The Role of Individual and Community Level Social and Cultural Connectedness in Modifying the Effect of Childhood Adversity on Anxiety and Depression in American Indian College Students

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Abstract

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Background: While causes of anxiety and depression are multifactorial, chronic and acute stress experiences play an important role. Adverse Childhood Experiences (ACEs), are sources of childhood stress for which a dose-response relationship with anxiety and depression symptoms across the lifespan has been well established. American Indian and Alaskan Natives (AIANs) experience significantly more ACEs compared to whites; and depression and anxiety symptoms at similar or higher rates compared to the general U.S. population. AIAN families endure a disproportionately high burden of social, cultural, and economic stressors associated with poor health; largely attributable to a history of attempted genocide, forced assimilation, and resulting historical trauma. Despite this, AIANs have demonstrated resilience and strength in surviving and overcoming adversity, both individually and collectively. An important priority for health research is to identify, describe, and document AIAN resiliency factors and the ways they buffer against adverse biological and psychosocial effects of stressors. This study uses an indigenist stress-coping framework to examine how individual and community level social and cultural connectedness factors protect against symptoms of depressive and anxiety disorders in AIAN college students with a history of childhood adversity.

Methods: This study is a secondary analysis of data collected in collaboration with Tribal Colleges and Universities across the US using Community Based Participatory Research (CBPR) methods. Our study data from AIAN college students was drawn from a convenience sample of 14 TCUs (N = 1,143). Descriptive statistics are presented. Bivariate correlations of ACEs, anxiety, depression, and five social and cultural connectedness measures at the individual-level (social support, ethnic identity, participation in Tribal practices, and perception of Tribal community fit) and two at the college community-level (opportunities for student communication and availability of cultural events) are assessed. Multivariable logistic regression models were used to examine associations of ACEs with anxiety and depression. To evaluate moderation by social and cultural connectedness factors, we added interaction terms containing the ACEs variable and each binary indicator of social and cultural connectedness.

Results: In this study sample, 14.7% of respondents reported elevated depression symptoms and 12.3% of respondents reported elevated anxiety. For each unit increase of ACEs, the odds of having depression increased by 19% (OR = 1.19; 95% CI: 1.14-1.24), and the odds of having anxiety increased by 20% (OR= 1.20; 95% CI: 1.16-1.25). Of the seven social and cultural connectedness measures tested, only emotional and instrumental social support factors were significantly associated with mental health outcomes ($p<0.001$). No interaction terms were statistically significant. Thus, we did not find evidence for moderation of the association between ACEs and mental health by social and cultural connectedness factors.

Conclusions: Our results indicate that exposure to ACEs adversely affects the mental wellbeing of AIAN college students. This finding that is consistent with existing research. Our hypothesis that the association between ACES and depression and anxiety would be weaker among AIAN college students who reported high levels of social and cultural connectedness was not supported by the results. However, social support displayed a strong independent association with mental health of AIAN college students in our sample. This study adds to the body of evidence on adverse effects of childhood trauma and provides evidence that fostering social support among AIAN college students promotes mental wellbeing for students with and without a history of childhood adversity. More research should be done to explore the connection between social and cultural connectedness and mental wellbeing in AIAN communities.

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Introduction

Major depression and anxiety disorders are leading causes of disability worldwide.[1] While there is legitimate concern regarding the suitability of current diagnostic measures used to ascertain mental health status in Indigenous communities,[2] studies suggest that American Indian and Alaskan Native (AIAN) groups experience depression and anxiety at similar or higher rates compared to the general U.S. population.[3] Kisely et al conducted a meta-analysis comparing 12-month prevalence of depression and anxiety disorders in Indigenous vs. non-Indigenous peoples in the Americas and reported summary odds ratios of 1.30 (CI: 0.76-2.23) for major depression and 0.72 (CI: 0.34-1.54) for generalized anxiety. [4] Causes of depression and anxiety are multifactorial, with chronic and acute stressors playing an important role, particularly in persons with a childhood history of trauma.[5]

Adverse Childhood Experiences (ACEs) are stressful or traumatic events occurring during critical childhood developmental periods. They have been shown to trigger neurodevelopment disruptions which can become biologically embodied and deter growth of stress response systems and healthy coping skills across the lifespan.[6,7] AIANs experience a higher prevalence of ACEs and a significantly higher average total number of ACEs, compared with non-Hispanic whites (NHW). In a national sample, Kenney et al found AIAN children were more likely than NHWs to report having experienced at least one of a battery of 9 ACEs (64.8% vs 44.3%) and 2-3 times more likely to report experiencing multiple (≥2 to ≥5) ACEs.[8] In a similar South Dakota study, Warne et al found 20% of AIAN respondents reported experiencing six or more ACEs, compared to only 4% of non-AI respondents.[9] There is a well-established dose-response relationship between ACEs and many adverse health outcomes in adults, including anxiety and depression.[5] However, there are only a few studies demonstrating the link between ACEs and mental health problems in AIAN populations, specifically.[8,9]

AIAN families endure a disproportionately high burden of social, cultural, and economic stressors associated with poor health; largely attributable to a history of attempted genocide, forced assimilation, and resulting historical trauma.[10] Despite this, AIANs have demonstrated resilience and strength in surviving and overcoming adversity, both individually and collectively. An important priority for Indigenous

health researchers is to identify, describe, and document AIAN resiliency factors and the ways they may buffer against adverse biological and psychosocial effects of stressors.[11]

Among Indigenous peoples, a commonly shared cultural feature is community emphasis on relationship and interdependence.[12] As lines of research centering Indigenous epistemologies have emerged, resiliency factors related to AIAN social and cultural connectedness have increasingly been raised as important social assets for wellness in Tribal communities.[13,14] While this notion is nearly ubiquitous in Tribal communities, it is less common in the public health literature, which tends, instead, to emphasize health deficits in Indigenous populations.[15] A systematic review of the literature from 1980-2015 identified only 9 studies which purposefully sought to understand and assess AIAN resilience* related to cultural, social, or collective strengths as an outcome measure or a resource to guide intervention design and research.[11] The target populations in these studies ranged across the lifespan. Three were with adolescents,[16–18] two with college students,[19,20] two with elders,[21,22] and two with AIAN intergenerational groups.[23,24] None directly addressed community level resilience.

Studies of AIAN social and cultural connection factors that have focused on social support, ethnic identification, and participation in cultural practices as potential resiliency factors for psychosocial outcomes have produced mixed results. Oetzel et al found that emotional and social support were inversely related to substance abuse disorders, but not with anxiety or mood disorders for AIAN adult women. Rather, factors related to social undermining, such as critical appraisal and isolation, were positively associated with both substance abuse and mental health disorders.[13] Meanwhile, in adolescents LaFromboise et al found positive correlations between community support and maternal warmth, an element of family support, and academic involvement and success;[25] and Stumbling-bear-Riddle identified peer-support as the strongest influence on positive attitudes towards school, academic goals, and grades.[18] Regarding ethnic identification, both Montgomery et al and Muehlenkamp et al reported AIAN college students' perceptions that stronger cultural identity contributes to academic success;[19,20] while Gfellner found that higher ethnic identity commitment and exploration scores inversely

* While this systematic review required use of the term "resilience" for inclusion in the study, other literature focuses on AIAN social and cultural connectedness factors such as social support and/or ethnic identity without using "resilience" explicitly. Nevertheless, the paucity of literature including this concept is telling.

predicted emotional tone, an indicator of anxiety and distress in First Nation adolescents.[26] In terms of cultural activities and participation, Stumblingbear-Riddle and Romans found cultural engagement to be significantly associated with academic success;[18] while Snowshoe et al found a positive correlation between a measure of cultural connectedness that included identity, traditions, and spirituality,[27] and self-efficacy, sense of self, and life satisfaction.[28] In general, the sparsity and heterogeneity of results, especially in light of between-study differences in the measures and constructs used for quantifying both resiliency and outcomes, make it difficult to construct a clear schema of the impact of social and cultural connectedness on mental health outcomes in AIAN populations.

In 2002, Walters and Simoni proposed an Indigenist Stress-Coping Model of Health.[29] This framework, informed by theoretical work of Dinges and Joos[30] and Krieger's eco-social theory, [31] was developed specifically with Indigenous populations in mind and posits that resiliency factors such as identity attitudes, enculturation, and traditional health practices act as cultural buffers from the effects of traumatic stressors on health outcomes (Appendix, Figure 1). Importantly, the Walters and Simoni framework shifts the focus of health outcomes away from individual pathologies and instead centers AIAN community histories and social environments, emphasizing AIAN resilience. From this perspective, social factors bearing on the etiology of anxiety and depression reach beyond individual experiences to include community-level social and cultural factors.[32] Consistent with this model, we here seek to empirically evaluate the potential moderating role of an array of resiliency factors related to social and cultural connection on the association between ACEs with anxiety and depression symptoms in AIAN college students (Appendix, Figure 2).

Our goal is to examine whether AIAN social and cultural connectedness factors protect against symptoms of depression and anxiety disorders in American Indian college students with a history of childhood adversity. Within this goal, there are two aims:

1) Assess the association between Adverse Childhood Experiences (ACEs) and depression and anxiety outcomes in American Indian students at Tribal Colleges and Universities. We hypothesize a positive association between ACEs and anxiety and depression outcomes.

2) Elucidate the role of social and cultural connection factors at both the individual level (social support, ethnic identity, participation in cultural practices, and perception of Tribal community fit) and community level (opportunities for student communication and availability of community cultural events) in moderating the association from Aim 1. For both individual and community level factors, we hypothesize that the association between ACEs and depression and anxiety outcomes will be significantly weaker among students with stronger social and cultural connections than in students with relatively weaker social and cultural connections.

The ultimate purpose of this research is to generate epidemiological knowledge to support resource allocation and policy at Tribal Colleges and Universities and to inspire future research that elucidates targets for promoting mental wellness and academic success for AIAN students.

Methods

Study Design

This study primarily used secondary data from the Tribal Colleges and Universities Alcohol, Drugs, and Mental Health Epidemiological Survey Study (TCU-ADME; P60MD006909; Bonnie Duran, PI). Three measures relating to college community-level social and cultural connectedness were retrieved from the Drug and Alcohol Problems and Solutions (DAPSS) Study (TCU-BASICS ; R01AA022068; Bonnie Duran, PI). Both studies were conducted using Community-Based Participatory Research methods in collaboration with the American Indian Higher Education Consortium (AIHEC) and with a collective of Tribal Colleges and Universities, described below. Childhood exposure to ACEs is the primary exposure of interest.[33,34] The population of interest was Native students at TCUs, including students who identified as either AIAN only or AIAN plus another race. Depression and anxiety symptoms are the main outcomes of interest.[35,36] Moderating factors of interest are measures of social and cultural connectedness at individual (TCU-ADME variables) and community (DAPSS variables) levels.

Study Setting

Parent studies were conducted with the goal of providing information to guide the development of culturally appropriate and sustainable services for reducing substance abuse and promoting mental wellness of AIAN college students at Tribal Colleges and Universities (TCUs).

TCUs are unique learning environments for AIAN college students located in remote community settings throughout the U.S. Their formation is a result of nationwide collaborative efforts by Tribal leaders and activists to address historic barriers to education in remote AIAN communities. TCU institutions are committed to revitalizing Indigenous cultural knowledge and serving their students' local communities.[37]

Community Approvals and Institutional Review Boards

Community-based Participatory Research (CBPR) is an approach to health disparities research which emphasizes collaboration and equitable involvement of all partners, including community members and other non-scientists, in the research process and subsequent decision making.[38] While most activities reflecting the CBPR methodology for this study take place during the survey data collection phase of the two parent studies, an important aspect of CBPR is community consent and control over the collected data throughout the research process. We here describe the approval processes and collaboration with Co-Investigators at the Indigenous Wellness Research Institute (IWRI), American Indian Education Consortium (AIHEC), and TCU faculty and staff. As this study is a secondary data analysis resulting from a parent study conducted using CBPR methodology, these processes comprise a unique and essential aspect of this project.

The first author initially consulted on the idea of this master's thesis project with the UW Indigenous Wellness Research Institute TCU Research team in June 2017. We proposed our research question and met with the IWRI TCU Science Team to confirm that all protocols outlined by IWRI would be followed to access data. In fall 2017, our IWRI proposal was approved by the parent study PI (Dr. Duran), who subsequently agreed to serve as a thesis committee member. Regular follow up with Myra Parker, Maya Magarati, and other IWRI staff, as well as a follow-up meeting with the TCU Science Team in April 2018, informed our research design, measurement, and analytic approach.

In December 2018, we received approval from the AIHEC Research Committee and began to seek approval from the UW IRB, as well as from individual Tribal and TCU IRBs. Nine of these named UW as the IRB of record, and this study was reviewed and approved as a modification to the UW TCU-ADME parent application. For the remaining four TCUs, individual IRB applications were submitted. We received approval from all IRBs prior to use of data in our analysis.

In July 2018, preliminary project results were presented to TCU members in a break-out session at the AIHEC Behavioral Health Research Institute Conference. Discussion from this session was recorded and a transcript created for review and incorporation into our analysis and write up. Feedback from the AIHEC Behavioral Health Research Institute Conference breakout session included requests related to presentation of tables, such as taking note to report age distribution of our sample; and discussion of results, particularly regarding realities of AIAN colleges students in TCU environments and appropriateness of measure items for TCU students.

Knowledge from both the IWRI TCU team and AIHEC Behavioral Health Breakout session were incorporated into this thesis, methods and discussion sections in particular. Future manuscripts will be drafted in consultation with members of both groups, and co-authorship will be sought for resulting publications.

Tribal Colleges and Universities Alcohol, Drugs, and Mental Health Epi Survey Methods

Twenty-two collaborating TCU sites participated in survey data collection in the TCU-ADME study. A stratified sampling design was used, grouping the 22 schools by size and randomly sampling students within each group. Inclusion criteria included being ≥18 years, enrolled in participating TCU at the time of the baseline survey, having valid contact information on file with the participating TCU and consenting to have that shared with the study team, and consenting to participate. Surveys were administered to TCU students online (89%) and on paper (11%). Participants took an average of 60 minutes to complete the survey. A more detailed description of survey administration is found in Shultz 2016.[39] Data from the administered TCU-ADME surveys now comprise the largest epidemiologic dataset of prevalence and risk and protective factors for alcohol, drug and psychiatric disorders in Indian Country.

Recruitment and data collection were conducted in two waves over 11 months from March 2015—February 2016, yielding a final response rate of 31% (N=3,202). Demographics of respondents aligned closely with what is known about TCU population demographics (e.g., gender and age distributions), which suggests this is a fairly representative sample. This study used a convenience sample approach to select a subset of TCUs for which college IRB review was free and did not require cross-country travel. Our final subset sample included 1,143 students at 14 (63.6%) of the collaborating

TCU-ADME schools (Appendix, Table 1). This subset is reflects the geographic distribution of the original 22 schools, (primarily the western and midwestern regions of the US) and has a summed student enrollment comprising 48.5% of the total number of students enrolled across all 22 TCU ADME schools.

Drug and Alcohol Problems and Solutions Study Survey Methods

DAPSS is a separate study from TCU-ADME, conducted in partnership with 26 TCUs. Subjects were students and faculty/staff recruited from a sample of persons deemed by a designated TCU advocate to be knowledgeable about their respective campuses.[40] Recruitment and data collection were conducted in waves between November 2011-September 2012 and made available both online or by mailed paper copy. Purposive sampling from these yielded a faculty/staff response rate of 67.8% and student response rate of 61.5%, as well as 26 additional key informants across the 26 schools. This analysis uses DAPSS data for 13 schools matched to those convenience sampled from the TCU-ADME study (1 TCU-ADME school was not surveyed in the DAPSS study).

Surveys were part of a wider community needs assessment and were used to identify college level perceptions of substance use patterns, TCU policies related to substance use, and related issues such as violence, academic performance, and general college resources and culture. A more detailed description of survey administration is found in Martin 2015.[40]

Measures

Dependent Variables: Depression and Anxiety

Depression and anxiety outcomes were measured using the 9-item Patient Health Questionnaire (PHQ-9), a brief, validated self-report scale measuring symptoms of major depressive disorder,[36] and the 7-item Generalized Anxiety Disorder scale (GAD-7), a brief, validated self-report scale measuring symptoms of generalized anxiety disorder.[35]

The PHQ-9 items each reflect one of the nine depressive symptoms corresponding to major depressive disorder criteria from the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, (DSM-IV).[41] Respondents are asked whether, during the previous two weeks, they were bothered by a symptom (0 = “not at all” through 3 = “nearly every day”). Depression severity is then determined from the sum of item scores, (range 0-27). The PHQ-9 was first validated in 2001 with a large sample of

adults against the 20-item Short-Form General Health Survey as well as with independent structured mental health professional interview results, and found to be a reliable and valid measure of depression severity. A PHQ-9 score of ≥ 10 has a sensitivity of 88% and specificity of 88% for identifying major depressive disorder.[36] Since then, it has been validated across many different settings, where the most consistently reported cutoff score for clinically relevant levels of depression is 10 or above.[42] Although the PHQ-9 has not been validated in AIAN young adult populations, it is widely used in primary care and research settings, including being recommended as a clinical practice screening tool by the Indian Health Service,[43] and has been used in previous studies of depression in AIAN populations.[44,45]

The GAD-7 has 7 items selected based on the DSM-IV criteria for generalized anxiety disorder. Respondents are asked, in the last 2 weeks, the extent to which they were bothered by a symptom (0 = "not at all" through 3 = "nearly every day"). Anxiety severity is determined from the sum of item scores, (range 0-21). The GAD-7 was first validated with a large sample of adults against the 20-item Short-Form General Health Survey, as well as independent structured mental health professional interview results, and found to be a reliable and valid measure of anxiety severity. A GAD-7 score of ≥10 has a sensitivity of 89% and specificity of 82% for identifying generalized anxiety disorder.[35] Given its later publication (2006), this scale has been used less widely than the PHQ-9. It is often administered alongside the PHQ-9, as there is a high co-occurrence of depression and anxiety, and both measures were similarly developed as efficient screening tools in busy primary care settings and clinical research. Like the PHQ-9, the GAD-7 has not been validated in AIAN populations, but some experts have recommended its routine use and new research studies using the GAD-7 are emerging.[46]

Consistent with earlier research, in our study, we designated scores <10 as "low," and scores ≥10 as "high" for both depression and anxiety. For simplicity, we refer to scores of ≥10 as having anxiety and/or depression for the remainder of this document.

Independent Variable: Childhood Adversity

ACEs exposure was measured using four items that were administered in the TCU-ADME survey. The items come from the Adverse Childhood Experiences Questionnaire, a standardized questionnaire used widely in research of childhood household dysfunction and adult risk behaviors and

disease.[33] Each of the four items relates to an interpersonal relationship stressor, including items about conflict in the parents' relationship, living with persons with mental illness, and being physically assaulted or bullied (see full questions in Appendix, Table 3). Respondents were asked to rate each childhood experience item (e.g., "When I was growing up, before age 18…My parents acted violent toward each other") from 0 ("Never True") to 4 ("Very Often True"). Severity of childhood adversity was determined from a sum of item scores (range 0-16). While the full set of ACEs items typically used in surveys assessing ACEs was not available from this dataset and prior studies have not used this subset of ACEs items, the four available items presented a unique opportunity to capitalize on ACEs-related analysis in the largest AIAN focused dataset including both ACEs and anxiety/depression scales. Previous studies have used items from the ACEs questionnaire to examine prevalence and distribution of adverse childhood experiences across distinct Tribes[9] and to compare the prevalence to non-Hispanic whites.[8] In the sample used here, a test of internal consistency showed a Cronbach's alpha of 0.80.

Effect Modifiers: Social and Cultural Connectedness

An array of measures that reflect social and cultural connection at the individual and college community-levels were assessed for their moderating/buffering roles in the association between exposure to ACES and depression and anxiety (Appendix, Table 2). Individual measures of social and cultural connection were retrieved from baseline surveys of the TCU-ADME study and included: Social Support, Ethnic Identity, Tribal Participation, and Tribal Community Fit. Measures of community-level communication and cultural activities were retrieved from DAPSS surveys and included: TCU communication and cultural activities. The mean score across all DAPSS surveys for each school was assigned as a community level score. For ease of interpretation, we included all potential effect modifiers as binary interaction terms in our logistic regression models. We selected a cutoff point at the 25th percentile for individual level measures; and median cutoff point for community level measures. For each cutoff, scores at or below were designated as "low," and scores above designated as "high."

Social Support

The Social Support questionnaire is a version of the Multidimensional Scale of Perceived Social Support[47] modified to fit AIAN respondents.[13] For this analysis, we used the Emotional Social Support, and Instrumental Social Support subscales. [13]

The Emotional Social Support subscale consists of six items that reflect the respondent's perception of how much friends or relatives care and appreciate them. (e.g., "How much can you… talk to your friends or relatives about your worries?"). Each contained a 1-3 Likert-type response, with 1 = "Never" and 3 = "Often." Level of perceived Emotional Social Support was determined from a sum of item scores (range 6-18).

The Instrumental Social Support subscale consists of 5 items that reflect the respondent's perception of available physical support such as friends and relatives to attend community events with or to assist with financial support (e.g., "Among the people you know, is there someone who would…. lend you money if you needed it in an emergency?"). Each item contains a 1 = "Yes"/ 0 = "No" response. Level of perceived Instrumental Social Support was determined from a sum of item scores (range 0-5).

Ethnic Identity

Assessment of Ethnic Identity is done using the Multigroup Ethnic Identity Measure-Revised (MEIM-R).[48] The MEIM-R assesses ethnic identity in terms of exploration and commitment and has been examined widely across different racial/ethnic minority groups including American Indian and First Nations populations.[26] It contains six self-report items related to exploration and commitment to the participant's identity (e.g., "I have spent time trying to find out more about my ethnic group, such as its history, traditions, and customs," "I have a strong sense of belonging to my own ethnic group."). Each item contains a Likert-type response, with 1 = "Strongly Disagree" through 5 = "Strongly Agree." Level of self-reported Ethnic Identity was determined from a sum of item scores, range (6-30).

The MEIM-R can be summed to yield a total Ethnic Identity Score as well as scores for two subscales: Exploration and Commitment. In another study of the TCU sample (Isaac Rhew written communication, January 2018), a factor analysis of the MEIM-R was conducted, and a Cronbach Alpha of 0.96 was found. Thus, our analysis combines the two subscales for a total Ethnic Identity Score.

Tribal Participation and Community Fit Measures

Scales representing the constructs of Tribal Participation and Tribal Connectedness are newly developed and implemented by study researchers Karina Walters and Myra Parker (Myra Parker written communication, July 2018).

Tribal Participation includes questions about participation in community gatherings, traditional ceremonies, and Tribal elections. It includes three items (e.g., "How often do you participate in traditional ceremonies?"), containing Likert-type responses, with 1 = "daily" through 5 = "once a year." Level of respondent reported Tribal Participation was determined from a sum of item scores (range 3-15).

Tribal Community Fit includes questions about feelings of belonging in one's own Tribal community, and knowing how to behave and fit in at community gatherings. It includes 5 items (i.e. "I know how to behave properly in my Tribal community," "I feel like I fit in with my Tribal community members by the way I behave."), containing Likert-type responses, with 1 = "Strongly Disagree" through 5 = "Strongly Agree." Level of respondent reported Tribal Community Fit was determined from a sum of item scores (range 5-25).

College Community Level Communication and Cultural Activity Measures

At the community-level we took the sum of two items from the DAPSS study (i.e., "Programs are successful at bringing students together to talk about problems and solutions," and "Students have an opportunity to voice their issues to faculty and staff.") into a single measure, "TCU Communication," to reflect the level of communication encouraged and available at the TCU (i.e., college investment in social connection). Both items included Likert-type responses with options from 1 = "Strongly Disagree" to 5="Strongly Agree." Level of respondent perceived TCU Communication opportunities was determined from a sum of the scores (range 2-10).

One other DAPSS item, "TCU Cultural Activities," was included to measure opportunities on each TCU campus for engaging in traditional AIAN practices, with other members of the campus community (e.g., "Traditional cultural or spiritual activities bring people together regardless of conflicts on the [TCU] campus"). It also includes a Likert-type response with options from 1 = "Strongly Disagree" to 5="Strongly

Agree." Level of respondent perceived TCU Cultural Activities was determined from the single item score (range 1-5).

Covariates

Key covariates for the association of ACEs with anxiety/depression outcomes include: TCU attended, birth sex, and age. We also included father and mother's highest level of education to reflect SES. Highest parent education was categorized into 1 = "High School/GED or less," 2 = "Some college—bachelor's degree," and 3 = "Advanced Degree."

Analysis

We first examined distributions and ran non-parametric Wilcoxon rank sum tests and Chi-squared test to examine bivariate associations among the independent variable, dependent variables, and social and cultural connectedness factors. We used multivariable logistic regression models to assess the association between adverse childhood events and anxiety and depression. We included factor variables for TCUs to account for potential clustering of individuals within the 14 schools. Potential confounders were identified *a priori,* and results from models with and without controlling for key confounders are reported. Because exposure to conditions of poverty is often included within ACEs measures and economic adversity is a common antecedent to interpersonal problems, we are cautious in our interpretation of results of analyses that include parents' education.

We used multivariable logistic regression models, which included each proposed social and cultural connection factor alone, to observe main effect associations with anxiety and depression. To test for moderation, we then added interaction terms (e.g., ACEs-x-social-support). We report parameter estimates, 95% confidence intervals, and p-values for the tested interactions. A p-value of .05 was the cut off value used to determine statistical significance. Analyses were conducted with StataCorp Statistical Software, Version 14.[49]

Results

Sample Description and Descriptive Statistics

General demographics of participants including age, birth sex, and other key factors are presented in Table 1. Ages ranged between 18 and 60 years. A majority of respondents were female

(68.7%), which is generally consistent with enrollment trends across TCUs. The majority of respondents (59.3%) reported having at least one parent with some college education.

Mean depression and anxiety scores were 4.7 (SD = 5.8) and 4.0 (SD = 5.0), respectively; with 14.7% of respondents reporting a PHQ score of ≥10 and 12.3% of respondents reporting GAD score of ≥10. College level means ranged from 3.7-6.7 for PHQ scores, and 3.2-4.7 for GAD scores. One-hundred fifty-two participants with missing responses to ACEs, sex, age, parent education or PHQ-9 scores were excluded from analyses. Sixty-seven (5.9%) of respondents included in descriptive analysis were missing GAD-7 scores. Table 2 presents two-way frequencies of anxiety and depression. Nine percent of our sample report high scores for both anxiety and depression; 80% report low scores for both. For self-reported ACEs scores, 21.5% of students reported a score of 0, and 52.8% reported a score of ≤4. The mean reported ACEs score was 5.1 (SD = 4.5).

Descriptive statistics of the social and cultural connectedness measures are shown in Tables 3a and 3b, (tables note how binary categories were assigned). Distributions of individual level social and cultural connectedness were skewed towards high scores. For example, for Instrumental Social Support the Median score was five, the highest score possible. Distributions of community level factors were similarly skewed, with Tribal Communication community level scores for each school ranging from 5-9 for a total sample mean of 7.0 (SD = 1.1) and Tribal Cultural Activities community level scores ranging from 3.65-4.75 for a total sample mean of 4.2 (SD = 0.3).

Table 3 shows bivariate associations between level of each of the social and cultural connectedness factors and the exposure and outcome variables. Compared to those students with low levels, students with high levels of emotional and instrumental support reported significantly lower ACEs scores and lower likelihood of anxiety and depression, on average ($p<0.001$). Students with high Tribal Community Fit scores reported having experienced significantly fewer ACEs ($p=0.048$). In contrast, students who reported high levels of Ethnic Identity reported significantly higher ACEs ($p<0.001$); and among schools which reported higher TCU Communication, students reported significantly higher ACEs scores ($p<0.001$), and higher likelihood of anxiety ($p=0.036$), on average.

Associations of ACEs with Depression and Anxiety

AIAN students who reported higher levels of ACEs had a higher risk of depression and anxiety (Table 4). For each additional point increase on the ACEs scale, the odds of having depression increased by 19% (OR = 1.19; 95% CI: 1.14-1.24) and the odds of having anxiety increased by 20% (OR= 1.20; 95% CI: 1.16-1.25). Adjustment for birth sex, age, parents' highest education, and possible clustering effects by school did little to change this association. Female sex was associated with having depression (OR = 1.57; 95% CI: 1.01-2.43), which is consistent with existing depression literature.

Social and Cultural Connectedness Factors and Depression and Anxiety

Except for Tribal Participation, each of the social and cultural connectedness factors was inversely associated with depression and anxiety symptoms. However, only the associations of emotional and instrumental social support with mental health outcomes were statistically significant (Table 6). High emotional social support was associated with a 70% lower odds of having depression (OR = 0.30; 95% CI: 0.21-0.44) and a 72% lower odds of having anxiety (OR = 0.28; 95% CI: 0.19-0.42). Similar results were found for the association between instrumental social support and depression (OR = 0.47; 95% CI: 0.33-0.68), as well as anxiety (OR = 0.52; 95% CI: 0.35-0.78). Inclusion of each social and cultural connectedness factor did little to change the magnitude of estimates for associations between ACEs and depression or anxiety.

Effect Modification of Social and Cultural Connectedness Factors on the Associations between ACEs and Depression and Anxiety

In our final analysis, shown in Table 7, interaction terms for ACES and each social and cultural connectedness factor were added to our logistic regression models. We did not find evidence for moderation of the association between ACEs and mental health outcomes by any social and cultural connectedness factors, as no interaction terms for the proposed moderators and ACEs were statistically significant.

Discussion

Discussion of Results

The first aim of this study was to elucidate the role of ACEs on symptoms of depression and anxiety. Our results support our hypothesis that exposure to ACEs adversely affects the mental wellbeing of AIAN college students. The finding in this population of AIAN young adults is consistent with

epidemiological studies of ACEs and mental health in AIAN adults, as well as the US popuation.[5] For example, Lu et al found that adults with psychological disorders are more likely to report multiple ACEs;[50] and Warne et al found that both AI and non-AI individuals with six or more ACEs had higher risk for depression and anxiety.[9]

The second aim of our study was to assess moderation of the association between ACEs and anxiety and depression by AIAN resiliency factors related to social and cultural connection. Our hypothesis that the association between ACES and depression and anxiety would be weaker among AIAN college students who reported high levels of social and cultural connectedness was not supported by our results. Null findings were also reported by Shultz who found that ethnic identity scores did not buffer the effects of Intimate Partner Violence on later drug use in AIAN young adult women.[39]

There are several possible reasons for this apparent lack of moderation by social and cultural connectedness factors. First, there was little variability in students' reports for most of our selected measures of social and cultural connectedness. For example, the median score on the instrumental social support measure was 5, the highest possible score. Insufficient variability would make moderation by those factors especially difficult to detect. High scores for social and cultural connectedness could be partially explained by the sample consisting of students at Tribal Colleges and Universities, a setting that is known for providing a stable and supportive environment for AIAN students. Secondly, the association between ACEs and adult mental health outcomes is well established, less is known about the specific mechanisms through which ACEs operate on mental health. A recent study by Jones et al used structural equation modeling to test both direct and indirect pathways by which ACEs are associated with mental health.[51] In addition to finding a direct effect of ACEs on mental health, adult adversity, adult social support, and most strongly, low adult income all demonstrated significant associations with mental health outcomes, with adult income and adversity mediating pathways from ACEs to adult mental health ($p<0.01$ for all). Importantly then, AIAN social and cultural connectedness factors may not have as strong an influence on mental health as adult socioeconomic experiences such as poverty and adversity, which were not controlled for in the present study. Nevertheless, the positive independent effects of social and cultural connectedness on mental health observed here show that these factors are associated with

mental health outcomes in AIAN college students, regardless of ACEs exposures.

Descriptive Statistics

AIAN college students in this sample report a somewhat comparable level of depression (M = 4.7 SD = 5.8, with 14.7% reporting a score of 10 or higher) to some other studies of AIAN adults. For example, a sample of 389 First Nations adults reported mean PHQ-9 score of 4.86, with 8.74% reporting a score of 15 or higher.[52] Comparatively, in a study of Alaska Natives, 17% of respondents reported a PHQ-9 score of ≥10.[45] As this study did not stratify by Tribe or region, depression and anxiety results should here be interpreted as representing an amalgam of AIAN college student respondents from many Tribes and communities across the US.

Depression scores in our sample of AIAN college students are comparatively lower than general samples of U.S. college students; which are primarily comprised young adults in the age ranges where mental health disorders have their peak onset.[53] A study validating the PHQ-9 in a sample of non-AIAN college students (N=857) found a mean PHQ-9 score of 15.55 (SD = 5.56); and much research indicates a higher prevalence of mental health problems among college students in general.[54] This difference may be due to several factors, including the nature of TCU colleges and compositions of their student bodies, such as a much wider age range than “traditional” colleges and universities. To our knowledge, no studies have focused on GAD-7 scores in AIAN participants; however, our reported mean of 4.0 (SD = 4.5) is slightly lower than GAD-7 means found in the general US population for women, (M = 6.1) or for men, (M = 4.6).[35]

With respect to ACEs exposure, composite scores from this study are not directly comparable to studies using previously established ACEs measures because we utilize here a subset of items. However, there is some existing research on prevalence of individual items. For example, in a previous study of AIANs in South Dakota, 39.34% of AIAN respondents reported experiencing parental separation or divorce, and 24.36% reported experiencing household mental illness.[9] In another study, 33% of AIANs lived with a parent who was divorced or separated, 13.2% lived with a family member who was mentally ill or suicidal, and 5.9% were victims of violence or witnessed violence in his/her neighborhood.[8] In our sample, 33.51% of respondents endorsed 3 = “Sometimes True” or more to “My parents acted violently

towards each other," 53.98% endorsed 3 = "Sometimes True" or more to "My parents had serious relationship problems," 33.34% of respondents endorsed 3 = "Sometimes True" or more to "I lived with someone who was depressed, mentally ill, or suicidal," and 32.71% endorsed 3 = "Sometimes True" or more to "I was physically intimidated, assaulted, emotionally bullied, or teased excessively."

Study Limitations

Our results should be interpreted with several limitations in mind. First, the cross-sectional nature of the study design makes it challenging to determine the temporal association between childhood trauma, adult mental distress symptoms, and community connectedness. For the social and cultural connectedness variables, it may be that TCU students with higher levels of social and cultural connection experience relatively lower severity of depression and anxiety symptoms, or that TCU students with lower depression and anxiety are able to attain higher levels of social and cultural connectedness.

While data from this study are advantageous in that it represents a cross-section of the AIAN Tribes across 14 different TCUs from across the country, we did not stratify our analysis by Tribal affiliation, age, or urban versus rural residence. Study of AIAN communities across these categories suggests differences in cultural norms that affect how signs of mental distress are recognized, interpreted, and reported.[57] There could be differing understandings regarding social and cultural connectedness by different AIAN communities, as well. As with other epidemiological studies of mental health status in AIAN populations, our study is caught in the tension between highlighting cultural specificity and describing trends across large and diverse samples of AIANs.[55]

Our response rate of 31% is a somewhat lower response rate than for other epidemiological web-based surveys in college students.[57] Surveys were administered just at the end of the school year, which likely contributed to a lower response rate.[39] Relatively lower accessibility of internet and computer access in rural and reservation settings may also be contributing factors.[58] However, as mentioned above, demographics of respondents aligned closely with what is known about TCU population demographics which suggests this is a fairly reliable sample. Additionally, for evaluation of community level social and cultural connectedness factors, small sample size at the college-level may limit our power to observe meaningful moderation.

Lastly, measures of ACEs are sometimes criticized as being vulnerable to recall bias due to their strictly retrospective nature; especially for respondents who are currently depressed.[59] However, some studies show that current depression symptoms have no significant bearing on reports of ACEs in young adults.[60] Furthermore, research shows similar associations between ACEs and adverse mental health outcomes in both retrospective and prospective studies.[61,62]

Future Research

Most of the survey scales used in this analysis have not been validated in AIAN populations, specifically, and have not been examined for cultural differences across Tribes or Tribal regions. As discussed in our introduction, this is a common limitation in research of social etiologies for AIAN mental health. More research to understand the reliability of existing psychosocial measures and to establish new and valid measures of social and cultural connection is vital to understanding population level mental wellness in Tribal communities.

Additionally, our results demonstrate the need for a deeper understanding of the complex associations between ACEs and mental health outcomes and their interplay with social and cultural assets. Further examination of models which include resiliency factors and how they may act on ACEs to mental health pathways, directly or indirectly, are called for.

Considering the established heterogeneity of reports of anxiety and depression across Tribes and lack of survey scales validated in AIAN populations, along with remaining gaps regarding the particular ACEs to mental health pathways that social and cultural connectedness factors may act on, further research exploring the protective effects of social and cultural connection factors among AIAN populations is needed. In particular, research which utilizes Indigenous models such as Walters and Simoni's Indigenist Stress-Coping model to explore community level resilience is especially warranted.

Implications

A strength of this study was the opportunity of having two rich sets of data collected from the same TCU settings to evaluate ACEs, mental health, and an array of variables that reflected the sense of social and cultural connectedness experienced by AIAN college students. Student perceptions of emotional and instrumental support were both associated with lower levels of depression and anxiety,

over and above the effects of exposure to ACEs. ACEs and emotional and instrumental support had strong independent associations with mental well-being in AIAN college students, and the effects of ACEs on depression and anxiety remained strong, regardless of the students' levels of support. Results from this study present a few key issues for practice and theory. First, if Tribal colleges and universities can take steps to foster these kinds of support, they can expect mental health benefits for students with and without prior exposure to childhood adversity. As indicated by prior research, addressing issues stemming from ACEs will likely contribute to educational success as well as to mental wellbeing. Secondly, our results add to the body of evidence regarding the negative effects of ACEs and point to the importance of preventing childhood trauma.[63]

Conclusion

In an era when Tribal communities and governments are increasingly seeking scientific evidence for and documentation of socially and culturally-oriented protective factors, findings from this study fill gaps by incorporating constructs of AIAN resilience and by contributing towards an understanding of the role these factors play in the mental wellness of AIAN college students. Given the paucity of research focused on the effect of ACEs on mental wellness in AIAN populations, this study builds upon existing ACEs literature and confirms that AIAN communities are affected by childhood trauma in similar ways to the general population. Considering the high rates of childhood adversity observed in AIAN communities, our results are further motivation to develop interventions to reduce the occurrence of ACEs and provide support for the biological and psychosocial consequences of ACEs across the lifespan. Although we did not find evidence for moderation of the association between ACEs and mental health outcomes by any social and cultural connectedness factors, the positive independent effects of these factors on mental health observed in our study suggest that further exploration of the benefits of social and cultural connectedness for mental health outcomes is warranted.

Results Tables

Table 1: Demographic Characteristics of AIAN TCU College Students (N=1,143).

	n (%)*	Mean (SD)	Median (IQR)
Age (years)		29.5 (10.5)	26 (21-35)
≤20	232 (20.3)		
21-30	514 (45.0)		
31-40	204 (17.8)		
41+	193 (16.9)		
Birth Sex			
Male	358 (31.3)		
Female	785 (68.7)		
Highest Parent Education			
High School/GED or Less	345 (30.2)		
Some college-Bachelors	678 (59.3)		
Advanced Degree	120 (10.5)		
Depression Score (PHQ-9)		4.7 (5.8)	2 (0-6)
Low (<10)	975 (85.3)		
High (≥10)	168 (14.7)		
Anxiety Score (GAD-7)		4.0 (5.0)	3 (0-7)
Low (<10)	935 (81.8)		
High (≥10)	141 (12.3)		
ACEs Score (4 items: 0-4 response)		5.1 (4.5)	4 (1-8)
≤4	603 (52.8)		
5-8	279 (24.4)		
9-12	174 (15.2)		
13-16	87 (7.6)		

*Due to some missingness, frequencies may not always add up to 1,143

Table 2. Frequency and Distribution of High, (≥10) vs Low (<10), Depression and Anxiety.					
			Depression		**Total**
			Low	High	
Anxiety	Low	Count	**865**	**44**	**909**
		% within Anxiety	95.2%	4.8%	100%
		% within Depression	93.4%	31.2%	84.5%
		% of Total	80.3%	4.1%	84.5%
	High	Count	**70**	**97**	**167**
		% within Anxiety	41.9%	58.1%	100%
		% within Depression	7.5%	68.8%	15.5%
		% of Total	6.5%	9.0%	15.5%
Total		Count	**935**	**141**	**1,076**
		% within Anxiety	86.9%	13.1%	100%
		% within Depression	100%	100%	100%
		% of Total	86.9%	13.1%	100%

*Due to 67 missing depression values, N ≠ 1,143.
**Results of chi-squared test p-value <0.001.

Table 3a: Distributions of Individual Level Social and Cultural Connectedness Measures in AIAN TCU College Students, (N=1,143).

	n (%)	Mean (SD)	Median (IQR)
Emotional Social Support		15.6 (2.7)	17 (14-18)
Low (<=14)	306 (26.8)		
High (>14)	831 (72.7)		
Instrumental Social Support		4.4 (1.3)	5 (4-5)
Low (<=4)	345 (30.2)		
High (>4)	790 (69.1)		
MEIM-R Score		22.3 (6.2)	23 (18-27)
Low (<=18)	313 (27.4)		
High (>18)	807 (70.6)		
Tribal Participation		12.7 (4.4)	13 (11-16)
Low (<=11)	308 (27.0)		
High (>11)	835 (73.1)		
Tribal Community Fit		20.4 (5.9)	22 (19-25)
Low (<=19)	315 (27.6)		
High (>19)	828 (72.4)		

Table 3b: Distributions of Community Level Social and Cultural Connectedness Measures in AIAN TCU College Students, (N=13).

	n (%)	Mean (SD)	Median (IQR)
TCU Communication		7.0 (1.1)	7.2 (5.7-7.8)
Low (<=7.2)	569 (49.8)		
High (>7.2)	555 (48.6)		
TCU Cultural Activities		4.2 (0.3)	4.3 (4.2-4.5)
Low (<=4.25)	721 (63.1)		
High (>4.25)	403 (35.3)		

*Due to some missingness, frequencies may not always add up to 1,143

Table 4. Mean ACEs, Depression, Anxiety by Moderator Levels and Tests for Bivariate Associations, (N=1,143).

	ACEs		Depression		Anxiety	
	Mean (SD)	**z-statistic (p-value)**	**Percentage**	**χ^2-statistic (p-value)**	**Percentage**	**χ^2-statistic (p-value)**
Emotional Support		6.80		74.4		61.9
Low	6.63 (4.82)	(<0.001)*	29.7%	(<0.001)*	26.5%	(<0.001)*
High	4.48 (4.22)		9.27%		8.2%	
Instrumental Support		3.67		22.2		13.8
Low	5.81 (4.62)	(<0.001)*	22.3%	(<0.001)*	19.0%	(<0.001)*
High	4.75 (4.39)		11.5%		10.6%	
Ethnic Identity (MEIM-R)		-4.34		0.005		0.004
Low	4.20 (4.27)	(<0.001)*	14.7%	(0.942)	13.0%	(0.949)
High	5.41 (4.53)		14.9%		13.2%	
Tribal Participation		0.38		1.87		1.04
Low	5.14 (4.49)	(0.704)	12.3%	(0.171)	11.4%	(0.308)
High	5.03 (4.48)		15.6%		13.7%	
Tribal Community Fit		1.98 (0.048)*		3.29		6.25
Low	5.48 (4.55)		17.8%	(0.070)	17.3%	(0.012)*
High	4.90 (4.45)		13.5%		11.5%	
TCU Communication		-3.34		0.460		4.42
Low	4.64, (4.32)	(<0.001)*	14.1%	(0.498)	11.0%	(0.036)*
High	5.54 (4.62)		15.5%		15.4%	
TCU Cultural Activities		1.32		0.007		3.25
Low	5.25 (4.61)	(0.188)	14.7%	(0.933)	14.6%	(0.072)
High	4.80 (4.26)		14.9%		10.8%	

*p<0.05

Table 5. Unadjusted and Adjusted Associations of ACEs with Anxiety and Depression.						
Anxiety Symptoms, Low (GAD7 <10), versus High (GAD-7 ≥10)						
	Model 1 Unadjusted		**Model 2** Adjusted for Clustering By TCU		**Model 3** Adjusted for TCU, Age, Sex, and Parent Education	
Factor	**OR (95% CI)**	**p-value**	**OR (95% CI)**	**p-value**	**OR (95% CI)**	**p-value**
ACEs Score	1.19 (1.14—1.23)	<0.001	1.18 (1.14—1.23)	<0.001	1.19 (1.14—1.24)	<0.001
Female Sex					1.39 (0.94—2.04)	0.100
Age					1.00 (0.98--1.01)	0.521
Parent Education					1.02 (0.03—0.38)	0.766
TCU*			-	-	-	-
Depression Symptoms, Low (PHQ-9 <10), versus High (PHQ9 ≥10)						
	Model 1 Unadjusted		**Model 2** Adjusted for Clustering By TCU		**Model 3** Adjusted for TCU, Age, and Sex, and Parent Education	
Factor	**OR (95% CI)**	**p-value**	**OR (95% CI)**	**p-value**	**OR (95% CI)**	**p-value**
ACEs Score	1.20 (1.15—1.24)	<0.001	1.20 (1.16—1.25)	<0.001	1.20 (1.16—1.25)	<0.001
Female Sex					1.57 (1.01—2.43)	0.044
Age					0.99 (0.97--1.00)	0.111
Parent Education					1.03 (0.92—1.16)	0.613
TCU*			-	-	-	-

*Individual TCU scores not reported for confidentiality of community partners.

Table 6: Adjusted Social and Cultural Connectedness Variable Associations of ACEs with Anxiety and Depression

Anxiety Symptoms, High (GAD-7 ≥10) vs. Low (GAD7 <10)							
	Individual Level Moderators					**Community Level Moderators**	
	Emotional Social Support	**Instrumental Social Support**	**MEIM-R**	**Tribal Participation**	**Tribal Community Fit**	**TCU Communication**	**TCU Cultural Activities**
ACEs	1.16 (1.11—1.21)**	1.18 (1.14—1.23)**	1.19 (1.14—1.24)**	1.18 (1.14—1.24)**	1.19 (1.14—1.24)**	1.18 (1.14—1.23)**	1.18 (1.14—1.23)**
Moderator	0.28 (0.19—0.42)**	0.52 (0.35—0.78)**	0.88 (0.57—1.35)	1.22 (0.79—1.90)	0.67 (0.45—0.99)	0.99 (0.36—2.71)	0.99 (0.36—2.71)
Depression Symptoms, High (PHQ9 ≥10) vs. Low (PHQ9 <10)							
	Individual Level Moderators					**Community Level Moderators**	
	Emotional Social Support	**Instrumental Social Support**	**MEIM-R**	**Tribal Participation**	**Tribal Community Fit**	**TCU Communication**	**TCU Cultural Activities**
ACEs	1.18 (1.13—1.22)**	1.20 (1.15—1.24)**	1.20 (1.15—1.25)**	1.20 (1.16—1.25)**	1.20 (1.15—1.25)**	1.20 (1.16—1.25)**	1.20 (1.16—1.25)**
Moderator	0.30 (0.21—0.44)**	0.47 0.33—0.68)**	0.82 (0.55—1.23)	1.36 (0.90—2.06)	0.76 (0.52—1.10)	0.99 (0.39—2.55)	0.99 (0.39—2.55)

Note: All interaction models were adjusted for TCU, Age, Sex, and Parent Education, as in Table 2, Model 3. “Moderator” identified by column headings.

*p < .05

**p<.01

Table 7: Adjusted Social and Cultural Connectedness Interaction Associations with ACEs and Anxiety and Depression

Anxiety Symptoms, High (GAD-7 ≥10) vs. Low (GAD7 <10),							
	Individual Level Moderators					**Community Level Moderators**	
	Emotional Social Support	**Instrumental Social Support**	**MEIM-R**	**Tribal Participation**	**Tribal Community Fit**	**TCU Communication**	**TCU Cultural Activities**
ACEs	1.19 (1.21—1.27)**	1.23 (1.15—1.32)**	1.13 (1.05—1.22)**	1.15 (1.06—1.24)**	1.21 (1.12—1.30)**	1.20 (1.13—1.27)**	1.18 (1.12—1.24)**
Moderator	0.32 (0.20—0.50)**	0.61 (0.39—0.96)*	0.78 (0.49—1.23)	1.08 (0.66—1.76)	0.71 (0.45—1.12)	1.03 (0.37—2.87)	0.96 (0.35—2.67)
Moderator x ACEs	0.95 (0.87—1.03)	0.94 (0.87—1.03)	1.07 (0.98—1.17)	1.05 (0.96—1.15)	0.98 (0.89—1.06)	0.98 (0.90—1.06)	1.02 (0.93—1.11)
Depression Symptoms, High (PHQ9 ≥10) vs. Low (PHQ9 <10)							
	Individual Level Moderators					**Community Level Moderators**	
	Emotional Social Support	**Instrumental Social Support**	**MEIM-R**	**Tribal Participation**	**Tribal Community Fit**	**TCU Communication**	**TCU Cultural Activities**
ACEs	1.19 (1.12—1.26)**	1.22 (1.15—1.30)**	1.18 (1.10—1.27)**	1.18 (1.09—1.27)**	1.20 (1.12—1.28)**	1.19 (1.12—1.25)**	1.20 (1.15—1.26)**
Moderator	0.32 (0.21—0.48)**	0.52 (0.34—0.78)**	0.79 (0.52—1.21)	1.28 (0.80—2.03)	0.75 (0.49—1.15)	0.94 (0.36—2.45)	0.99 (0.38—2.58)
Moderator x ACEs	0.98 (0.90—1.06)	0.97 (0.89—1.04)	1.02 (0.94—1.11)	1.02 (0.94—1.12)	1.00 (0.92—1.09)	1.03 (0.95—1.11)	1.00 (0.92—1.08)

Note: All interaction models were adjusted for TCU, Age, Sex, and Parent Education, as in Table 2, Model 3. “Moderator” identified by column headings.
*p < .05
**p<.01

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Appendix: Additional Figure and Tables

Figure 1: Indigenous Stress Coping Model, (Walters & Simoni 2002)

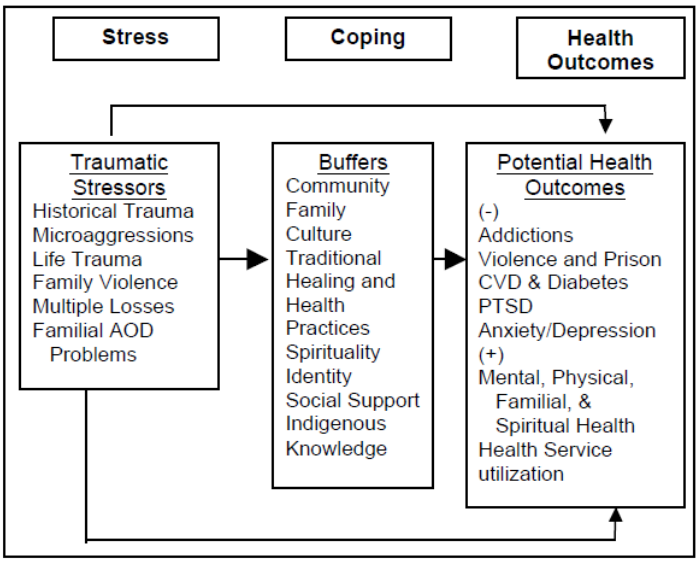

Figure 2: Simple Conceptual Model for the Present Study

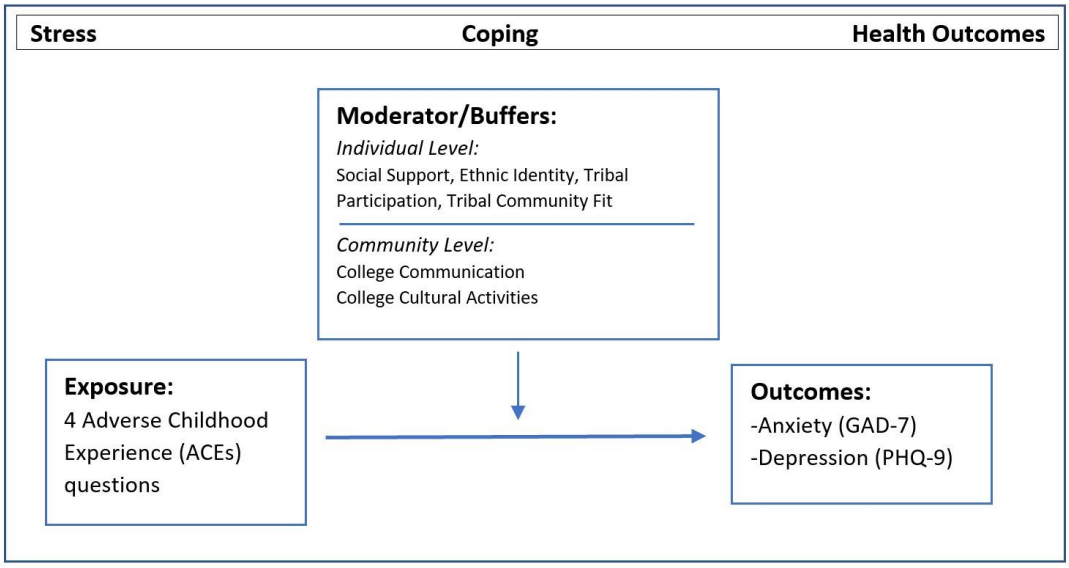

Table 1: Tribal Colleges Included and Sample Size

Tribal College/University	TCU-ADME Survey Sample (n)	Subset Used in Current Study (n)
TCU 1	169	107
TCU 2	212	182
TCU 3	44	11
TCU 4	52	21
TCU 5	66	51
TCU 6	25	19
TCU 7	63	42
TCU 8	36	29
TCU 9	50	42
TCU 10	28	18
TCU 11	40	28
TCU 12	498	355
TCU 13	75	54
TCU 14	239	184
Total	**1,759**	**1,143**

*TCUs are not identified as part of confidentiality requirements for study

**Subset is responses from each school where respondent identified as AIAN and there were no missing values for ACEs, sex, age, parent education or PHQ-9.

Table 2: Moderating Factors

	Individual Level	**Community Level**

Social Support	***TCU-ADME measures:***
	• Social Support
	  ○ Emotional
	  ○ Instrumental
		DAPSS measures:
		• [TCU] programs are successful at bringing students together to talk about problems and solutions
		• Students have an opportunity to voice their issues to faculty and staff

Ethnic Identity and Participation	***TCU-ADME measures:***
	• Tribal Affiliation
	  ○ Tribal Participation: Karina Walters
	  ○ Tribal community fit: Myra Parker
	• Multi-Group Ethnic Identity (MEIM) Measures
		DAPSS measures:
		• Traditional cultural or spiritual activities bring people together regardless of conflicts on the [TCU] campus

Table 3: Four ACEs questions:

Variable Name	Survey	Variable Label	Variable Type
Adverse Childhood Experiences Scale Stem: “When I was growing up, before age 18…”	**TCU-ADME**	**AACE1-4**	**0-4 categorical, Never true-Very often true**
“My parents acted violent toward each other”	TCU-ADME	AACE1	“
“My parents had serious relationship problems”	TCU-ADME	AACE2	“
“I lived with someone who was depressed, mentally ill, or suicidal”	TCU-ADME	AACE3	“
“I was physically intimidated, assaulted, emotionally bullied, or teased excessively by a peer that was not my sibling”	TCU-ADME	AACE4	“