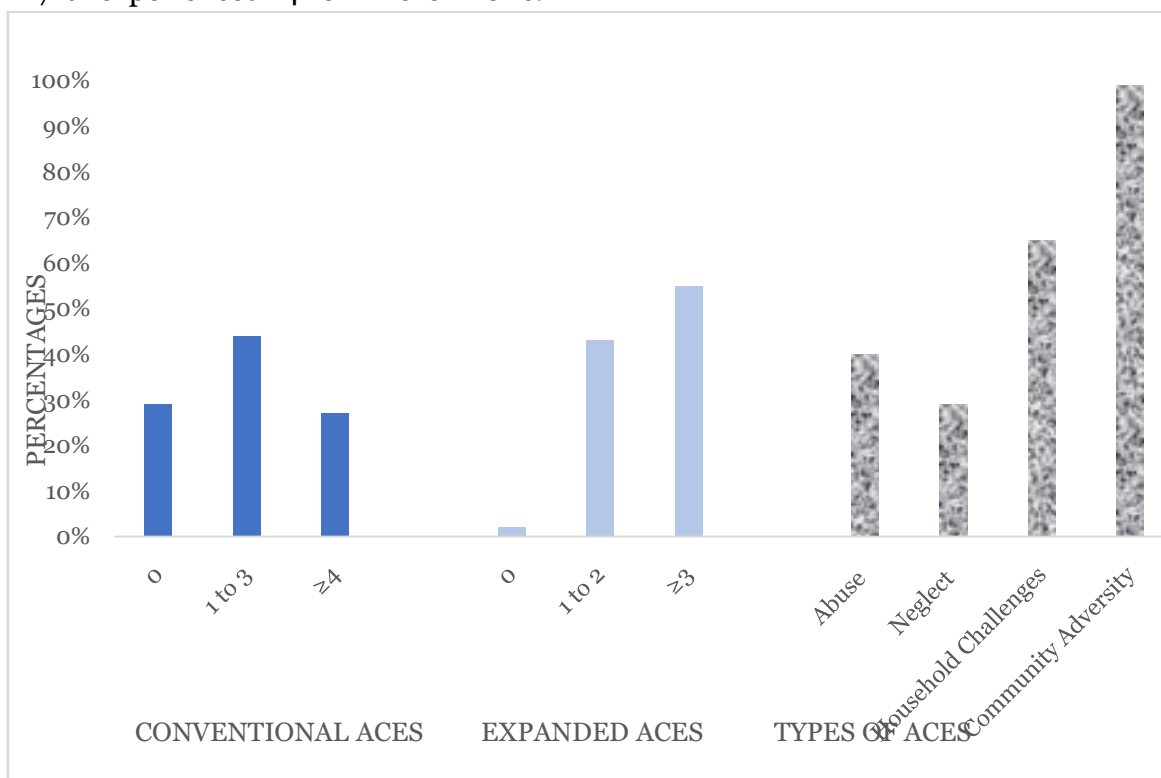
The study was reviewed and approved by the ETSU Institutional Review Board and the approval letter was obtained from the

research ethics committee in August 2018. Informed consent was received from all study participants.

## RESULTS

Summaries of total ACE scores as well as the types of ACEs are presented in figure 1. Of the 570 participants in the study sample, less than one third (29%) reported no experience with conventional ACEs. Less than half (44%) of respondents experienced between one and three conventional ACEs and 27% experienced 4 or more ACEs.

Approximately 2% of participants reported no experience with expanded ACEs and over half (55%) of the sample experienced 3 or more expanded ACEs. The least common type of ACEs was neglect (29%) while almost all participants had experienced at least one adversity in their community (99%). Forty percent of participants had experienced at least one form of abuse, and approximately 65% of participants had experienced one form of adversity within their household.



**Figure 1. Prevalence of ACES**

Approximately 40% of the study sample had high resilience and 60% had low resilience (Table 1). Seventy-seven percent of highly resilient individuals were females while seventy-two percent of low resilient individuals were females ( $p=0.010$ ). Among highly resilient individuals, 75% grew up with more than one parent and 25% grew up in single-parent homes, while among low resilient individuals, 66%

grew up with more than one parent and 33% grew up in single-parent homes ( $p=0.011$ ).

Among highly resilient individuals, 42% had zero conventional ACE scores, 40% had conventional ACE scores between 1 and 3 and 18% had conventional ACE scores greater than 4, while among individuals with low resilience, 21% had zero conventional ACE scores, 47% had

conventional ACE scores between 1 and 3 and 31% had conventional ACE scores greater than 4 (p<0.001). Although not significant, 43% of study participants had

expanded ACE scores between 1 and 2 and 56% had expanded ACE scores greater than 3 (p= 0.974).

**Table 1. Characteristics of high resilient vs low resilient individuals**

	Overall Resilience Level		Total (N%)	p
	Low	High		
	N=344 (60.4%)	N=226 (39.7%)	N= 570	
<b>Demographics</b>				
<b>Gender</b>				0.010
Male	72(21.3)	52 (23.0)	124 (22.0)	
Female	243(71.9)	173 (76.6)	416 (73.8)	
<b>Residence of childhood</b>				0.398
Urban	41(12.2)	29 (12.9)	70 (12.5)	
Sub urban	133 (39.6)	78(34.7)	211 (37.6)	
Rural	162(48.2)	118 (52.4)	280 (49.9)	
<b>Other characteristics</b>				
<b>Family Structure</b>				0.011
Two parents	226 (65.7)	169 (74.8)	395(69.3)	
One parent	112 (32.6)	57 (25.2)	169 (29.7)	
<b>Employment</b>				0.756
Full Time	125 (36.3)	95 (42.0)	220 (38.6)	
Part Time	118 (34.3)	71 (31.4)	189 (33.2)	
None	95 (27.6)	60 (26.6)	155 (27.2)	
<b>Conventional ACEs Score</b>				<0.001
0	65 (21.2)	93 (41.9)	158(29.9)	
1-3	145 (47.4)	88(39.6)	233(44.1)	
≥4	96 (31.4)	41 (18.5)	137 (26.0)	
<b>Expanded ACEs</b>				0.974
0	1 (0.3)	1 (0.5)	2(0.4)	
1-2	132 (43.1)	96 (43.2)	228 (43.2)	
≥3	173 (56.5)	125 (56.3)	298 (56.4)	
<b>Health Measures</b>				
<b>General Health</b>				<0.001
Excellent/Very Good	158(45.9)	164 (72.6)	322 (56.5)	
Good	118 (34.3)	54 (23.9)	172 (30.2)	
Fair/Poor	58 (16.9)	8 (3.5)	66 (11.6)	
<b>Physical Unhealthy Days</b>				0.001
None	219 (65.6)	178 (78.8)	397 (70.9)	
1/more days	115 (34.4)	48 (21.2)	163 (29.1)	
<b>Mental Unhealthy Days</b>				<0.001
None	64 (19.3)	105(46.9)	169 (30.4)	
1/more days	268 (80.7)	119 (53.1)	387 (69.6)	
<b>Painful Days</b>				0.034
None	248 (73.8)	183 (81.0)	431 (76.7)	
1/more days	88 (26.2)	43(19.0)	131 (23.3)	

Among highly resilient individuals, 73% reported excellent or very good general health and 4% reported poor general

health, while among individuals with low resilience, 46% reported excellent or very good general health and 17% reported poor

general health ( $p < 0.001$ ). Among high resilient individuals, approximately 79% reported zero days of not having good physical health within the past 30 days compared to 66% of individuals with low resilience ( $p = 0.001$ ). High resilient individuals reported having a higher number of zero days of not having good mental health within the past 30 days than low resilient individuals (47% vs 19%, respectively,  $p < 0.001$ ). High resilient individuals reported lesser number of days where pain made it difficult to perform their usual activities compared to low-resilience individuals (19% vs 26%, respectively,  $p = 0.034$ )

Findings from the bivariate ordinal regression analysis are shown in Table 2. The total conventional ACEs score were examined first. For individuals with a low resilience score overall, the odds of an ACE score greater than 4 versus between 1 and 3 are 2.38 greater when compared to individuals with high resilience. The same increase is found between the categories of having an ACE score between 1 and 3 and an ACE score of 0. Examining the subscales of the DARS survey revealed similar

significant positive associations for low resilient individuals within the relationship, internal beliefs, initiative and self-control scales. Females were more likely to have higher conventional ACE scores than males. Individuals who grew up in suburban regions were less likely to have high ACE scores compared to individuals who grew up in rural regions. Individuals who grew up with 2 parents were 83% less likely to have high ACE scores compared to individuals who grew up with single parents.

For individuals whose general health was not excellent or very good, the odds of greater than 4 ACEs versus 1-3 ACEs are 3 times greater (Table 2). Likewise, the odds of having an ACE score between 1 and 3 versus 0 are 3 times greater. Physical unhealthy days, mental unhealthy days and painful days were also positively associated with higher ACE scores. Furthermore, the expanded ACEs scores were examined next in the bivariate analyses. Female individuals and general health status showed significant associations with expanded ACE scores.

**Table 2. Binary ordinal logistic regression of total ACE scores**

	Conventional ACEs Score OR (95% CI)	Expanded ACEs Score p	OR (95% CI)	p
<b>Resilience</b>				
Overall Resilience	2.38 (1.71-3.31)	<0.001	1.01(0.71-1.43)	0.948
Relationship Resilience	2.02(1.46-2.82)	<0.001	0.99 (0.70-1.41)	0.975
Internal Beliefs		<0.001		0.600
Resilience	2.11 (1.53-2.92)		0.91(0.65-1.29)	
Initiative Resilience	1.72 (1.23-2.40)	<0.001	1.04(0.73-1.48)	0.850
Self-Control Resilience	2.47 (1.67-3.64)	<0.001	1.41 (0.94-2.12)	0.095
<b>Sociodemographic</b>				
Gender	1.67(1.14-2.45)	0.010	0.54 (0.35-0.82)	0.004
Urban Residence	1.26 (0.75-2.13)	0.383	0.67 (0.38-1.18)	0.164
Sub urban Residence	0.61 (0.43-0.85)	0.004	1.29 (0.89-1.87)	0.179
Family Structure	0.17(0.12-0.25)	<0.001	1.34 (0.92-1.96)	0.129
Employment	1.17(0.79-1.73)	0.437	1.33 (0.87-2.03)	0.191
<b>Health Measures</b>				
General Health	3.07 (2.19-4.29)	<0.001	1.50 (1.05-2.13)	0.024
Physical Unhealthy Days	1.62 (1.14-2.30)	0.010	1.46(1.00-2.15)	0.053
Mental Unhealthy Days	2.62 (1.84-3.72)	<0.001	1.35 (0.93-1.95)	0.115
Painful Days	2.25 (1.53-3.31)	<0.001	1.41 (0.92-2.14)	0.112

The adjusted ordinal regression analyses are presented for the conventional ACE scores in table 3. Individuals with low resilience were 73% more likely to have an ACE score of 4 or higher versus 1-3 after accounting for other characteristics. Likewise, the same increase is expected when comparing an ACE score of 0 versus 1-3. The results from these analyses showed that higher total conventional ACE score remained positively associated with the following factors: gender (AOR=1.50, 95%

CI= 1.01, 2.25), mental unhealthy days (AOR=1.76, 95% CI= 1.18, 2.62) and painful days AOR= 1.76, 95% CI= 1.15, 2.69). Suburban residence and having both parents remained negatively associated with ACE score. Individuals whose health were not excellent or very good were 3 times more likely to have an ACE score greater than 4 or between 1 and 3 compared to an ACE score of 0 given that other variables in the model are held constant.

**Table 3. Multivariate regression analyses based on total conventional ACE scores**

	<b>Conventional ACEs Score</b>	
	<b>Adjusted OR (95% CI)<sup>a</sup></b>	<b>P</b>
<b>Resilience</b>		
Overall Resilience	1.73 (1.20-2.50)	0.003
<b>Sociodemographic</b>		
Gender	1.50(1.01-2.25)	0.047
Urban Residence	1.32 (0.75-2.31)	0.337
Suburban Residence	0.56 (0.39-0.81)	0.002
Family Structure	0.16(0.11-0.24)	<0.001
<b>Health Measures</b>		
General Health (1 <sup>st</sup> response function)	1.62(1.02-2.56)	0.041
General Health (2 <sup>nd</sup> response function)	3.35 (2.06-5.44)	<0.001
Mental Unhealthy Days	1.76 (1.18-2.62)	0.005
Painful Days	1.76 (1.15-2.69)	0.010

<sup>a</sup> The multivariable model controlled for total resilience (low vs high), gender (female vs male), residence (reference: rural), family structure ( 2 vs 1 parent), general health (reference: not excellent/very good), mental unhealthy days (1 or more days vs none), painful days (1 or more days vs none).

## DISCUSSION

This study examined the prevalence of (ACEs) and its relationship with resilience, health and certain sociodemographic characteristics among college students. Exposure to at least one conventional ACE was reported by 71% of study participants compared to 52% in the original study (Felitti *et al.*, 1998). 98% of study participants experienced adversities related to expanded ACEs alone and these findings would have gone unrecognized if conventional ACEs were examined exclusively. Other authors have noted that it would be beneficial to include the expanded ACE

measures (Cronholm *et al.*, 2015; Crouch *et al.*, 2018). These data are relevant as author contemplate elaborating the conventional ACE measurement to improve its capacity to capture other adversities.

The finding that exposure to ACEs in this study was higher compared to studies on adult community samples is unique. A potential explanation is the fact that younger respondents who have left their childhood homes recently can recall their ACEs better than older adults (Khrapatina and Berman, 2017). Also, similar rates of ACEs in the original study are still being found by recent research on adult parti-



cipants in the community (Centers for Disease Control and Prevention, 2010; Felitti and Anda, 2010). Further research on the types of ACEs among college students should be explored to improve understanding as this study mainly examined ACE scores.

The results show that there is an inverse relationship between low resilience and high ACE scores and the impact of ACEs on future outcomes may vary by resilience. The coping skills and strengths that such individuals possess can help them overcome traumatic experiences. Authors have highlighted protective factors related to positive adaption to include individual abilities, sense of belonging and a protective community (Narayan et al., 2018). Key elements of resiliency as reflected by the DARS scale included secure attachments to other individuals that involve emotional support and encouragement, control of one's thoughts, self-efficacy, effective decision making, and the ability to make positive choices and appropriately express one's feelings. Other authors have identified similar traits of resiliency such as high self-esteem, optimism, internal locus of control, determination, cognitive reappraisal and flexibility, and social competence (Bellis et al., 2018).

Individuals with low self-control resiliency had the greatest odds of higher conventional ACE scores. This refers to one's ability to regulate emotions and express them using appropriate actions. Although children react differently to adversity, children exposed to ACEs are likely to have problems with self-regulation, focusing and interpersonal interactions. A study discovered that resilience, defined as self-control when faced with a challenge, reduced the impact of ACEs on poor school performance and grade repetition (Bethell et al., 2014).

An important aspect of social and emotional competency is learning how to recognize, regulate and express one's feelings in a healthy way. Children experience and express their emotions starting from early infancy, however assistance from an adult who is sensitive and responsive is helpful to help the child become aware of such feelings and control them. Infants who are able to recognize and express their emotions as well as develop self-regulation are better able to control their behavior as they grow older and self-regulation is associated with better resilience, coping and stress management when faced with adversity (Murray et al., 2016).

It can sometimes be difficult for children to control their feelings; however, they can learn to express such feelings in positive ways and control actions that result from such feelings. When young kids are not given the opportunity to have their emotions acknowledged or express such feelings without the fear of being punished, it becomes difficult for them to gain a sense of security and a good sense of themselves. Children need adults to support their feelings by instructing them regarding labels for feelings, acknowledging their feelings and helping them to express such emotions in appropriate ways. Particular attention is imperative to help children identify, manage and express conflicting emotions for children who may have experienced significant trauma.

The internal beliefs skills as measured by the DARS refer to the thoughts about our lives. Positive appraisal skills and expectations have been shown to be associated with resilience (Traub and Boynton-Jarrett, 2017). Executive function refers to a set of skills that are similar to the components measured by the DARS scale such as internal beliefs, initiative and self-control. These skills underlie the capacity to meet

goals, plan ahead, display self-control, follow directions, and stay focused despite interruption. Researchers have identified strong executive function to predict resilience and early childhood adversity is associated with low levels of executive function. Davidovich et al. (2016) found fewer depressive symptoms in children with improved executive function that were exposed to ACEs. Executive functioning in children can be improved with educational methods such as computer training programs and mindfulness training (Traub and Boynton-Jarrett, 2017).

Masten's framework of resilience as well as other ecological perspectives have included the community as a major component of resilience or developmental adaptation (Masten and Tellegen, 2012). An improved understanding of how socio-ecological resilience can mitigate the programs for individuals with high ACE scores may help to create approaches that allow for greater precision in determining the level of risk in individuals with high ACE scores (Masten and Tellegen, 2012; Narayan *et al.*, 2018). It may also have helped to see how such measures of resilience correlated with the expanded ACE score which measured community level adversity. However, in this sample, many factors that were significant for the conventional ACEs were not significant for the expanded ACEs. This could be due to the fact that majority of the study population were whites. It has been argued that certain demographic groups are more associated with expanded ACEs but not the conventional ACEs since the conventional ACEs measures were originally developed for and measured within a predominantly white population (Cronholm et al., 2015). Future work should include community level measures of resilience and explore differences in exposure to ACEs between

college attendees and those who do not attend college.

The need for young individuals to acquire education beyond high school has been largely emphasized. This continued involvement in educational training allows emerging adults to widen their social connections to groups different from their families of origin which creates new ways of living and encourages students to focus on developing unique skills (Arnett, 2019). For ACE survivors, college may be an opportunity to be distant from families that could have been sources of their adverse experiences which could explain why many factors were more significant for the conventional ACE scale than the expanded ACE scale. Thus, students are provided with more opportunities to improve their adaptive functioning or resiliency.

It would have been expected that ACEs would be higher in a rural area due to the unique health barriers rural resident experience. Researchers found that exposure to ACEs was prevalent among rural adults and ACEs were more likely to co-occur in rural areas and it is possible that there would be an elevated risk of ACEs compared to urban areas, although there is limited evidence regarding urban-rural differences (Belanger *et al.*, 2018). Although not significant, the data suggested that urban residents were more likely to have ACEs compared to rural residents (OR= 1.26, 95% CI= 0.75, 2.13). Other studies found that rural residents were less likely to experience ACEs or showed similar odds to urban residents (Talbot, Szlosek and Ziller, no date; Chanlongbutra, Singh and Mueller, 2018). However, this study showed that individuals in rural regions were more likely to have ACEs compared to suburban regions. Future studies should examine the multilevel urban/rural

spectrum in order to provide a better perspective of the urban/rural experiences.

This study showed that individuals with more than one parent had high resilience and lower odds of high ACE scores. Research has shown that ACEs are more common among children without parental care (Bramlett and Radel, 2014). This shows that a stable home environment and frequent interaction with parents as well as positive family functioning can serve as protective factors. This supports the case for expanding resources to children from at-risk families. Family functioning has shown to be a protective factor against mental health concerns and neighborhood violence as well as other unfavorable outcomes for children exposed to ACEs (Fan and Chen, 2012; Balistreri and Alvira-Hammond, 2016).

The results also imply that screening for ACEs can help to identify students who have high risk for deterioration in physical and mental health. Self-rated health has repeatedly shown to be a valid marker of objective health which can predict physical activity, cognitive capacity, health care expenditure, morbidity and mortality (Pérez-Zepeda *et al.*, 2016). Resilience was defined in a different study as good physical and mental health despite the consequences of early adversity (Liu *et al.*, 2020)

The cross-sectional nature of this study while unique and convenient prevents assessment of causality. Respondents may have misinterpreted survey questions due to the use of self-reported data although the ACE scale has shown good retrospective reporting and improved recall for younger participants as previously stated (Dube *et al.*, 2004; Khrapatina and Berman, 2017). The resiliency scale did not capture community level measures of resilience, although in this study, non-resilience factors were not significantly asso-

ciated with the expanded ACE score which measured community level adversity. The HRQOL measures could not be measured on a continuous scale due to the nature of reported data although the responses enabled a meaningful categorization. Nonetheless, the findings of this study provide additional knowledge for continued work.

Improving resiliency in young adults who have been exposed to ACEs can help to mitigate the effect of ACEs and assist them to recover, thereby promoting healthier and more productive lives. ACEs possess such a deep-seeded effect on individuals and families which can produce a ripple effect that extends to the community and cause intergenerational dysfunction. Addressing various forms of trauma will enable individuals who have experienced ACEs to succeed and break the inter-generational cycle.

Building the personal attributes of children related to resiliency such as self-regulation, self-efficacy, executive functioning, stable relationships, environmental factors and social competency, can provide protective effects against the adverse effects of ACEs. Identifying, understanding and fostering protective school, home and community factors can help to reduce the impact of ACEs. Policies and programs are needed to train service providers and educators on resilience. This can help to decrease the effect of trauma on the life course and impact young individuals at such a critical phase of development as they transition into adulthood.

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Author was responsible for all research.

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## CONFLICT OF INTEREST

There are no conflicts of interest.

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