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Adverse Childhood Experiences and Indigenous Identity: Testing for Aggregation Fallacy in the Multiracial Category

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Abstract: *Adverse childhood experiences (ACEs) predict poor adulthood health. ACEs are most common among American Indian/Alaska Native (AI/AN) and Multiracial groups, two groups that overlap substantially in population. We aimed to determine if the Multiracial population's high mean ACE score differs by those who do and do not identify as AI/AN. We analyzed Waves 1, 3, and 4 (1994-2009) of the National Longitudinal Study of Adolescent to Adult Health (N = 12,372), estimating race-specific mean ACE scores and component prevalence, and disaggregating the Multiracial group by AI/AN identity. We compared means and prevalence ratios using Bonferroni-corrected Tukey's honestly significant tests of differences. Mean scores on a 10-point scale were higher among AI/AN (mean = 3.21, 95% CI: 2.54, 3.97), Multiracial AI/AN (2.95, 95% CI: 2.71, 3.18), Multiracial non-AI/AN (2.88, 95% CI: 2.57, 3.19), and Black (2.84, 95% CI: 2.65, 3.02) groups than White (2.35, 95% CI: 2.26, 2.44) and Asian/Pacific Islander (2.32, 95% CI: 2.09, 2.54) groups. Tests of mean and prevalence differences between the AI/AN and two Multiracial groups were all insignificant. The Multiracial population's high mean ACE score does not differ by those that do and do not identify as AI/AN. ACEs prevention strategies should be tailored to meet the specific needs of groups at higher risk of exposure to improve health equity.*

INTRODUCTION

Adverse childhood experiences (ACEs) are traumatic events occurring before age 18 and are associated with increased risk of developing physical, psychological, and behavioral health problems later in life (Hughes et al., 2017; Kalmakis & Chandler, 2015). The first study of ACEs and adulthood health, conducted in 1995-97 by Kaiser Permanente, surveyed a relatively high socioeconomic status (SES) and commercially-insured population in San Diego, CA, finding that over half of respondents reported one ACE and a quarter reported two or more (Felitti et al., 1998). Disparities in the prevalence of ACEs by race, SES, gender, sexual orientation, and other characteristics persist, with populations in socially-privileged positions consistently reporting fewer ACEs than socially-marginalized groups (Giano et al., 2020). Like many population health studies, studies of ACEs frequently omit results for smaller populations such as the Multiracial (two or more races) and American Indian/Alaska Native (AI/AN) groups. However, the few studies that do present results for these two groups find that they have higher mean ACE scores than other racially-defined groups (Giano et al., 2020; Hall et al., 2020; Merrick et al., 2018; Weller et al., 2021).

Current Centers for Disease Control and Prevention (CDC) ACEs prevention guidance advocates generally for strengthened social and economic supports for families, but does not discuss racial disparities in ACEs or targeted strategies for reducing disparities (CDC, 2019). However, disparities in ACEs result from the inequitable distribution of the social and structural determinants of health, which are in turn a product of structural racism (i.e., "the totality of ways in which societies foster racial discrimination, via mutually reinforcing inequitable [social] systems") (Bailey et al., 2017; Harper et al., 2023). Examples of these processes include targeted overpolicing leading to mass incarceration of communities of color, racially discriminatory lending practices leading to racial residential segregation and persistent racial wealth gaps, and racialized treatment standards in health care delivery leading to disparities in treatment access and outcomes. Structural racism has subordinated minoritized groups in different ways across space and time through what Omi and Winant call *racialization*, with certain processes differentially targeting specific groups (e.g., genocide of AI/AN tribes, chattel enslavement and later mass incarceration of Black people, or exclusion of Asian immigrants) (Kim, 1999; Omi & Winant,

2014). However, because of the consistent spatiotemporal patterning of racial stratification across numerous social, educational, economic, and health outcomes in the US, structural racism is widely considered a "fundamental cause" of health inequities (Phelan & Link, 2015).

Among the most enduring and severe examples of structural racism are the historic and continued dispossession and colonization of Indigenous lands; forced resettlement of AI/AN peoples into reservations; substandard health care, educational, and employment opportunities on those reservations; and the wholesale erasure of language, culture, knowledge, and identity impacting generations of AI/AN communities, families, and individuals (Cross, 2014). These historical and ongoing processes are hypothesized to link to biological and behavioral expressions of embodied trauma via overlapping socioeconomic, psychopathological, and pathophysiological mechanisms, ultimately leading to population health disparities (Walters et al., 2011). The collective stress resulting from coping with trauma has facilitated adverse familial and developmental environments and exposure to parental separation, substance use, mental illness, and neglect (e.g., ACEs) (Goodkind et al., 2012; Strickland et al., 2006). Thus, while ACEs are an individual-level measure, their disproportionate prevalence among the AI/AN population compared to other groups may reflect a deeper history of collective cultural trauma and structural racism specifically affecting AI/AN communities (Giano et al., 2021).

The majority of literature on structural racism focuses on monoracial groups; thus, its influence on the distribution of risk factors – including ACEs – in the Multiracial population remains relatively less clear. Increasingly, however, social scientists recognize that Multiracial peoples' experience of racialization are unique, and that the links between structural racism, risk factors, and health disparities for this group may differ from others. A growing body of research highlights the impact of psychosocial processes resulting from structural racism on Multiracial peoples' health and well-being, including anti-Multiracial discrimination (i.e., *monoracism*); links between identity formation, racial categorization systems, and health; and the importance of racially diverse contexts in supporting healthy psychological adjustment (Franco & Carter, 2019; Franco & O'Brien, 2020; Gabriel et al., 2022; Grilo et al., 2022; Jones & Rogers, 2022; Lam-Hine et al., 2023). It is plausible that the Multiracial group's high mean ACE score could reflect unsupportive environments shaped by structurally racist forces that adversely impact social and developmental trajectories of Multiracial youth.

Compounding the challenges of studying Multiracial peoples' experiences of structural racism is the sheer diversity encompassed within a catch-all Multiracial category. Some have

argued that a Multiracial category is so broad that its use leads to aggregation fallacy (i.e., misclassification arising from aggregating dissimilar groups) (Song, 2021). From this perspective, an alternative explanation for the group's unexpectedly high ACE scores could then be that it is biased upward by potentially high scores among the approximately two-thirds of Multiracial people that identify as AI/AN (Pew Research Center, 2015). If this were true, reporting data in an aggregate Multiracial category would be an example of *data genocide*, an information bias that distorts statistics for AI/AN or Native Hawaiian or Pacific Islander (NHPI) groups because of the large proportion of people in these groups that are Multiracial (Friedman et al., 2023; Quint et al., 2023). However, to the extent that Indigenous Multiracial people prefer to be identified with their Indigenous heritage, as Multiracial, or as both, assignment into any one single category may reflect a form of erasure, underscoring the importance of theory in guiding aggregation and disaggregation decisions (Becker et al., 2021; Khanna, 2012). Unfortunately, large, nationally representative health surveys frequently report race in collapsed categories, making disaggregation of the Multiracial population in population health research challenging.

In this study, we explore whether the Multiracial group's high mean ACE score reflects the effects of aggregating data from Multiracial participants identifying as AI/AN with those that do not, two groups with potentially distinct social experiences and health needs. To do so, we rely on a dataset that reports all of the races self-identified by participants and test the hypothesis that Multiracial participants identifying as AI/AN will report significantly higher mean ACE scores and prevalence of individual ACE components than those that do not. Support of this hypothesis would suggest that lumping all Multiracial subgroups together when reporting ACEs data is inappropriate and that data on the Multiracial AI/AN group should potentially be reported separately or in an aggregated AI/AN "alone or in combination" category. This information may be especially valuable for informing the currently recommended CDC ACEs prevention strategies, which are universal in nature and not tailored for the specific needs of racial, ethnic, or Indigenous groups.

MATERIALS AND METHODS

Data and Analytic Sample

The National Longitudinal Study of Adolescent to Adult Health (Add Health) is a longitudinal, nationally representative study following 20,745 individuals from grades 7-12 in 1994-

95 through four waves of follow up (1996, 2001-02, 2008-09, 2016-18) (Harris, 2013). Add Health is the largest US-based longitudinal health study that has consistently allowed study participants to select more than one racial category, making it an important source of research on Multiracial people (Charmaraman et al., 2014). From a database of all 26,666 high schools in the United States, Add Health selected 80 public and private high schools with probability based on enrollment size, stratifying schools by type, grade range, setting, demographics, and geographic location. Investigators matched high schools to associated feeder middle schools, and sampled students in grades 7-12 without stratification from school enrollment rosters, purposely oversampling certain demographic groups. Students received invitations to complete an at-home interview during Wave 1 (N = 20,745 participants). This interview included detailed questions about the adolescent's demographics and family background, social networks, home and school environments, and health behaviors. Wave 4 was conducted 14 years later (2008-09) when the participants were in their late 20's and included measurements of the participants' metabolic and cardiovascular function. More details about the study design can be found elsewhere (Harris, 2013).

Classification of Race

Add Health participants were asked to self-identify their race and ethnicity in Waves 1 and 3. In Wave 1, there were five choices: White, Black, American Indian/Native American, and Asian or Pacific Islander (API), and Other, with the option to select multiple categories. We recoded American Indian/Native American to AI/AN to align with wording in other Add Health survey questions and federal standard racial group nomenclature; however, Add Health's survey instruments prevent separating the API group into Asian and NHPI categories as is current practice. In a separate question, participants were asked if they identified as Hispanic or Latino. At Wave 3, the "Other" option was removed, still with the option to select multiple categories. If a participant selected multiple categories in both waves, we used their Wave 3 races. If a participant only identified as Multiracial in Wave 1 (but not in Wave 3), we used their Wave 1 race. We further split the Multiracial group into those reporting and not reporting AI/AN ancestry. The final racial categories were White, Black, API, AI/AN, Multiracial AI/AN, and Multiracial non-AI/AN. Post-hoc analysis led us to exclude the "Other alone" category due to the lack of meaningful interpretation, large confidence intervals, and smaller sample size relative to other groups (n = 24).

Despite official attempts to separate race and Hispanic ethnicity, a majority of Hispanic/Latino people consider *Latinidad* to be a core part of their racial identity (Pew Research

Center, 2015). When race and Hispanic ethnicity are assessed separately, it becomes impossible to differentiate between monoracial or Multiracial Hispanic/Latino people. Given these challenges, we align our methods with other studies using Add Health data (Udry et al., 2003) and exclude participants identifying as Hispanic/Latino in Wave 1 or 3.

Measurement of ACEs

The original ACEs questionnaire included seven question categories, each corresponding to a domain of adverse experiences related to abuse or household dysfunction. The abuse categories included (1) emotional, (2) physical, and (3) sexual abuse; the household dysfunction categories included (4) substance abuse, (5) mental illness, (6) domestic abuse (mother treated violently), and (7) incarceration history in the household (Felitti et al., 1998). Later versions of the ACEs questionnaire added a neglect domain covering emotional and physical neglect, as well as a parental divorce category in the household dysfunction domain for a total of ten categories. These ten categories are still reflected in the current adult ACEs screener recommended by the California Surgeon General's ACEs Clinical Advisory Committee and the ACEs Aware initiative (ACEs Aware, 2020). We used a modified version of the widest set of questions available in Add Health data to construct ten variables approximating the components of the ACEs Aware adult screener, coding variables as binary and then summing them (minimum of zero and maximum of ten) (Lee et al., 2020). Further details on the questions and variables used to construct the ACEs score in Add Health are available in Appendix A.

Statistical Analyses

We compared crude mean ACE scores (e.g., the mean number of ACEs experienced) and prevalence ratios of reporting each ACE component across racial groups. We chose to present unadjusted figures as our goal is to describe actual disparities, not present an artificially-constructed alternative reality (Fox et al., 2022; Lesko et al., 2022). Because Add Health's design purposely oversampled certain groups based on demographic characteristics, we used complex survey weights to produce nationally representative estimates and standard errors. We assessed differences in group mean scores and prevalence of individual ACE components using Tukey's honestly significant difference test, adjusted p values using Bonferroni correction for multiple testing and compared resulting values to alpha = 0.05, and incorporated design effects in analyses using complex survey weights. We used Markov chain Monte Carlo multiple imputation (M=20)

to adjust for high missingness in ACE components (frequencies presented in Appendix B). Our imputation models specified all ACE components, participant demographic information, and variables hypothesized to be associated with missingness as imputation predictor variables. We conducted all data analyses using R software. The University of California, Berkeley Office for Protection of Human Subjects determined that this study was exempt from review.

RESULTS

Table 1 presents unweighted counts and weighted frequencies of participant sex, age, component ACE scores, and summary ACE scores by racial group. Total sample size was 12,372 after removing Hispanic/Latino participants, "Other alone" participants, and those missing complex survey weights for design-based analysis. Of these, the majority (93.6%) were monoracial, with monoracial White (74%) and Black (17%) participants forming the largest groups. Among the Multiracial group, a majority identified as AI/AN (61%). In the overall sample, prevalence of emotional abuse and physical neglect were strikingly high (47% and 43%, respectively); racial group prevalence estimates ranged between 45-54% and 42-53%, respectively. Prevalence of sexual abuse (5.9%) and mother treated violently (6.4%) were lowest among ACE components, with race-specific prevalences ranging from 4.6-9.4% and 3-12.4%, respectively. Overall sample prevalences ranged from 16-30% for physical abuse, emotional neglect, parental divorce or separation, household substance abuse, household mental illness, or parental incarceration.

Table 2 presents pairwise tests of differences in mean ACE scores between racial groups and associated 95% CIs. Among all racial groups, AI/AN (mean = 3.21, 95% CI: 2.54, 3.97), Multiracial AI/AN (2.95, 95% CI: 2.71, 3.18), Multiracial non-AI/AN (2.88, 95% CI: 2.57, 3.19), and Black (2.84, 95% CI: 2.65, 3.02) participants reported the highest mean ACE scores. Despite appreciable differences in point estimates, tests of difference in mean scores were not significant comparing the two Multiracial groups, nor in any pairwise comparisons between these groups and the AI/AN or Black groups. The mean scores of these four groups were all significantly higher than those of the White or API groups.

Table 3 summarizes the statistically significant pairwise tests of ACE component score prevalence ratios and associated 95% CIs (results from all tests available in Appendix C). Prevalence ratios were insignificant for all comparisons between AI/AN, Multiracial AI/AN, and

Multiracial non-AI/AN groups. Prevalence ratios were largest for the household substance abuse, household mental illness, and parental incarceration components. In these comparisons, AI/AN, Multiracial AI/AN, and Black participants had much higher prevalence than the API or White groups. Prevalence ratios of reported household substance abuse were 2-5 times higher for the AI/AN group compared to White (2.59, 95% CI: 1.79, 3.75), Black (2.31, 95% CI: 1.58, 3.37), or API (5.33, 95% CI: 2.84, 9.99) participants and about 1.5-3 times higher for the Multiracial AI/AN group compared to White (1.46, 95% CI: 1.18, 1.79) and API (3.00, 95% CI: 1.69, 5.31) groups. Household mental illness was twice as prevalent for Black compared to White participants (2.03, 95% CI: 1.71, 2.41) and approximately 3.5-4 times as prevalent for AI/AN compared to White (3.65, 95% CI: 2.22, 6.02) and API (3.96, 95% CI: 2.10, 7.48) participants. Parental incarceration was almost twice as prevalent for Black compared to White (1.83, 95% CI: 1.56, 2.15), 4.5 times compared to API (4.54, 95% CI: 1.96, 11.1) participants, and 1.5 times for Multiracial AI/AN compared to White participants (1.54, 95% CI: 1.23, 1.93). White participants generally were the least likely to report any of the ACE components.

Table 1.
Participant characteristics and ACE components[a] stratified by race, Add Health 1994-2008

Characteristic	AI/AN	Multiracial AI/AN	Multiracial non-AI/AN	API	Black	White	Overall
	76 (0.6%)	484 (3.9%)	313 (2.5%)	805 (3.2%)	2,915 (17%)	7,742 (74%)	12,372 (100%)
Male sex	41 (64%)	230 (50%)	150 (50%)	418 (53%)	1,267 (50%)	3,672 (51%)	5,778 (51%)
Mean age, (years)	28.8	28.8	28.8	29.2	29.2	28.9	29.0
Emotional abuse	33 (45%)	268 (52%)	172 (54%)	406 (51%)	1,329 (51%)	3,571 (45%)	5,779 (47%)
Physical abuse	22 (36%)	164 (37%)	98 (37%)	264 (37%)	603 (28%)	1,674 (26%)	2,825 (28%)
Sexual abuse	4 (8.4%)	34 (9.4%)	7 (4.6%)	37 (5.8%)	133 (8.2%)	246 (5.2%)	461 (5.9%)
Emotional neglect	27 (36%)	186 (39%)	109 (33%)	281 (35%)	903 (32%)	2,209 (28%)	3,715 (30%)
Physical neglect	29 (46%)	212 (48%)	119 (47%)	330 (53%)	954 (47%)	2,453 (42%)	4,097 (43%)
Parental divorce or separation	17 (34%)	149 (31%)	93 (35%)	64 (14%)	774 (34%)	1,922 (30%)	3,019 (30%)
Mother treated violently	0 (3.6%)	6 (3.6%)	10 (12%)	6 (3.0%)	61 (12.4%)	148 (5.2%)	231 (6.4%)
Household sub-stance abuse	23 (48%)	118 (32%)	49 (26%)	49 (13%)	408 (23%)	1,302 (21%)	1,949 (22%)
Household mental illness	14 (31%)	54 (18%)	30 (14%)	70 (14%)	313 (24%)	706 (14%)	1,187 (16%)
Parental incarcera-tion	24 (32%)	124 (25%)	72 (26%)	48 (6.3%)	726 (29%)	1,212 (16%)	2,206 (19%)
Mean ACE score	3.21	2.95	2.88	2.32	2.84	2.35	2.46

ACE = adverse childhood experience; AI/AN = American Indian/Alaska Native; API = Asian or Pacific Islander

[a] Counts are crude non-missing values; proportions (for categorical variables) and means (for continuous) are pooled estimates from 20 survey-weighted imputations

Table 2.
Mean ACE scores by race and mean difference test[a] results, Add Health 1994-2008

Comparison	Mean ACE score (95% CI)	Reference	Mean difference[b] (95% CI)	*p* value
AI/AN	3.21 (2.54, 3.97)	Multiracial AI/AN	0.19 (-0.08, 0.46)	0.164
		Multiracial non-AI/AN	0.10 (-0.18, 0.38)	0.486
		API	0.50 (0.25, 0.76)	< 0.001
		Black	0.10 (-0.12, 0.32)	0.390
		White	0.43 (0.22, 0.64)	< 0.001
Multiracial AI/AN	2.95 (2.71, 3.18)	Multiracial non-AI/AN	0.09 (-0.15, 0.33)	0.470
		API	0.69 (0.49, 0.89)	< 0.001
		Black	0.29 (0.11, 0.46)	0.001
		White	0.62 (0.46, 0.78)	< 0.001
Multiracial non-AI/AN	2.88 (2.57, 3.19)	API	0.60 (0.36, 0.84)	< 0.001
		Black	0.18 (-0.01, 0.40)	0.062
		White	0.53 (0.33, 0.73)	< 0.001
API	2.32 (2.09, 2.54)	Black	-0.40 (-0.56, -0.25)	< 0.001
		White	-0.07 (-0.21, 0.07)	0.325
Black	2.84 (2.65, 3.02)	White	0.33 (0.25, 0.42)	< 0.001
White	2.35 (2.26, 2.44)			

AI/AN = American Indian/Alaska Native; API = Asian or Pacific Islander
[a] Tukey's honestly significant difference pairwise tests
[b] Mean difference = comparison mean – reference mean

Table 3.
Significant[a] Bonferroni-corrected[b] tests of ACE component prevalence ratios, Add Health 1994-2008

Comparison	Reference	ACE component	Prevalence ratio[c] (95% CI)	p value
AI/AN	API	Household substance abuse	5.33 (2.84, 9.99)	< 0.001
		Household mental illness	3.96 (2.10, 7.48)	< 0.001
	Black	Household substance abuse	2.31 (1.58, 3.37)	< 0.001
	White	Household substance abuse	2.59 (1.79, 3.75)	< 0.001
		Household mental illness	3.65 (2.22, 6.02)	< 0.001
Multiracial AI/AN	API	Household substance abuse	3.00 (1.69, 5.31)	< 0.001
	White	Physical abuse	1.42 (1.19, 1.69)	< 0.001
		Emotional neglect	1.37 (1.18, 1.59)	< 0.001
		Household substance abuse	1.46 (1.18, 1.79)	< 0.001
		Parental incarceration	1.54 (1.23, 1.93)	< 0.001
API	White	Physical abuse	1.45 (1.18, 1.77)	< 0.001
		Physical neglect	1.35 (1.16, 1.56)	< 0.001
Black	API	Parental incarceration	4.54 (1.96, 11.1)	< 0.001
	White	Sexual abuse	1.64 (1.27, 2.13)	< 0.001
		Mother treated violently	2.33 (1.47, 3.69)	< 0.001
		Household mental illness	2.03 (1.71, 2.41)	< 0.001
		Parental incarceration	1.83 (1.56, 2.15)	< 0.001

AI/AN = American Indian/Alaska Native; API = Asian or Pacific Islander
[a] Results from all Tukey's honestly significant difference tests available in Appendix C
[b] Bonferroni-corrected *p* values compared to alpha = 0.05
[c] Prevalence ratio = comparison prevalence / reference prevalence

DISCUSSION

This study tested our hypothesis that the mean ACE score and prevalence of ACE score components is significantly higher among Multiracial participants with AI/AN ancestry than those without AI/AN ancestry. Our results refuted this hypothesis, as there were no significant differences between either the mean score or prevalence of components between Multiracial groups with and without AI/AN ancestry, suggesting that reporting ACE scores combining AI/AN and non-AI/AN Multiracial people may not constitute data genocide. Tests of mean difference in scores and prevalence ratio of ACE components were also insignificant for all comparisons between the AI/AN group and the two Multiracial groups. However, when considering point estimate magnitudes alone, the AI/AN group had an appreciably higher mean ACE score than either of the two Multiracial groups, supporting previous studies suggesting that this group may be particularly vulnerable to ACEs. The elevated score for this group has been reported in previous studies but to our knowledge has not been put in direct comparison with Multiracial groups (Giano et al., 2021; Kenney & Singh, 2016).

The distribution of ACE components in the Add Health sample differed somewhat from those reported in the Giano et al. (2020) study of ACEs, which used pooled 2011-2014 data from the Behavioral Risk Factor Surveillance System (BRFSS) (Giano et al., 2020). Prevalence of emotional (47% vs. 34%) and physical abuse (28% vs. 18%) and parental incarceration (19% vs. 8%) were substantially higher in the overall Add Health sample, while prevalence of sexual abuse (6% vs. 12%) and household substance abuse (22% vs. 28%) were lower. Prevalence of household mental illness (16% vs. 17%) and parental separation or divorce (30% vs. 28%) were similar across the two samples (neglect measures and mother treated violently were not assessed in Giano et al., 2020). Giano and colleagues also found that Multiracial participants were more likely to report each of the ACE components than any other racial group except for parental separation or divorce and parental incarceration, which Black participants were most likely to report. That study did not report estimates for the AI/AN group; however, the authors pooled more years (2009-2017) of BRFSS data to provide stabilized estimates for the AI/AN population in a follow-up study (Giano et al., 2021). ACE component prevalences from the 2021 follow-up study of the AI/AN group showed similar prevalence across all components to results for the Multiracial population from their 2020 study. This study's findings confirm that prevalence of many ACE components (other

than household dysfunction components) are similar between the AI/AN group and Multiracial groups with and without AI/AN ancestry.

The insignificance of differences in ACE scores and component prevalence across both Multiracial groups may be related to the unique social experiences Multiracial people as a whole face – experiences which are not reflected in Add Health data. For example, implicit and explicit racism cited by interracial couples as a source of relationship stress could lead to elevated rates of intimate partner violence, divorce, and household dysfunction among interracial families (Bratter & Eschbach, 2006; Martin et al., 2013; Qian & Lichter, 2007; Rosenthal & Starks, 2015; Skinner & Hudac, 2017). However, it is important to acknowledge that the source of such social stressors is exogenous to interracial couples and not an inherent feature of interracial relationships. Beyond traditional forms of racism, evidence suggests monoracism is a feature of many interracial and Multiracial families, and may be especially harmful when perpetrated by family members (Atkin et al., 2022; Atkin & Jackson, 2021; Franco & Carter, 2019). It is thus plausible that certain ACEs such as abuse or neglect could reflect manifestation of monoracist beliefs or attitudes among parents of Multiracial children. Monoracism has received limited attention in public health literature, but could help explain other concerning cardiovascular, respiratory, and mental health disparities between monoracial and Multiracial people (Lam-Hine et al., 2023). Additional research is needed to describe disparities in exposure to monoracism and ACEs by Multiracial subgroups disaggregated beyond just AI/AN identity, which was not possible in Add Health data due to small sample sizes.

Another potential explanation for the lack of significant difference across the two Multiracial groups' ACE scores could be the fact that most Multiracial AI/AN people identify as Biracial AI/AN-White. Among this group, 61% report stronger affinity with White people than others, 81% report stronger ties to White relatives than AI/AN relatives, 66% live in predominantly White neighborhoods, and 88% report being mostly perceived as White (Pew Research Center, 2015). Social proximity to White communities and distance from AI/AN communities could thus be reflected in a social and health risk factor profile for this group that more closely resembles that of Whites. However, further nuance and differences in this group would likely arise following additional disaggregation across intersectional categories such as residence in urban or reservation areas, socioeconomic status, gender, sexuality, etc.

While tests of differences were insignificant comparing the AI/AN and Multiracial groups, the higher prevalence of household substance abuse, household mental illness, and parental

incarceration for AI/AN, Multiracial AI/AN, and Black participants could directly reflect the effects of specific structurally racist processes. For example, targeted overpolicing and resulting mass incarceration in Black and Indigenous communities directly impact risk of incarceration, which is associated with both substance abuse and mental illness (Baranyi et al., 2022; Warde, 2023). The CDC's ACEs prevention strategies – which are currently universal in nature – could benefit from additional tailoring, for example to disrupt structurally racist processes that differentially shape high-prevalence groups' risk of exposure to specific ACE components (Centers for Disease Control and Prevention, 2019; Lam-Hine et al., 2023). Examples of preventive interventions could include programs addressing racialized disparities in policing and incarceration, increased funding for programs supporting the re-entry process for formerly incarcerated individuals and their families (Draine et al., 2005; Wallace et al., 2016). Additional qualitative and mixed-methods research can help further elucidate the processes leading to these racialized groups' differential exposure to ACE components and effective preventive interventions.

This study had several strengths, including much more detailed race information than is typically available in large population-based datasets, and a uniquely large sample of Multiracial participants. It also had limitations. First, ACEs are defined as events occurring before the age of 18, but several ACEs domains can only be constructed with Add Health data using questions that were only asked during Wave 1, when participants were ages 12-19. Therefore, observations for those ACE domains were censored for any participants that turned 18 after Wave 1. This is particularly problematic for the parental separation or divorce ACE, given the high prevalence of divorce in the United States. Estimated ACE scores may thus be too low, especially for younger participants. Second, if there is indeed an association between mean ACE score and race, the removal of the "Other" race option during Wave 3 of Add Health may have unintentionally introduced differential misclassification that could have affected results in unpredictable ways, particularly those previously endorsing the "Other" racial group. Third, while various subgroups of the Multiracial population (e.g., Asian-White, AI/AN-Black) likely have very different life experiences, we did not further disaggregate the two Multiracial categories due to small sample sizes in Add Health (Charmaraman et al., 2014). This limitation likely masks substantial heterogeneity in ACE scores across subgroups of the Multiracial population. Finally, the AI/AN population of nearly 10 million people is also extremely diverse, comprising of roughly 1,000 federally recognized and unrecognized tribes speaking hundreds of distinct languages, living in

both urban and rural areas in all US states and territories. Add Health's sample size of 76 participants identifying as AI/AN alone is small; thus, inference on the AI/AN population as a whole from this sample should be done with caution. Replicating this analysis in a larger dataset could increase confidence in our estimates; however, multiple race selections are frequently unavailable in large population-based datasets without completing expensive and time-consuming applications, making such analyses difficult (Lam-Hine et al., 2024). Investigators involved with primary data collection should make detailed race variables (i.e., multiple race and ethnicity selections) available in public-use versions of published datasets, which could help advance knowledge on the nature and causes of Multiracial-monoracial and AI/AN disparities in ACEs.

This study is the first to provide preliminary evidence that Multiracial people with and without AI/AN ancestry do not have significantly different ACE scores or prevalence of ACE components, suggesting the high mean ACE score among Multiracial people does not result from aggregation fallacy. These results underscore the potential need to further tailor ACEs prevention strategies to account for group-specific needs and experiences. Regardless of this specific study's results, it is crucial that researchers carefully consider the impact of grouping Indigenous Multiracial people into an aggregate Multiracial category, and to examine if doing so results in an aggregation fallacy leading to data genocide for Indigenous groups. Studies disaggregating the Multiracial group are important for progressing towards health data equity, a prerequisite for health equity (Lam-Hine et al., 2024; Ponce et al., 2023). Population health researchers seeking to describe, monitor, and address racial health disparities should continue to integrate theory and knowledge of the unique health and social experiences of populations holding multiple overlapping social identities to develop effective preventive interventions.

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CONFLICT OF INTEREST

The authors declare they have no known conflicts of interest.

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APPENDIX

Appendix A. Crosswalk of topical domains, questions in Kaiser ACEs questionnaire, and questions in Add Health used to create ACEs score

Domain	ACE Questionnaire	Add Health Measure Coding
Emotional abuse	1. Did a parent or other adult in the household often... Swear at you, insult you, put you down, or humiliate you? Or Act in a way that made you afraid that you might by physically hurt? Yes/No	H4MA1 (Wave 4): Before your 18th birthday, how often did a parent or other adult caregiver say things that really hurt your feelings or made you feel like you were not wanted or loved? 1 = 1-10 times or more 0 = this never happened
Physical abuse	2. Did a parent or other adult in the household often... Push, grab, slap, or throw some- thing at you? Or Ever hit you so hard that you had marks or were injured? Yes/No	H3MA3 (Wave 3): Before the time you started 6th grade, how often had your parents or other adult care- givers slapped, hit, or kicked you? 1 = 1-10 times or more 0 = this never happened
Sexual abuse	3. Did an adult or person at least 5 years older than you ever... Touch or fondle you or have you touch their body in a sexual way? Or Try to actually have oral, anal, or vaginal sex with you? Yes/No	H3MA4 (Wave 3): Before the time you started 6th grade, how often had your parents or other adult care- givers touched you in a sexual way, forced you to touch him or her in a sexual way, or forced you to have sexual relations? 1 = 1-10 times or more 0 = this never happened

Domain	ACE Questionnaire	Add Health Measure Coding
Emotional neglect	4. Did you often feel that… No one in your family loved you or thought you were important or special? Or Your family didn't look out for each other, feel close to each other, or support each other? Yes/No	H1PR8 (Wave 1): How much do you think your family pays attention to you? 1 = quite a bit – very much 0 = not at all – somewhat
Physical neglect	5. Did you often feel that… You didn't have enough to eat, had to wear dirty clothes, and had no one to protect you? Or Your parents were too drunk or high to take care of you or take you to the doctor if you needed it? Yes/No	By the time you started 6th grade, how often had your parents or other adult care-givers: H3MA1 (Wave 3): Left you home alone when an adult should have been with you? Or H3MA2 (Wave 3): Not taken care of your basic needs, such as keeping you clean or providing food or clothing? 1 = 1-10 times or more for either 0 = this never happened
Parental separation or divorce	6. Were your parents ever separated or divorced? Yes/No	PA38 – PA54 (Wave 1 Parent) 1 = parents divorced or separated before participant turned 18 0 = parents not divorced or separated before participant turned 18
Mother treated violently	7. Was your mother or step-mother: Often pushed, grabbed, slapped, or had something thrown at her? Or Sometimes or often kicked, bitten, hit with a fist, or hit with something hard? Or Ever repeatedly hit over at least a few minutes or Threatened with a gun or knife? Yes/No	PB20 (Wave 1 Parent): How much do you fight or argue with your current (spouse/partner)? 1 = a lot 0 = not at all – some

Domain	ACE Questionnaire	Add Health Measure Coding
Household substance abuse	8. Did you live with anyone who was a problem drinker or alcoholic or who used street drugs? Yes/No	PC49E_2 (Wave 1 Parent): His/her biological father has alcoholism? Or PC49E_3 (Wave 1 Parent): His/her biological mother has alcoholism? Or H1TO52 (Wave 1): Are illegal drugs easily available to you in your home? 1 = yes to any 0 = no to all
Mental illness in household	9. Was a household member depressed or mentally ill or did a household member attempt suicide? Yes/No	PA20 (Wave 1 Parent): In general, are you (main parent respondent) happy? Or PB16 (Wave 1 Parent): In general do you think (he/she) (main parent respondent's partner or spouse) is happy? Or H1SU6 (Wave 1): Have any of your family tried to kill themselves during the past 12 months? 1 = yes to PA20, yes to PB16, and no to H1SU6 0 = any other combination of responses
Incarceration of household member	10. Did a household member go to prison? Yes/No	H4WP3 (Wave 4): Has/did your biological mother ever spent/spent time in jail or prison? Or H4WP9 (Wave 4): Has/did your biological father ever spent/spend time in jail or prison? Or H4WP16 (Wave 4): Has/did your mother figure ever spent/spend time in jail or prison? Or H4WP30 (Wave 4): Has/did your father figure ever spent/spend time in jail or prison? 1 = yes to any 0 = no to all

Appendix B. Participant characteristics[a] comparing complete case[b], imputations[c], and missingness[d], stratified by race

Characteristic	AI/AN	M. AI/AN	M. non-AI/AN	API	Black	White	Overall
	76 (0.6%)	484 (3.9%)	313 (2.5%)	805 (3.2%)	2,915 (17%)	7,742 (74%)	12,372 (100%)
Male sex							
Complete case	41 (64%)	230 (50%)	150 (50%)	418 (53%)	1,267 (50%)	3,672 (51%)	5,778 (51%)
Imputed	64%	50%	50%	53%	50%	51%	51%
Missing	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Age							
Complete case	28.8	28.8	28.8	29.2	29.2	28.9	29.0
Imputed	28.8	28.8	28.8	29.2	29.2	28.9	29.0
Missing	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Emotional abuse							
Complete case	33 (44%)	268 (52%)	172 (54%)	406 (51%)	1,329 (46%)	3,571 (47%)	5,779 (47%)
Imputed	45%	52%	54%	51%	51%	45%	47%
Missing	3 (9.0%)	10 (1.5%)	5 (1.2%)	8 (1.3%)	63 (2.6%)	92 (1.4%)	181 (1.7%)
Physical abuse							
Complete case	22 (33%)	164 (37%)	98 (37%)	264 (38%)	603 (29%)	1,674 (26%)	2,825 (28%)
Imputed	36%	37%	37%	37%	28%	26%	28%
Missing	13 (21%)	68 (16%)	68 (23%)	141 (16%)	703 (27%)	1,502 (20%)	2,495 (21%)
Sexual abuse							
Complete case	4 (2.4%)	34 (7.8%)	7 (2.4%)	37 (5.4%)	133 (6.5%)	246 (4.0%)	461 (4.5%)
Imputed	8.4%	9.4%	4.6%	5.8%	8.2%	5.2%	5.9%
Missing	11 (19%)	57 (13%)	64 (21%)	125 (13%)	665 (26%)	1,453 (19%)	2,375 (20%)
Emotional neglect							
Complete case	27 (36%)	186 (39%)	109 (33%)	281 (35%)	903 (32%)	2,209 (29%)	3,715 (30%)
Imputed	36%	39%	33%	35%	32%	28%	30%
Missing	2 (1.0%)	4 (0.5%)	0 (0%)	4 (1.6%)	17 (0.8%)	37 (0.6%)	64 (0.7%)
Physical neglect							
Complete case	29 (38%)	212 (28%)	119 (46%)	330 (55%)	954 (45%)	2,453 (41%)	4,097 (42%)
Imputed	46%	48%	47%	53%	47%	42%	43%
Missing	14 (23%)	81 (20%)	74 (25%)	167 (18%)	733 (27%)	1,675 (22%)	2,744 (23%)
Parental divorce or separation							
Complete case	17 (36%)	149 (30%)	93 (35%)	64 (15%)	774 (33%)	1,922 (29%)	3,019 (30%)
Imputed	34%	31%	35%	14%	34%	30%	30%

Characteristic	AI/AN	M. AI/AN	M. non-AI/AN	API	Black	White	Overall
Missing	19 (22%)	72 (12%)	67 (21%)	269 (30%)	605 (23%)	971 (12%)	2,003 (15%)
Mother treated violently							
Complete case	0 (0%)	6 (1.2%)	10 (5.7%)	6 (0.5%)	62 (6.4%)	148 (2.8%)	231 (3.0%)
Imputed	3.6%	3.6%	12%	3.0%	12.4%	5.2%	6.4%
Missing	42 (68%)	169 (29%)	153 (50%)	355 (42%)	1,602 (58%)	2,102 (37%)	4,423 (33%)
Household substance abuse							
Complete case	23 (51%)	118 (29%)	49 (25%)	49 (9.6%)	408 (22%)	1,302 (20%)	1,949 (20%)
Imputed	48%	32%	26%	13%	23%	21%	22%
Missing	21 (15%)	98 (16%)	87 (24%)	309 (37%)	817 (31%)	1,273 (15%)	2,605 (19%)
Household mental illness							
Complete case	14 (46%)	54 (17%)	30 (12%)	70 (12%)	313 (25%)	706 (12%)	1,187 (14%)
Imputed	31%	18%	14%	14%	24%	14%	16%
Missing	37 (64%)	155 (26%)	139 (46%)	334 (41%)	1,473 (53%)	1,982 (25%)	4,120 (31%)
Parental incarceration							
Complete case	24 (33%)	124 (24%)	72 (25%)	48 (6.3%)	726 (29%)	1,212 (16%)	2,206 (18%)
Imputed	32%	25%	26%	6.3%	29%	16%	19%
Missing	10 (9.2%)	33 (5.5%)	29 (5.7%)	34 (3.0%)	187 (6.2%)	436 (4.7%)	729 (5.0%)
Mean ACE score							
Complete case	2.58	2.45	2.15	1.92	2.12	1.89	1.94
Imputed	3.21	2.95	2.84	2.32	2.84	2.35	2.46

[a] Unweighted counts

[b] Weighted proportions (for categorical variables) and means (for continuous) reported

[c] Imputations pooled over 20 datasets; imputation models included all regression variables and variables representing status of parental self-rated health, divorce, employment, disability, retirement, happiness, and welfare receipt, interviewer assessments of neighborhood safety and how well-kept the household is, and number of interruptions to interview with parent

[d] Unweighted counts and weighted proportions

Appendix C. Summary of all Bonferroni-corrected[a] Tukey's honestly significance difference tests of ACE component prevalence ratios, Add Health 1994-2008

ACE Component	Comparison	PR (95% CI)	*p* value
Emotional abuse	Black-White	0.98 (0.91, 1.06)	> 0.999
	API-White	1.10 (0.95, 1.27)	> 0.999
	AI/AN-White	0.94 (0.68, 1.30)	> 0.999
	M. AI/AN-White	1.12 (1.00, 1.26)	> 0.999
	M. not AI/AN-White	1.16 (1.02, 1.33)	> 0.999
	API-Black	1.12 (0.97, 1.30)	> 0.999
	AI/AN-Black	0.96 (0.70, 1.32)	> 0.999
	M. AI/AN-Black	1.14 (1.00, 1.30)	> 0.999
	M. not AI/AN-Black	1.18 (1.03, 1.36)	> 0.999
	AI/AN-API	0.86 (0.61, 1.19)	> 0.999
	M. AI/AN-API	1.02 (0.86, 1.21)	> 0.999
	M. not AI/AN-API	1.05 (0.90, 1.24)	> 0.999
	M. AI/AN-AI/AN	1.19 (0.84, 1.69)	> 0.999
	M. not AI/AN-AI/AN	1.23 (0.88, 1.73)	> 0.999
	M. not AI/AN-M. AI/AN	1.03 (0.88, 1.22)	> 0.999
Physical abuse	Black-White	1.09 (0.95, 1.25)	> 0.999
	API-White	1.45 (1.18, 1.77)	< 0.001
	AI/AN-White	1.24 (0.77, 2.00)	> 0.999
	M. AI/AN-White	1.42 (1.19, 1.69)	< 0.001
	M. not AI/AN-White	1.43 (1.10, 1.84)	0.42
	API-Black	1.33 (1.06, 1.66)	0.84
	AI/AN-Black	1.14 (0.70, 1.85)	> 0.999
	M. AI/AN-Black	1.30 (1.07, 1.60)	0.60
	M. not AI/AN-Black	1.31 (0.98, 1.74)	> 0.999
	AI/AN-API	0.86 (0.51, 1.44)	> 0.999
	M. AI/AN-API	0.98 (0.77, 1.26)	> 0.999
	M. not AI/AN-API	0.99 (0.74, 1.31)	> 0.999
	M. AI/AN-AI/AN	1.15 (0.69, 1.91)	> 0.999

ACE Component	Comparison	PR (95% CI)	*p* value
	M. not AI/AN-AI/AN	1.15 (0.67, 1.97)	> 0.999
	M. not AI/AN-M. AI/AN	1.00 (0.76, 1.33)	> 0.999
Sexual abuse	Black-White	1.64 (1.27, 2.13)	< 0.001
	API-White	1.36 (0.59, 3.13)	> 0.999
	AI/AN-White	0.61 (0.09, 4.02)	> 0.999
	M. AI/AN-White	1.98 (1.30, 3.01)	0.12
	M. not AI/AN-White	0.62 (0.20, 1.91)	> 0.999
	API-Black	0.83 (0.35, 1.97)	> 0.999
	AI/AN-Black	0.37 (0.05, 2.54)	> 0.999
	M. AI/AN-Black	1.20 (0.78, 1.85)	> 0.999
	M. not AI/AN-Black	0.37 (0.12, 1.16)	> 0.999
	AI/AN-API	0.45 (0.05, 3.90)	> 0.999
	M. AI/AN-API	1.45 (0.59, 3.58)	> 0.999
	M. not AI/AN-API	0.45 (0.12, 1.78)	> 0.999
	M. AI/AN-AI/AN	3.22 (0.45, 23.3)	> 0.999
	M. not AI/AN-AI/AN	1.00 (0.11, 9.21)	> 0.999
	M. not AI/AN-M. AI/AN	0.31 (0.10, 0.94)	> 0.999
Emotional neglect	Black-White	1.12 (1.01, 1.24)	> 0.999
	API-White	1.24 (1.04, 1.48)	0.96
	AI/AN-White	1.28 (0.84, 1.95)	> 0.999
	M. AI/AN-White	1.37 (1.18, 1.59)	< 0.001
	M. not AI/AN-White	1.16 (0.92, 1.47)	> 0.999
	API-Black	1.11 (0.93, 1.32)	> 0.999
	AI/AN-Black	1.14 (0.75, 1.74)	> 0.999
	M. AI/AN-Black	1.22 (1.03, 1.45)	> 0.999
	M. not AI/AN-Black	1.04 (0.83, 1.31)	> 0.999
	AI/AN-API	1.03 (0.67, 1.58)	> 0.999
	M. AI/AN-API	1.10 (0.89, 1.36)	> 0.999
	M. not AI/AN-API	0.94 (0.71, 1.23)	> 0.999
	M. AI/AN-AI/AN	1.07 (0.69, 1.65)	> 0.999
	M. not AI/AN-AI/AN	0.91 (0.58, 1.43)	> 0.999
	M. not AI/AN-M. AI/AN	0.85 (0.65, 1.11)	> 0.999
Physical neglect	Black-White	1.11 (1.00, 1.22)	> 0.999
	API-White	1.35 (1.16, 1.56)	< 0.001

ACE Component	Comparison	PR (95% CI)	*p* value
	AI/AN-White	0.93 (0.52, 1.64)	> 0.999
	M. AI/AN-White	1.18 (1.04, 1.34)	0.72
	M. not AI/AN-White	1.13 (0.93, 1.38)	> 0.999
	API-Black	1.22 (1.04, 1.44)	> 0.999
	AI/AN-Black	0.84 (0.47, 1.48)	> 0.999
	M. AI/AN-Black	1.07 (0.92, 1.24)	> 0.999
	M. not AI/AN-Black	1.03 (0.84, 1.26)	> 0.999
	AI/AN-API	0.69 (0.38, 1.26)	> 0.999
	M. AI/AN-API	0.88 (0.72, 1.06)	> 0.999
	M. not AI/AN-API	0.84 (0.70, 1.02)	> 0.999
	M. AI/AN-AI/AN	1.27 (0.71, 2.28)	> 0.999
	M. not AI/AN-AI/AN	1.23 (0.68, 2.20)	> 0.999
	M. not AI/AN-M. AI/AN	0.96 (0.77, 1.20)	> 0.999
Parental divorce or separation	Black-White	1.13 (1.02, 1.26)	> 0.999
	API-White	0.50 (0.30, 0.83)	0.42
	AI/AN-White	1.22 (0.72, 2.10)	> 0.999
	M. AI/AN-White	1.03 (0.85, 1.24)	> 0.999
	M. not AI/AN-White	1.20 (0.96, 1.50)	> 0.999
	API-Black	0.44 (0.27, 0.73)	0.06
	AI/AN-Black	1.08 (0.63, 1.86)	> 0.999
	M. AI/AN-Black	0.91 (0.75, 1.10)	> 0.999
	M. not AI/AN-Black	1.06 (0.83, 1.35)	> 0.999
	AI/AN-API	2.44 (1.07, 5.57)	> 0.999
	M. AI/AN-API	2.05 (1.22, 3.43)	> 0.999
	M. not AI/AN-API	2.39 (1.43, 3.98)	0.06
	M. AI/AN-AI/AN	0.84 (0.47, 1.50)	> 0.999
	M. not AI/AN-AI/AN	0.98 (0.54, 1.77)	> 0.999
	M. not AI/AN-M. AI/AN	1.16 (0.87, 1.55)	> 0.999
Mother treated violently[b]	Black-White	2.33 (1.47, 3.69)	< 0.001
	API-White	0.19 (0.04, 0.83)	> 0.999
	AI/AN-White		
	M. AI/AN-White	0.42 (0.15, 1.16)	> 0.999
	M. not AI/AN-White	2.06 (0.93, 4.58)	> 0.999
	API-Black	0.08 (0.02, 0.38)	0.06

ACE Component	Comparison	PR (95% CI)	*p* value
	AI/AN-Black		
	M. AI/AN-Black	0.18 (0.06, 0.55)	0.18
	M. not AI/AN-Black	0.89 (0.36, 2.16)	> 0.999
	AI/AN-API		
	M. AI/AN-API	2.22 (0.37, 13.5)	> 0.999
	M. not AI/AN-API	10.9 (1.98, 60.3)	0.36
	M. AI/AN-AI/AN		
	M. not AI/AN-AI/AN		
	M. not AI/AN-M. AI/AN	4.93 (1.35, 17.8)	0.96
Household substance abuse	Black-White	1.12 (0.98, 1.28)	> 0.999
	API-White	0.49 (0.28, 0.83)	0.54
	AI/AN-White	2.59 (1.79, 3.75)	< 0.001
	M. AI/AN-White	1.46 (1.18, 1.79)	< 0.001
	M. not AI/AN-White	1.28 (0.91, 1.79)	> 0.999
	API-Black	0.43 (0.25, 0.76)	0.18
	AI/AN-Black	2.31 (1.58, 3.37)	< 0.001
	M. AI/AN-Black	1.30 (1.05, 1.60)	0.84
	M. not AI/AN-Black	1.14 (0.79, 1.63)	> 0.999
	AI/AN-API	5.33 (2.84, 9.99)	< 0.001
	M. AI/AN-API	3.00 (1.69, 5.31)	< 0.001
	M. not AI/AN-API	2.63 (1.35, 5.12)	0.24
	M. AI/AN-AI/AN	0.56 (0.37, 0.85)	0.42
	M. not AI/AN-AI/AN	0.49 (0.29, 0.85)	0.66
	M. not AI/AN-M. AI/AN	0.88 (0.59, 1.31)	> 0.999
Household mental illness	Black-White	2.03 (1.71, 2.41)	< 0.001
	API-White	0.92 (0.59, 1.45)	> 0.999
	AI/AN-White	3.65 (2.22, 6.02)	< 0.001
	M. AI/AN-White	1.34 (0.99, 1.81)	> 0.999
	M. not AI/AN-White	0.92 (0.54, 1.59)	> 0.999
	API-Black	0.45 (0.29, 0.71)	0.06
	AI/AN-Black	1.80 (1.08, 2.99)	> 0.999
	M. AI/AN-Black	0.66 (0.47, 0.93)	0.96
	M. not AI/AN-Black	0.46 (0.27, 0.78)	0.24
	AI/AN-API	3.96 (2.10, 7.48)	< 0.001

ACE Component	Comparison	PR (95% CI)	*p* value
	M. AI/AN-API	1.46 (0.85, 2.50)	> 0.999
	M. not AI/AN-API	1.00 (0.52, 1.93)	> 0.999
	M. AI/AN-AI/AN	0.37 (0.21, 0.65)	0.06
	M. not AI/AN-AI/AN	0.25 (0.12, 0.55)	0.06
	M. not AI/AN-M. AI/AN	0.69 (0.37, 1.29)	> 0.999
Parental incarceration	Black-White	1.83 (1.56, 2.15)	< 0.001
	API-White	0.40 (0.17, 0.93)	> 0.999
	AI/AN-White	2.09 (0.90, 4.86)	> 0.999
	M. AI/AN-White	1.54 (1.23, 1.93)	< 0.001
	M. not AI/AN-White	1.59 (1.22, 2.07)	0.06
	API-Black	0.22 (0.09, 0.51)	< 0.001
	AI/AN-Black	1.14 (0.48, 2.72)	> 0.999
	M. AI/AN-Black	0.84 (0.67, 1.06)	> 0.999
	M. not AI/AN-Black	0.87 (0.69, 1.09)	> 0.999
	AI/AN-API	5.26 (1.62, 17.1)	0.36
	M. AI/AN-API	3.87 (1.63, 9.18)	0.12
	M. not AI/AN-API	3.99 (1.67, 9.53)	0.12
	M. AI/AN-AI/AN	0.74 (0.32, 1.67)	> 0.999
	M. not AI/AN-AI/AN	0.76 (0.31, 1.89)	> 0.999
	M. not AI/AN-M. AI/AN	1.03 (0.75, 1.42)	> 0.999

PR = Prevalence Ratio M. = Multiracial; AI/AN = American Indian/Alaska Native

[a] Bonferroni-corrected *p* values compared to alpha = 0.05

[b] Observed and imputed values for AI/AN group were 0, preventing meaningful comparisons

[c] Prevalence ratio = comparison prevalence / reference prevalence

Risk and Protective Factors for Mental Health among American Indian, Alaska Native, and Native Hawaiian Older Adults in the United States

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Abstract: *Despite histories of loss and discrimination, more American Indian, Alaska Native, and Native Hawaiian (AI/AN/NH) people are living into old age. Risk and protective factors for AI/AN/NH Elder mental health are poorly described. Data from the 2017-2020 Identifying Our Needs (ION): A Survey of Elders needs assessment of 19,143 AI/AN/NH Elders receiving nutrition, socialization, and caregiver-assistance services through Title VI of the Older Americans Act were analyzed. We hypothesized that (1) family, cultural, and social engagement are protective factors, (2) limitations in activities of daily living (ADL) and instrumental activities of daily living (IADL) are risk factors for mental health status, and (3) status of grandparent caregiver is associated with lower mental health scores. As hypothesized, frequent engagement in traditional cultural activities was protective for mental health status. ADL/IADL limitations were the largest risk factor for poor mental health among AI/AN/NH Elders, while engagement in social activity was the strongest protective factor. Additionally, the status of a grandparent as a primary caregiver for their grandchildren was associated with poorer mental health. Indigenous-serving programs need expanded funding to support both cultural and personal/family services to the growing population of AI/AN/NH Elders in the United States.*

INTRODUCTION

Mental health is a priority set forth by the U.S. Surgeon General's Office (Surgeon General's Office, 2024). The older adult (65+ years) group is the fastest growing population demographic in the United States (US Census Bureau, 2024), but older adults are markedly absent from the priority populations for mental health protection. This may be, in part, because limited previous research suggests that fewer older adults experience depression compared to younger adults, which recognizes the role of survivorship and resilience in aging (Blazer, 2000, 2003; Gerlach et al., 2022). Approximately 5-10% of the general population of community-living adults aged 65 and older in the United States have depression, and major risk factors for depression include chronic disease, disability, and lack of social support (Blazer, 2003; Cheruvu & Chiyaka, 2019; Kiyoshige et al., 2019; Na & Streim, 2017). Despite these seemingly low rates of mental health disorders among the general older adult population, more research is needed to support older adults who do experience adverse mental health effects. Importantly, American Indian, Alaska Native, and Native Hawaiian (AI/AN/NH) populations experience unique mental health challenges rooted in the history of trauma, yet are unlikely to seek proper help (National Alliance on Mental Illness, 2024).

AI/AN/NH Elders have the unique experience of living through U.S. policies focused on termination of AI/AN/NH Tribal governance systems and the forceable assimilation of AI/AN/NH peoples into the general population (Wilkins & Stark, 2017). These policies resulted in loss of culture, land, and traditions, which was determinantal to AI/AN/NH ways of life and to the mental health of AI/AN/NH peoples (Brave Heart, 1995; Sotero, 2006; Walters et al., 2011). Currently, about 9.7 million AI/ANs and about 560,000 NHs are estimated to live in the United States, together comprising less than 3% of the U.S. population (Chavez & Kaur, 2021). As of 2020, over 300,000 of these AI/AN/NH peoples were aged 65 or over and these numbers are expected to increase to over 640,000 by 2060 (Administration on Community Living, 2021).

On the whole, life expectancy is 5.5 years shorter for the AI/AN population and 2.9 years shorter for the NH population than the national average, although this varies by Tribe and state (Indian Health Service, 2019; Wu et al., 2017). Lower life expectancies experienced by AI/AN/NH populations are the result of structural inequities directly and indirectly related to colonization and

earlier onset of chronic disease experienced by these groups (Jaramillo et al., 2022; de Leeuw et al., 2015). Nevertheless, more AI/AN/NH people are living into old age, making this group increasingly interested in gerontologists (Braun et al., 2014; Jervis, 2010).

Although there is growing awareness of the impact of historical trauma on the physical and mental health of Indigenous Peoples worldwide (Brave Heart, 1995; Hiratsuka et al., 2017; Sotero, 2006; Walters et al., 2011), less is known about current risk and protective factors associated with mental health in AI/AN/NH older adults in the United States. A 2017 literature review found that AI/AN/NH adults may have a lower or similar prevalence of depression and anxiety disorders compared to non-AI/AN/NH adults, but a higher prevalence of post-traumatic stress disorder (Kisely et al., 2017). A 2020 analysis of 818 AI Elders in the Strong Heart Study found that 20% reported depressive symptoms (Suchy-Dicey et al., 2020), compared to the national general estimates of 5-10% (Blazer, 2003). Additionally, in 2020, AI/AN people had the highest rate of suicide across all age groups, commonly linked to depression, at 23.9 per 100,000 compared to 16.9 per 100,000 for non-Hispanic Whites (Ehlman et al., 2022). As noted above, AI/AN/NH Elders experience structural inequities, including greater disparities in education, income, and housing compared to older adults from the White population of the U.S., which may contribute to higher rates of suicide and lower life expectancy (Adamsen et al., 2018; Pettit et al., 2014; Suchy-Dicey et al., 2020). While AI/AN/NH Elders have faced historical trauma and structural inequities, they also exhibit significant resilience through cultural continuity, community engagement, and traditional healing practices (Viscogliosi et al., 2020). It is important to explore both the risk and protective factors associated to mental health in the population.

A major risk factor for depression and declining mental health for older adults is the presence of a disability, which is commonly operationalized by counting limitations in Activities of Daily Living (ADL; including bathing, dressing, toileting, transferring, eating, and walking) and Instrumental Activities of Daily Living (IADL; including cooking, cleaning, shopping, managing money, and going out of the house). Similarly, secondary analyses of the National Social Life, Health, and Aging Project (Na & Streim, 2017) and the Medicare Health Outcomes Survey (Albanese et al., 2020) suggest that mental health declines as ADL limitations increase, and an analysis of data from the Fordham Centenarian Study found that IADL limitations were also associated with depression (Jopp et al., 2016).

Social support is seen as a protective factor for good mental health in later life in the general population (Gariépy et al., 2016), while family caregiving has been seen as both a risk and

protective factor. Schure and Goins (2015) found a positive correlation between depressive symptomology and receipt of informal caregiving for AI Elders. However, it is also recognized that, among AI/AN/NH Elders, family care for a dependent member aligns with family values and is positively associated with participation in cultural events (Goins et al., 2010). In regards to caring for grandchildren, research in AI/AN/NH communities has found that this is expected and important, but it also can be associated with economic and social hardships for Elders (Lewis et al., 2018; Mokuau et al., 2015). Such hardships regarding poor economic status and social impacts can be detrimental to mental health status.

Social engagement is a protective factor in the general population (Ertel et al. 2008; Lee et al., 2012) and AI/AN/NH Elders. Studies have pointed out the protective role of cultural practice and community involvement in the mental health status of AI/AN/NH peoples (Adamsen et al., 2021; Browne et al., 2020; Howell & Bardach, 2018; Nelson et al., 2013; Rasmus et al., 2019). For AI/AN/NH peoples, cultural practice is not just about entertainment. Rather, it often involves speaking, learning, or teaching AI/AN/NH languages; eating traditional foods; honoring traditional customs and spiritual practices; and participating in ceremonies and activities with family, friends, and other community members (Adamsen et al., 2021; Redvers & Blondin, 2020; Lewis, 2011).

To learn more about the risks and protective factors for mental health of AI/AN/NH Elders, we analyzed data from the 2017-2020 *Identifying Our Needs (ION): A Survey of Elders* needs assessment administered by the University of North Dakota (UND) National Resource Center on Native American Aging. The assessment collected health and social data from AI/AN/NH Elders participating in nutrition and caregiver programs funded through Title VI of the Older Americans Act (Older American Act, 1965; Administration for Community Living, 2023). Results are used by Tribes to estimate the current health status of their older members, identify needs for services, and satisfy needs assessment requirements associated with Title VI funding (Adamsen et al., 2021, 2018; Schroeder, 2019). The needs assessment was analyzed to test the hypotheses that: 1) participation in family, cultural, and social activities are associated with better mental health; 2) high ADL/IADL limitation scores are associated with poorer mental health; and 3) status of grandparent caregiver is associated with lower mental health.

METHODS

Survey Data

This paper examined data from the 2017-2020 Identifying Our Needs (ION): A Survey of Elders, a survey of AI/AN/NH Elders receiving nutrition, socialization, and caregiver-assistance services through Title VI of the Older Americans Act (Older American Act, 1965; Administration for Community Living, 2023). Data were collected from 23,427 AI/AN/NH Elders, representing more than 258 Tribes, Native villages, and communities. These Elders are affiliated with 168 Title VI programs serving AI Elders, 28 programs serving AN Elders, and one program serving NH Elders. The ION instrument included 72 items on general health status, hospitalizations, ADL and IADL limitations, health behaviors, health care access, social engagement, household size, caregiving, mental health, service needs, and sociodemographics (for more information, please see Adamsen et al., 2021, 2018; Schroeder, 2019).

Data Access and Ethical Approvals

The assessment and analysis of associated data were approved by UND under protocol IRB-200712-139. Additionally, each participating Tribe has passed a tribal resolution or other form of permission document required by the AI/AN/NH community's governing body to authorize data processing. In some instances, this can also include approvals that are necessary by the tribe's institutional review board. The data remain the property of the AI/AN/NH Tribes, villages, and communities that supplied them and are not available for public use without the express permission of the Tribes. The UND is entrusted by Tribes as the repository of data and, per tribal agreements, all data must remain on the UND server for analysis. UND staff analyze tribal-level data and provide reports directly to Tribes. UND staff also have permission to publicly share analyses related to aggregated data.

Setting

The primary purpose of the ION: A Survey of Elders was to fulfill a needs assessment requirement for the Title VI grant application process. The survey was distributed by over 200 Title VI programs, which made a standardized recruitment approach not feasible. Instead, individual Title VI programs were responsible for implementing recruitment methods that worked best for their programs and communities. A convenience sample approach was most often used with each program surveying Elders who meet their eligibility criteria through program outreach

rather than random selection. No incentive was offered by the researchers for completion of the survey. Participants were allowed to self-administer the survey, or a Title VI program staff member could assist administrating the survey.

Participants

Due to the decentralized nature of the survey administration, refusal rates and data on the general health and independence of the program participants were not collected. From the 23,427 Elders who completed the needs assessment, we excluded 2,333 participants who did not identify as AI, AN, or NH; 1,805 participants who reported their age as less than the Title VI program age requirement of 55 years; and 146 records that were missing data for the section on mental health. Thus, the analytical sample in this study was 19,143 Elders, including 17,184 AI Elders, 1,521 AN Elders, and 438 NH Elders.

Measures

Dependent Variable

The revised Mental Health Index-5 (R-MHI-5) was used to assess mental health status on the needs assessment questionnaire. The R-MHI-5 has five questions: during the past month, how much of the time (1) were you a happy person, (2) have you felt calm and peaceful, (3) have you been a very nervous person, (4) have you felt downhearted and blue, (5) have you felt so down in the dumps that nothing could cheer you up? Four response options were offered: 1 = all of the time; 2 = most of the time; 3 = some of the time; and 4 = none of the time (Berwick et al., 1991; Veit et al., 1983). The first two items were reverse coded, responses were added together, and the sum was transformed into a 0 to 100 score, where 100 represents optimal mental health. Published norms suggest that R-MHI-5 mean scores for adults increase with age and that scores for adults ages 55 years and older range from 73.99 to 76.87 (Ware et al., 1993). Although the validity of the R-MHI-5 has limitations (Rumpf et al., 2001), numerous researchers believe it is an acceptable short assessment for depression in general (Thorsen et al., 2013) and among older adults (Friedman et al., 2005).

Explanatory Variables

These variables included sociodemographics, ADL and IADL limitations, living arrangements, caregiving, participation in cultural practices, and participation in social activities.

Missing values in the explanatory variables were coded as "unknown" to retain the sample size (Dong & Peng, 2013).

Sociodemographic Variables. AI/AN/NH group (AI, AN, and NH) was tested as an explanatory variable to examine the difference in R-MHI-5 score by group, with AI serving as the reference group. Most other sociodemographic variables were recoded. Age categories were 55-64, 65-74, 75-85, and 85+. Sex was coded as male or female. Education was coded as high school or lower, college/technical school, or graduate/professional school. Employment status was coded as full/part-time, retired, or not employed. The reference groups for regression were male, age group 55-64, high school of less education, and full/part-time employment.

ADL and IADL Limitations. Both ADL and IADL were calculated from the questions "because of a health or physical problem that lasted more than 3 months, did you have any difficulty with….". Elders marked yes or no for six ADL items: bathing or showering; dressing; eating; getting in or out of bed; walking; and using the toilet, including getting to the toilet. They also marked yes or no for six IADL items: preparing your own meals; shopping for personal items; using the telephone; doing heavy housework; doing light housework; and getting outside. The six ADL items were summed and then categorized into three groups: no limitations, 1-2 limitations, and 3 or more limitations. This was repeated for the six IADL items. The reference groups for regression were zero ADL limitations and zero IADL limitations.

Living Arrangements. Living arrangement and household size data were combined into one variable with four categories: lives with family and household size 2-3, lives with family and household size 4+, lives with non-family, and lives alone. The group of "live with non-family" was not separated by household size due to the limited sample size; this category also included households with non-family and family members living together. The reference group for regression was "lives alone."

Caregiving. The two caregiving questions were: "do you have a family member providing care for you" and "do you take care of grandchildren." The response options were "yes" or "no." For both variables, "no" was the reference group.

Cultural Practice and Social Activity Variables. The cultural practice variable question was, "How often do you participate in cultural practices that include traditional food, music, and customs?" Response options were none of the time (reference group), some of the time, most of the time, or all of the time. The social activity variable question was, "How many times per month do you get out and socialize, for example to attend church/ religious meetings, clubs/organizations

you belong to, or cultural activities/traditional ceremonies?" Participants were prompted to fill in the blank with a number and the numbers are grouped as: 0 times, 1-2 times, 3-4 times, 5-8 times, or 9 or more times.

Statistical Analysis

Statistical software R (version 4.1.0) was used for the analyses. We conducted descriptive analyses for the entire sample and by the three AI/AN/NH groups (mean and standard deviation for continuous variables, frequency and proportion for categorical variables). To examine the association between the explanatory variables and R-MHI-5 score, we performed sequential multivariable linear regression models controlling for different subsets of explanatory variables: model 1 included only sociodemographic variables; model 2 added ADL and IADL limitations; and model 3 added factors, including living arrangement, caregiving variables, cultural practice, and social activity. For linear regression analysis, we reported regression coefficients, 95% confidence intervals (CIs), and the corresponding *p*-values. Significance was based on $p < 0.05$. Intercepts were included in the model, referring to the mean R-MHI-5 score for the reference group.

RESULTS

The characteristics of the sample by AI/AN/NH group are shown in **Table 1**, and the differences were significant (p<.01) for each of the variables. The dependent variable, mean R-MHI-5 score ($\alpha = 0.812$), varied significantly across groups with the lowest (76.0) in the AI group and highest (80.9) in the NH group.

Across all groups, females were overrepresented (AI = 61.0%, AN = 57.3%, and NH = 74.9%) compared to males. The AI group had the highest percentage of the youngest Elders aged 55 to 64 years (33.9%) who qualify for Title VI services but are not yet eligible for entitlement programs such as Medicare, and the NH group had the highest percentage of the oldest age group of 85+ (20.3%). For education, 43.2% of the AI and 40.2% of the NH groups reported attending college and above, compared to 32.4% of the AN group. Perhaps as a reflection of the difference in age distribution, the AI group had a higher proportion of Elders working full-time or part-time (30.4%), while the NH group had the highest percentage of retirees (42.5%).

Despite having the youngest age distribution, 38.3% of AI Elders reported one or more ADL limitations, compared to 33.7% of AN and 26.3% of NH Elders. Similarly, the presence of IADL limitations was the highest among AI Elders, with 44.2% reporting one or more limitations, compared to 38.0% of AN and 31.1% of NH Elders.

Approximately 40% of each group were living with family members in households of two to three people, about 20-25% of each group lived in households with four or more family members, and between 21-28% of each group lived alone. Less than 9% of each group lived with non-family.

In terms of cultural practice frequency, the NH group was most likely to report consistent engagement, with 32.4% saying "all the time" or "most of the time," compared to 28% of AN and 20.1% of AI Elders. The AI group was most likely to report no time spent in cultural practice, with 28.9% saying "none of the time." For the open-ended question on the frequency of social activity, 13.5% of the overall sample reported no social activity in a month (writing 0 in the blank). However, 62.6% of NH Elders reported engaging in social activity five or more times per month, compared to 40.6% of AN and 36.2% of AI Elders.

About 32% of overall respondents reported that a family member provided care for them. The percentage was highest in AI Elders (32.8%) and lowest in the NH group (26.3%), likely reflecting that more AI and fewer NH Elders reported ADL and IADL limitations. About one-fourth (25%) of the respondents across the groups reported taking care of grandchildren.

Table 1.
Sample characteristics for the total sample and by AI/AN/NH group[a]

	All	American Indian	Alaska Native	Native Hawaiian
	N=19,143	N=17,184	N=1,521	N=438
	Mean ± SD	**Mean ± SD**	**Mean ± SD**	**Mean ± SD**
Mental health R-MHI-5	76.3±16.7	76.0±16.7	77.9±16.4	80.9±15.7
	N (%)	**N (%)**	**N (%)**	**N (%)**
Sex				
Male	7,208 (37.7)	6,478 (37.7)	624 (41.0)	106 (24.2)
Female	11,686 (61.0)	10,486 (61.0)	872 (57.3)	328 (74.9)
Unknown	249 (1.3)	220 (1.3)	25 (1.6)	4 (0.9)
Age Group				
55-64	6,271 (32.8)	5,823 (33.9)	373 (24.5)	75 (17.1)
65-74	6,928 (36.2)	6,177 (35.9)	606 (39.8)	145 (33.1)
75-84	3,349 (17.5)	2,877 (16.7)	343 (22.6)	129 (29.5)
85+	2,595 (13.6)	2,307 (13.4)	199 (13.1)	89 (20.3)

continued on next page

Table 1 continued
Sample characteristics for the total sample and by AI/AN/NH group[a]

	All N=19,143	American Indian N=17,184	Alaska Native N=1,521	Native Hawaiian N=438
Education				
High school or less	10,709 (55.9)	9,465 (55.1)	985 (64.8)	259 (59.1)
College/Tech	6,802 (35.5)	6,221 (36.2)	437 (28.7)	144 (32.9)
Graduate/Professional	1,289 (6.7)	1,200 (7.0)	57 (3.7)	32 (7.3)
Unknown	343 (1.8)	298 (1.7)	42 (2.8)	3 (0.7)
Employment				
Full/Part-time	5,688 (29.7)	5,229 (30.4)	374 (24.6)	85 (19.4)
Retired	4,495 (23.5)	3,880 (22.6)	429 (28.2)	186 (42.5)
Not employed	8,088 (42.3)	7,281 (42.4)	650 (42.7)	157 (35.8)
Unknown	872 (4.6)	794 (4.6)	68 (4.5)	10 (2.3)
# of ADL Limitations				
0	11,930 (62.3)	10,599 (61.7)	1,008 (66.3)	323 (73.7)
1-2	5,087 (26.6)	4,654 (27.1)	356 (23.4)	77 (17.6)
3 or more	2,126 (11.1)	1,931 (11.2)	157 (10.3)	38 (8.7)
# of IADL Limitations				
0	10,832 (56.6)	9,587 (55.8)	943 (62.0)	302 (68.9)
1-2	5,420 (28.3)	4,981 (29.0)	355 (23.3)	84 (19.2)
3 or more	2,891 (15.1)	2,616 (15.2)	223 (14.7)	52 (11.9)
Living arrangement				
Living alone	4,837 (25.3)	4,313 (25.1)	430 (28.3)	94 (21.5)
With family, hhsize[b] 2-3	7,398 (38.7)	6,649 (38.7)	574 (37.7)	175 (40.0)
With family, hhsize [b] 4+	3,991 (20.9)	3,581 (20.8)	300 (19.7)	110 (25.1)
With non-family	1,426 (7.5)	1,289 (7.5)	98 (6.4)	39 (8.9)
Unknown	1,491 (7.8)	1,352 (7.9)	119 (7.8)	20 (4.6)
Cultural practice frequency				
None of the time	5,375 (28.1)	4,966 (28.9)	318 (20.9)	91 (20.8)
Some of the time	8,982 (46.9)	8,065 (46.9)	721 (47.4)	196 (44.7)
Most of the time	2,451 (12.8)	2,105 (12.2)	267 (17.6)	79 (18.0)
All of the time	1,583 (8.3)	1,362 (7.9)	158 (10.4)	63 (14.4)
Unknown	752 (3.9)	686 (4.0)	57 (3.7)	9 (2.1)
Social activity per month				
0 times	2,578 (13.5)	2,337 (13.6)	195 (12.8)	46 (10.5)
1-2 times	3,516 (18.4)	3,244 (18.9)	236 (15.5)	36 (8.2)
3-4 times	3,967 (20.7)	3,583 (20.9)	320 (21.0)	64 (14.6)
5-8 times	2,931 (15.3)	2,633 (15.3)	231 (15.2)	67 (15.3)
9 or more	4,183 (21.9)	3,589 (20.9)	387 (25.4)	207 (47.3)
Unknown	1,968 (10.3)	1,798 (10.5)	152 (10.0)	18 (4.1)
Family member provided care for me				
No	12,181 (63.6)	10,879 (63.3)	987 (64.9)	315 (71.9)
Yes	6,208 (32.4)	5,632 (32.8)	461 (30.3)	115 (26.3)
Unknown	754 (3.9)	673 (3.9)	73 (4.8)	8 (1.8)
Take care of grandchildren				
No	13,121 (68.5)	11,708 (68.1)	1,089 (71.6)	324 (74.0)
Yes	5,295 (27.7)	4,820 (28.0)	367 (24.1)	108 (24.7)
Unknown	727 (3.8)	656 (3.8)	65 (4.3)	6 (1.4)

[a] The p-values for the tests of group differences are <0.01.
[b] hhsize: household size

Findings from the regression models, with R-MHI-5 score as the dependent variable, are shown in **Table 2**. In Model 1, including sociodemographic characteristics, most associations were significant. Being NH was associated with a 4.76-point increase in R-MHI-5 score. The older age groups had higher R-MHI-5 scores than those aged 55-64. In all groups, having more education was associated with higher R-MHI-5 scores. For instance, Elders with college or technical school education had a 1.28-point higher R-MHI-5 score, and Elders with graduate/professional education had a 1.54-point higher R-MHI-5 score compared to Elders with high school or less education. Lower scores were associated with being female (-1.92), being retired (-2.33), and being unemployed (-4.10).

Model 2 added ADL and IADL limitations to Model 1. As expected, AI/AN/NH Elders with ADL or IADL difficulties had worse mental health than those without ADL or IADL difficulties. Specifically, scores exponentially worsened for Elders with one or two ADL limitations (-3.18) and three or more limitations (-6.11). Similarly, scores worsened for Elders with one to two IADL limitations (-4.32) and three or more IADL limitations (-8.28).

Model 3 added living arrangement, cultural practice, social activity, and caregiving variables to Model 2 (see Table 2). Adding these variables did not change the significant negative associations between ADL/IADL limitations and the R-MHI-5 scores as seen in Model 2. The ideal living arrangement appeared to be with a family with a household size of 2-3 (+0.82) compared to living alone, whereas living with a non-family was associated with lower R-MHI-5 scores (-2.05). Engaging in cultural practice "all of the time" was also associated with significantly higher R-MHI-5 scores (+2.28) compared to those who reported never engaging in cultural practices. Participation in social activity was associated with higher R-MHI-5 scores, from +2.12 points for one activity per month to +6.10 for nine or more activities per month. Controlling for ADL and IADL limitations and other covariates, Elders who were caregiving recipients had a slightly higher R-MHI-5 score (+0.92) compared to those who were not receiving care, whereas taking care of grandchildren was associated with a lower R-MHI-5 score (-1.16) compared to non-caregivers. Across all three models, being NH was significantly associated with a higher R-MHI-5 score.

Table 2.
Linear regression analysis of R-MHI-5

	Model 1[a] Beta	*p*	Model 2[b] Beta	*p*	Model 3[c] Beta	*P*
Intercept[d]	77.26 (76.63, 77.89)	<0.001	80.03 (79.34, 80.71)	<0.001	75.51 (74.57, 76.45)	<0.001
Sex (Ref: Male)						
Female	-1.92 (-2.40, -1.43)	<0.001	-1.53 (-2.00, -1.06)	<0.001	-1.65 (-2.12, -1.18)	<0.001
Unknown	-2.85 (-4.94, -0.76)	0.008	-2.56 (-4.57, -0.56)	0.012	-2.91 (-4.89, -0.93)	0.004
Age Group (Ref: 55-64)						
65-74	2.38 (1.79, 2.97)	<0.001	2.24 (1.68, 2.81)	<0.001	2.01 (1.45, 2.57)	<0.001
75-84	4.00 (3.26, 4.74)	<0.001	4.00 (3.29, 4.72)	<0.001	3.51 (2.80, 4.22)	<0.001
85+	1.98 (1.20, 2.76)	<0.001	2.66 (1.90, 3.41)	<0.001	2.37 (1.61, 3.12)	<0.001
Education (Ref: High school or lower)						
College/Tech	1.28 (0.77, 1.79)	<0.001	1.04 (0.55, 1.53)	<0.001	0.81 (0.32, 1.30)	0.001
Graduate/Professional	1.54 (0.58, 2.50)	0.002	1.22 (0.30, 2.14)	0.01	0.72 (-0.20, 1.63)	0.127
Unknown	1.43 (-0.35, 3.21)	0.115	1.01 (-0.70, 2.72)	0.249	0.62 (-1.07, 2.32)	0.472
Race/ethnicity (Ref: American Indian)						
Alaska Native	1.83 (0.96, 2.70)	<0.001	1.24 (0.40, 2.07)	0.004	0.96 (0.13, 1.78)	0.024
Native Hawaiian	4.76 (3.18, 6.33)	<0.001	3.36 (1.85, 4.88)	<0.001	2.43 (0.93, 3.94)	0.002
Employment (Ref: Full/Part-time)						
Retired	-2.33 (-3.03, -1.63)	<0.001	-0.28 (-0.96, 0.40)	0.418	-0.55 (-1.23, 0.12)	0.11
Not employed	-4.10 (-4.69, -3.51)	<0.001	-1.20 (-1.79, -0.62)	<0.001	-1.36 (-1.94, -0.77)	<0.001
Unknown	-4.20 (-5.40, -3.00)	<0.001	-2.44 (-3.59, -1.29)	<0.001	-2.78 (-3.93, -1.64)	<0.001
# of ADL Difficulties (Ref: 0)						
1-2			-3.18 (-3.83, -2.54)	<0.001	-3.08 (-3.72, -2.44)	<0.001
3 or more			-6.11 (-7.09, -5.13)	<0.001	-5.96 (-6.93, -4.98)	<0.001
# of IADL Difficulties (Ref: 0)						
1-2			-4.32 (-4.95, -3.69)	<0.001	-4.26 (-4.88, -3.63)	<0.001
3 or more			-8.28 (-9.19, -7.37)	<0.001	-7.92 (-8.84, -7.01)	<0.001
Living arrangement (Ref: Living alone)						
With family, hhsize[e] 2-3					0.82 (0.24, 1.40)	0.006
With family, hhsize[e] 4+					0.14 (-0.54, 0.81)	0.692
With non-family					-2.05 (-2.98, -1.12)	<0.001
Unknown					0.10 (-0.93, 1.13)	0.845
Cultural practice frequency (Ref: None of the time)						
Some of the time					-0.27 (-0.82, 0.29)	0.345
Most of the time					0.68 (-0.10, 1.46)	0.087
All of the time					2.28 (1.37, 3.19)	<0.001
Unknown					2.78 (1.44, 4.13)	<0.001
Social activity per month (Ref: 0 times)						
1-2 times					2.12 (1.29, 2.94)	<0.001
3-4 times					2.87 (2.07, 3.68)	<0.001
5-8 times					4.84 (3.98, 5.70)	<0.001
9 or more					6.10 (5.29, 6.91)	<0.001
Unknown					4.43 (3.44, 5.42)	<0.001
Family provide care for me (Ref: No)						
Yes					0.92 (0.39, 1.45)	<0.001
Unknown					2.21 (0.53, 3.90)	0.01
Take care of grandchildren (Ref: No)						
Yes					-1.16 (-1.70, -0.61)	<0.001
Unknown					-1.06 (-2.77, 0.66)	0.226

[a] Model 1 is adjusted for sociodemographics.
[b] Model 2 has ADLs/IADLs added to Model 1.
[c] Model 3 has a living arrangement, cultural practice, social activity, and caregiving variables in addition to variables in Model 2.
[d] Intercept: mean MHI_100 for the reference group.
[e] hhsize: household size

DISCUSSION

Findings from this quantitative analysis of assessment data collected from 19,143 AI/AN/NH Elders suggest that the mean R-MHI-5 score for this AI/AN/NH sample (76.3) was similar to national norms for all U.S. adults 55 years and older (last estimated in the 1990s at 76.9 for Elders ages 65-74 years and 74.0 for Elders aged 75+ years) (Ware et al., 1993). As expected, R-MHI-5 scores were higher in Elders living with family, engaging in cultural and social activities, with fewer ADL/IADL limitations, and fewer caregiving responsibilities (Albanese et al., 2020; Ertel et al., 2008; Jopp et al., 2016; Lee et al., 2012; Na & Streim, 2017; Ware et al., 1993).

Research suggests that activity participation, such as traditional and cultural activities, is linked to individual well-being because social activity increases perceptions of social support (Adams et al., 2011). Mackenzie and Abdulrazak (2021) also found a strong association between a number of social activities and measures of social engagement (defined as the number of friends and family they see, feel close to, and can discuss personal matters with) in their cross-sectional study of Canadian Elders. In other words, individuals participating in more social activities are likely to report more social support and less psychological distress. This suggests that perhaps simple measures of social participation, like those used in this assessment, may serve as proxy measures for social support.

The caregiving variables suggested that receiving care was associated with a slightly higher R-MHI-5 score (+0.92) and caring for grandchildren was associated with a slightly lower score (-1.16). These single-item variables likely do not do justice to caregiving situations, as the reasons for receiving care and the reasons for caring for grandchildren are not known. Research suggests that AI/AN/NH Elders prefer to receive care from family members than strangers (Braun et al., 2014). However, research also suggests that some family caregivers are better at providing care than others, with younger caregivers, caregiving sons, and caregivers living elsewhere meeting fewer of the Elder's needs compared to older, female family members living with the Elder (Beach & Schulz, 2017). Elders who care for grandchildren do so under many different circumstances, from occasional babysitting to becoming guardians and full-time caregivers for grandchildren whose parents are incapable or unavailable to provide that care (Hill, 2016). Also, the consequences of caring for grandchildren likely differ by the Elder's financial circumstances and culture. For example, Chen and colleagues (2015) found that grandparents co-residing with grandchildren experience more health deterioration than those who do not, and that living in a

skipped generation household may be particularly detrimental to health, especially for grandparents with limited financial and social resources. Overall, despite the positive aspects of caregiving, such as a sense of fulfillment (Jennings et al., 2021), without proper support, caregiving can be associated with increased levels of caregiving burden, depression, and anxiety (Hong et al., 2023; Schulz et al., 2008; Yao et al., 2024). Furthermore, grandparents taking care of grandchildren with severe physical illness experience added challenges related to emotional fear and lack of formal help (Priboi et al., 2022).

The NH group had a higher mean R-MHI-5 score of 80.1 compared to the other groups. NH Elders were also more likely to report engaging in cultural practices all or most of the time (34.2% vs. 21.1% for the entire sample) and participating in five or more social activities per month (62.6% vs. 37.2% for the entire sample). NHs were the group of Elders with the highest proportion of retirees, which may impact the higher rates of cultural and social participation.

A possible explanation may stem from the fact that the NH history and ongoing experience with colonization, while devastating, differs in important ways from the experience of AI and AN people (Muneoka et al., 2021). Unlike with AI peoples, the United States did not establish treaties with NH groups. Rather, the sovereign kingdom of Hawai‘i was illegally overthrown by the U.S. military and annexed in 1898. Only seven schools in Hawai‘i were funded by the federal government to assimilate Native Hawaiian children, but the experience was different than that experienced by many AI and AN children who were removed from their families and sent to faraway boarding schools (Sebwenna-Painter et al., 2023). Also, there is just one Native Hawaiian language with more than 90% of Hawai‘i residents literate in written Hawaiian before children were banned from using it in the schools, whereas hundreds of AI and AN languages exist (and many have been lost) making it difficult to maintain Native language fluency. In 1978, the Hawai‘i constitution was amended to make Hawaiian an official language, and today a good number of public elementary and secondary schools teach only in Hawaiian. Also, Hawai‘i is seen as a dreamy tourist destination, and the romanticizing and broad accessibility of Hawaiian culture may have reduced racist attitudes toward this group compared to AI/ANs. Future studies need to incorporate each group's historical and cultural narratives to fully understand the context of health and activities.

Limitations

This study had several limitations. First, the R-MHI-5 questions usually offer six response options and yield scores of 6 to 30, which are transformed from 0 to 100 using the standard linear

transformation (Ware et al., 2000). However, in the UND assessment survey, only four response options were provided. Based on feedback from staff that administered the survey, two response options were left out: "a good bit of the time" and "a little of the time," as staff noted difficulties explaining to Elders the difference between these and adjacent items (e.g., "a good bit of the time" and "most of the time"). Although these changes are acknowledged as a limitation, they are also a strength given that they made the survey more accessible to AI/AN/NH Elders.

Additionally, the items measuring participation in cultural practices and participation in social activities (which included cultural activities and traditional ceremonies as well as religious and organizational meetings) were somewhat conflated. However, these items were measured slightly differently; response options for participation in cultural activities were from never to always, while the response option for frequency of participation in social activities was open-ended.

Variables not included in the assessment have also been shown to negatively affect mental health status, including perceived racial discrimination (William et al., 2019) and experiences with ageism (Lyons et al, 2018). These two constructs are usually measured with multi-item scales but to add additional questions to an already-long assessment would require a search for single-item measures for race and age discrimination, which we may consider for future iterations of the questionnaire.

Lastly, in order to be included in the survey sample, Tribes, Tribal organizations, and NH-serving organizations had to be part of a Title VI program. This meant that they needed to have at least 50 people aged 60+ to be eligible for services and thus participate in the survey, so smaller Tribes and NH communities were not represented in the sample. Also, urban AI/AN peoples are not in the sample, although urban NH did participate in the survey. These limitations result in a lack of generalizability of the sample to all AI/AN/NH Elders in the United States, especially those living in urban settings. Regardless, there are no other samples of this large of a scope to learn from.

CONCLUSION

This study confirms that living with family and frequent participation in social and cultural activities are protective of mental health, while the effects of receiving care and caring for grandchildren are mixed. Thus, incorporating traditional or cultural practices into Eldercare programming is of great importance, as it provides other opportunities for socialization and program support with ADL and IADL limitations and caregiving. The Title VI program of the

U.S. Administration for Community Living funds AI/AN/NH communities to provide these types of services to their Elders, but funding should be expanded as the number of AI/AN/NH Elders continues to grow. Additional federal, state, and local agencies are also encouraged to fund services to help support the growing Elder population. For instance, funding opportunities and policies to support community-based programs that can understand and incorporate tribal culture and community relationships are critical in supporting the needs of the increasing number of diverse aging populations.

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CONFLICT OF INTEREST

The authors declare they have no known conflicts of interest.

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Assessing American Indian Traditional Ceremonial Practices and Substance Use Behaviors in an Urban, Multi-Tribal Setting: Results from a Community Survey

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Abstract: *American Indian and Alaska Native (AI/AN) communities have relied on traditional ceremonial practices (TCPs) for survival and resilience for generations. Research examining the role of TCPs on wellness in urban, multi-tribal communities, however, has only recently emerged over the last several decades. This study explored the association between TCP-related variables and substance use in an urban AI/AN community in Montana. Specifically, participant knowledge, attitudes, and beliefs (KAB) regarding TCPs, their level of intent to participate in TCPs, and past year substance use were measured. This cross-sectional study used survey data from 194 AI/AN adults (66% female, 5% nonbinary; M age = 44). Positive KAB toward TCPs was found in 56.4% of respondents. Greater level of intent to participate in TCPs was found in 36.7% of respondents. Multivariate logistic regression showed individuals with positive KAB were less likely to report past year alcohol [adjusted odds ratio (AOR): 0.49; 95% confidence interval (95% CI): 0.26, 0.93] or other drug use (AOR: 0.30; 95% CI: 0.11, 0.76). Individuals who reported a greater level of intent to participate in TCPs were also less likely to report past year alcohol (AOR: 0.51; 95% CI: 0.26, 0.98) or other drug use (AOR: 0.31; 95% CI: 0.08, 0.91). The findings highlight a need for further examination of the potential effectiveness of substance use interventions for urban AI/AN adults that incorporate TCP-related factors.*

INTRODUCTION

American Indian and Alaska Native (AI/AN) communities have successfully relied on long-held traditional ceremonial practices (TCPs) to survive and heal from historical traumas, such as forced relocation and boarding schools, for generations (Brave Heart et al., 2011, 2016; Hartmann & Gone, 2014). Despite millennia of practice-based evidence, however, TCP-based substance use interventions are often deemed lacking an evidence base due to a paucity of academic research (Venner et al., 2021; Komro et al., 2023; Hunter et al., 2024). A national movement toward accepting only Western scientific evidence of effectiveness culminated with the development of the National Registry of Effective Prevention Practices (NREPP), in 1996, and its 2006 successor, the National Registry of Evidence-based Programs and Practices (Hennessy et al., 2006). AI/AN scholars, along with many other voices, drew attention to the inequity and lack of representation of cultural knowledge reflected in many NREPP interventions (Lucero, 2011). Additionally, NREPP-required criteria—such as reliability and validity of measures, intervention fidelity, missing data, and attrition—pose considerable challenges for AI/AN communities due to small population sizes and tribal heterogeneity (Walters & Simoni, 2009; Smith, 2021).

Reliance on evidence-based programs, whether culturally adapted or not, does not appear to have solved the crisis of substance use in AI/AN communities. Although the 2022 National Survey on Drug Use and Health found that lifetime alcohol use was lower among AI/AN participants than non-Hispanic Whites, AI/AN adults (18 years or older) reported the highest prevalence of heavy drinking for any identified race (Center for Behavioral Health Statistics and Quality [CBHSQ], 2023). AI/AN adults also reported the highest prevalence of both lifetime and past year illicit drug use—including marijuana, methamphetamine, and opioids—of any other race (CBHSQ, 2023). The COVID-19 pandemic added to the substance use crisis, with AI/AN communities experiencing the greatest drug overdose death rate (drug overdose deaths per 100,000) of any racial or ethnic group in the United States between January and September 2020, according to the CDC (Panchal et al., 2021).

As community-informed and community-led research approaches become more common, studies are beginning to highlight the potential for TCP-based interventions to prevent or decrease substance use within AI/AN communities (Jernigan et al., 2020; Dickerson et al., 2020; Chase-

Begay et al., 2023). Emerging research is finding that this approach may also be effective in urban AI/AN communities, which are often more heterogeneous in terms of tribal affiliation and acculturation (Wright et al., 2011; Tonigan et al., 2020; Dickerson et al., 2021). However, not enough information is available on the generalizability of TCP-based interventions within urban AI/AN populations. There have been no studies, for example, assessing the potential effectiveness for this type of substance use programming among urban AI/AN communities in the state of Montana.

Nationally, just over three percent of the population identifies as AI/AN alone or in combination with one or more racial group (Office of Minority Health, 2025). More than 70% of AI/AN people live in urban, non-reservation settings across the United States (Norris et al., 2012). However, Montana is a largely rural state, and the proportion of AI/AN people living in urban, non-reservation settings is closer to half (Health Resources and Services Administration, 2021). AI/AN people living in Montana's urban towns often retain strong relations and ties to a home reservation, including through cultural practices (Montana Office of Public Instruction, 2015).

There are five federally funded Urban Indian Health Organizations (UIHOs) located in Montana, the second highest concentration within any state after California (Indian Health Service, n.d.). To better understand TCPs and, more importantly, the potential acceptability of a TCP-based substance use intervention, a survey was conducted as part of a larger research study with AI/AN clients from one Montana UIHO. This study reports the findings of the survey and presents implications for the planning and development of future work to decrease substance use within this population.

METHODS

The 6 Rs of Indigenous Research—**R**espect, **R**elationship, **R**epresentation, **R**elevance, **R**esponsibility, and **R**eciprocity—guided the approach of this study (Tsosie et al., 2022). Meetings between the first author and AI/AN staff members at the UIHO—specifically the director of behavioral health and the behavioral health clinical supervisor—informed the conceptualization and design of this project. Study approval was received from both the UIHO board of directors and the Indian Health Service (IHS) National Institutional Review Board, protocol number N20-N-03.

Project Model

Prior to the COVID-19 pandemic, the community survey was conceptualized to measure self-reported rates of participation in TCP activities and past year substance use behaviors. However, the COVID-19 pandemic created a situation in which many community-based TCP activities were cancelled for several years in an effort to limit the spread of the SARS-CoV-2 virus. Accordingly, the research team adapted the survey measures to include construct measures that could approximate for direct participation in TCPs — a participant's knowledge, attitudes, and beliefs (KAB) regarding TCPs, their self-reported access to TCPs, and their self-reported intent to participate in TCPs.

The resulting COVID-adapted project model drew on several existing theories. The foundational tenet for this project is *Reziliency* (Belcourt-Dittloff, 2007). Adapted from Resilience Theory (Richardson, 2002), *Reziliency* was developed by an American Indian psychologist for application in both reservation and urban American Indian communities. It is a strengths-based framework that encompasses the positive factors, approaches, and methods used within AI/AN communities when faced with experiences of adversity or trauma that create an environment for individuals to demonstrate resilience (Belcourt-Dittloff, 2007). *Reziliency* informed the current study design through the emphasis and inclusion of asset-, rather than deficit-based, scales related to cultural and ceremonial practices.

Because the study did not measure direct participation in TCPs due to COVID-related prevention protocols, the research team drew on the theories of Reasoned Action and Planned Behavior (McEachan et al., 2016). These frameworks have been successfully applied to prior public health work with American Indian participants (Dippel et al., 2017; Dobbs et al., 2019). The theories include components related to KAB as well as intent (Steinmetz et al., 2016). Behavioral intention, in particular, is the step just before behavior in the models and has been shown to be a valid predictor variable, moderated by intention strength and stability (Conner & Norman, 2022). Based on these theoretical concepts, the research team developed the following COVID-responsive project model (Figure 1).

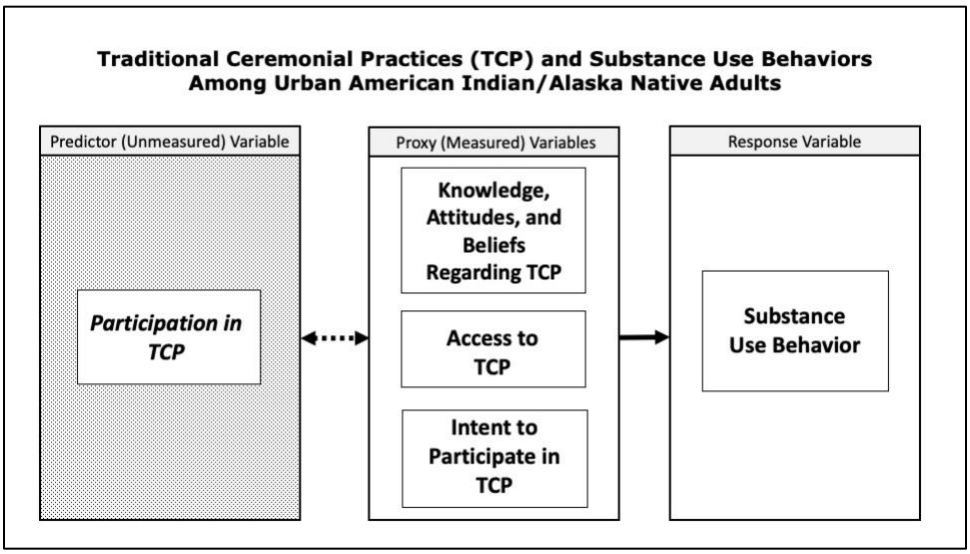

Figure 1. COVID-adapted project model showing the anticipated association between the predictor, proxy, and response variables. Dashed line represents unmeasured relationships; solid line represents measured (proxy) relationships.

Survey Development

In discussions between the lead author and UIHO staff, a concern was raised about the potential for survey fatigue. In addition to the current study and a need for a general community health assessment survey, the UIHO had also been approached by a graduate student seeking to conduct a community survey on intimate partner violence (IPV). Instead of three separate surveys, UIHO leadership decided, and the research team agreed, to combine the three survey topics (health assessment, TCPs, and IPV) into one general questionnaire.

Substance Use Measures

In partnership with the UIHO behavioral health leadership, select substance use measures were drawn from the National Survey on Drug Use and Health to capture data on needs and concerns as defined by, and relevant to, the target community. Specifically, respondents were asked about their past year use of (1) alcohol, (2) marijuana, (3) methamphetamine, (4) inhalants, and (5) prescription medications (in a way not directed by a medical provider).

TCP Measures

Knowledge, Attitudes, and Beliefs. A review of the literature was performed to inform the selection of scales or items aimed at measuring TCP-related constructs. A COVID-19 Indigenous Needs Assessment instrument that included a protective factor scale for TCP

(Indigenous Wellness Research Institute, n.d.) was adapted for this study to measure participant attitudes, knowledge, and beliefs (KAB) regarding TCP. The scale includes 13 items asking respondents about the importance of factors such as attending ceremonies, using traditional medicines, and seeking help from tribal elders, among others. Responses for this measure were collected on a 4-point Likert scale ranging from very important to not at all important.

Access. The research team could not find any prior published or unpublished studies using a scale that measured access to TCP. The team developed a novel scale for measuring access that included four items: (1) If I want to participate in ceremonies or traditional practices, I have people who will support me in doing so (family, friends, elders, etc.); (2) If I am invited to a ceremony or other traditional practice, I am confident that I will know what to do or how to act (e.g. when to talk, songs to sing, what to wear); (3) In my community, access to ceremony is largely based on who you are connected to (reverse coded); and (4) I would like to attend ceremonies in my community, but don't feel like I can because they don't reflect my own tribal practices (reverse coded). The access scale was provided to two American Indian clinical psychologists for feedback before pilot testing. Responses for this measure were collected on a 5-point Likert scale ranging from strongly agree to strongly disagree.

Intent. The research team could not find any prior published or unpublished studies using a scale that measured intent to participate in TCP. The team developed a novel scale for measuring intent that included five items: (1) Once COVID is no longer an issue or I feel safe again, I will participate in ceremonies or other traditional practices; (2) I will participate in ceremonies or other traditional practices, regardless of COVID; (3) If I am dealing with a physical illness, I will include ceremony or other traditional practices in my treatment; (4) If I am dealing with mental or emotional problems (e.g., depression, anxiety, stress), I will include ceremony or other traditional practices in my treatment; and (5) If a ceremony is taking place but is not part of my own tribal practices, I will still attend. The research team added Item 5 specifically because the study was surveying an urban, multitribal community—increasing the likeliness of tribal heterogeneity compared to reservation settings. The intent scale was provided to two American Indian clinical psychologists for feedback before pilot testing. Responses for this measure were collected on a 5-point Likert scale ranging from extremely likely to extremely unlikely.

The research team, in consultation with UIHO staff and three cultural advisors identified by the UIHO decided against a constrained definition of the terms “ceremony” or “traditional ceremonial practices” in the survey questionnaire. Instead, language was included that described

TCPs and identified examples of ceremonies—including sweat lodge, Native American Church (NAC), pipe ceremony, naming ceremony, and coming of age ceremony. But participants were ultimately able to respond based on their own definition of ceremony as informed by their respective tribal nations.

Covariates

The full survey questionnaire also included measures related to general health status, IPV, positive childhood experiences (PCEs), AI/AN identity, and sociodemographic variables including age, gender, education level, and household income (See Supplemental File for full survey). Health status was assessed using the SF-12, which has been previously validated among AI/AN populations (Edwards et al., 2012). PCEs were assessed using a scale from the Wisconsin Behavioral Risk Factor Survey (Bethell et al., 2019). AI/AN identity was assessed using a 3-item scale: (1) Being a member of my particular Native American tribe/People is an important part of my identity; (2) Being Native American in general is an important part of my identity; and (3) When I talk about Native Americans, I usually say "we" rather than "they." Responses were recorded using a 5-point Likert scale, ranging from strongly disagree to strongly agree.

Pilot Testing

Before deploying the survey to the community, it was pilot tested with ten AI/AN individuals who were purposively selected for diversity in representation of the target population based on age, gender, level of education, and role within the AI/AN community. The pilot testing sample was comprised of five females, four males, and one Two Spirit individual, and included college students, elders, AI/AN professionals, and a traditional practitioner. Pilot test participants were asked to take the survey on their own and then participate in an interview with a member of the research team to provide feedback on questionnaire items for clarity, perceived relevance, and cultural appropriateness. Additionally, the survey was reviewed by three cultural advisors identified by the UIHO. Final modifications to the instrument were made by the research team based on feedback from the pilot testers and cultural advisors before being distributed to the community.

Sample

Via an electronic health records (EHR) system, UIHO staff identified eligible participants. Inclusion criteria were: (1) AI/AN adults (18 years and older); (2) currently living in one of two

counties served by the UIHO; and (3) at least one interaction with the UIHO within the last three years. An "interaction" included any medical, dental, or behavioral health appointment, along with participation in any health promotion events or activities where contact information was collected. Based on these criteria, EHR records generated 275 e-mail addresses and 504 physical addresses for 779 unduplicated urban AI/AN adults. Due to HIPAA privacy restrictions, the sampling frame was developed and retained by the UIHO, and all survey invitations were sent by UIHO staff on behalf of the research team.

Between September and November 2021, an e-mail invitation and four follow-up e-mails were sent to potential survey participants via the UIHO Qualtrics account (Qualtrics, 2020). From the original set of 275 e-mail addresses, 33 email addresses bounced or could not be delivered and one individual opted out of receiving emails, for a total of 241 potential electronic respondents. In October 2021, 504 paper survey packets were sent out. From this original set, 76 packets were returned as undeliverable and four were returned because the individual was deceased, for a total of 424 potential paper respondents.

Survey Procedure

Potential respondents received an invitation sent out by UIHO staff, either electronically or on paper, to complete the final survey questionnaire (Supplemental File). Email invitations included a link to complete the survey questionnaire online. Participants who received an electronic invitation were allowed to stop and start the survey via a unique link. The Qualtrics platform tracked which e-mail addresses had completed the survey, to inform follow-up requests, but did not link individual survey data to e-mail addresses. Mailed invitations included an option to complete the survey online, using an included link or QR code, or via mail using a postage-paid return envelope The paper invitations included a unique Participant Code. Each individual was assigned a 5-digit code that was automatically generated during the printing process. To avoid response duplication, if the respondent chose to complete the survey online, the Participant Code needed to be entered as part of the survey. Paper responses were entered into Qualtrics by a research team member and reviewed for accuracy by the lead author before analysis.

Both the paper and electronic versions of the survey included a description of the survey content and information on informed consent at the beginning of the questionnaire. Participants were notified that their responses were anonymous, that they could choose to skip any question(s), and that the first 200 respondents would receive a $30.00 Amazon gift card in gratitude for their

participation. The paper survey included a separate form that respondents could fill out indicating how they would like to receive their incentive payment—via e-mail or U.S. postal mail—along with their contact information. These forms were not attached to survey responses and were filed and maintained in a separate location. Online participants were given the opportunity to click a link at the end of the survey that would take them to a separate form where they could provide their e-mail address for electronic delivery of the incentive payment.

Both the consent language and the amount and mode of the incentive payments were approved by the IHS National Institutional Review Board.

Statistical Methods

Measures

Outcome measures were binary, in which *0* was used to indicate no reported substance use and *1* indicated substance use. TCP variables were dichotomized based on their Likert scale values. Participants were assigned a *0* for the KAB scale if their mean score reflected "Not At All Important" or "A Little Important" or a *1* if their mean score reflected "Fairly Important" or "Very Important." Participants were assigned a *0* for the access scale if their mean score reflected "Strongly Disagree," "Disagree a Little," or "Neither Agree nor Disagree" or a *1* if their mean score reflected "Agree a Little" or "Strongly Agree." Participants were assigned a *0* for the intent scale if their mean score reflected "Extremely Unlikely," "Somewhat Unlikely," or "Neither Likely nor Unlikely" or a *1* if their mean score reflected "Somewhat Likely" or "Extremely Likely." While this approach is common with Likert scale data (Harpe, 2015), cut-point effects were investigated to test the validity of the results comparing against using median and upper quartile values. No indication was found that the significance of the association increases or decreases according to the cut-point.

Data Analysis

All analyses were conducted using RStudio software (RStudio Team, 2020). Proportions of past year substance use, KAB, access, and intent were estimated using Chi-square tests. Model building for logistic regression was accomplished through a purposeful selection process (Zhang, 2016). First, bivariate analyses were performed for each type of substance use outcome with each TCP measure and individual covariates. Any variables that were either significant predictors (returning a p value < 0.05) or that individually influenced the odds ratio by 10% or more in either

direction, regardless of significance, were retained for further analysis. Models including the remaining variables were refined by evaluating the effect of dropping a given variable (ANOVA p-value < 0.05) to find the most parsimonious model for each outcome variable.

RESULTS

There was a cumulative response rate of 32% for all survey modes. There was a 26% response rate for the 424 individuals contacted via U.S. mail, with 68 respondents mailing a completed survey packet and 42 respondents completing the survey online. There was a 42% (102/241) response rate for the individuals contacted via e-mail and completing the survey online. Of the 212 completed surveys, two were excluded because the respondents did not currently live in one of the target counties, and 16 were excluded due to incompleteness, resulting in 194 survey responses included in the final analysis. The average time to complete the survey online was 17.25 minutes (Range: 5.5 – 65 minutes).

Cronbach's Alpha

To assess internal validity of the survey questionnaire, a Cronbach's alpha test was performed on each TCP measurement scale. As expected, the modified KAB scale adapted from a previously employed instrument showed high internal consistency (α = 0.93). The intent scale also showed acceptable internal consistency (α = 0.85). The access scale, however, did not show acceptable internal consistency (α = 0.44) and was removed from final analyses.

Demographics

Table 1 shows characteristics of the sample by reported substance use. All respondents identified as American Indian, Alaska Native, or Indigenous. Tribal heterogeneity was present in the sample; there were 38 different tribal nations reported as part of various tribal affiliations, and 62% of respondents reported affiliation with at least one tribe located in Montana. Females comprised 66% of respondents in the sample and 5% identified as Two-Spirit or nonbinary. Young adults (18-29 years) made up 24% of the sample, 47% were adults (30-55 years), and 29% were elders (56 years or older). The study took place in a college town, which may explain why education among the sample is higher than would be expected in other parts of the state. Only 17.5% had a high school diploma or less, 32.5% had completed some college, and 50% had a

college degree. Despite high levels of education, 46% of respondents reported an annual household income below $30,000, 29% between $30,000 and $60,000, and 25% more than $60,000.

Table 1
Select characteristics of survey respondents (N = 194) by reporting of past year substance use

Variable	*N*[a] (%)[b]	Alcohol (*n* = 123)[c]	Marijuana (*n* = 101)[c]	Other drugs (*n* = 24)[c]
Age				
Young adult (18-29)	47 (24.2%)	33 (70.2%)	**33 (70.2%)**	8 (17.0%)
Adult (30-55)	91 (46.9%)	59 (64.8%)	**48 (52.7%)**	13 (14.3%)
Elder (56+)	56 (28.9%)	31 (55.4%)	**20 (35.7%)**	≤ 5
Gender				
All female genders	129 (66.5%)	83 (64.3%)	67 (51.9%)	15 (11.6%)
All male genders	56 (28.9%)	34 (60.7%)	29 (51.8%)	6 (10.7%)
All nonbinary genders	9 (4.6%)	6 (66.7%)	≤ 5	≤ 5
Education				
HS diploma or less	34 (17.5%)	23 (67.6%)	22 (64.7%)	9 (26.5%)
Some college	63 (32.5%)	43 (68.3%)	34 (54.0%)	6 (9.5%)
Associate or bachelor's degree	70 (36.1%)	38 (54.3%)	35 (50.0%)	7 (10.0%)
Graduate degree	27 (13.9%)	19 (70.4%)	10 (37.0%)	≤ 5
Annual Household Income				
< $30,000	89 (45.9%)	**47 (52.8%)**	49 (55.1%)	**17 (19.1%)**
$30,000 - $59,999	57 (29.4%)	**42 (73.7%)**	29 (50.9%)	**≤ 5**
$60,000+	48 (24.7%)	**34 (70.8%)**	23 (47.9%)	**≤ 5**
Health Status				
Better health	78 (40.2%)	55 (70.5%)	37 (47.4%)	≤ 5
Average to poorer health	116 (59.8%)	68 (58.6%)	64 (55.2%)	19 (16.4%)
Native American Identity				
Stronger Native identity	142 (73.2%)	86 (60.6%)	77 (54.2%)	17 (12.0%)
Limited Native identity	52 (26.8%)	37 (71.2%)	24 (46.2%)	7 (13.5%)
Positive Childhood Experiences				
0 – 2 PCEs	32 (16.5%)	22 (68.8%)	19 (59.4%)	8 (25.0%)
3 – 5 PCEs	77 (39.7%)	50 (64.9%)	46 (59.7%)	8 (10.4%)
6 – 7 PCEs	85 (43.8%)	51 (60.0%)	36 (42.4%)	8 (9.4%)

Bolded associations significant at the 0.05 level. *P* values determined by χ^2 test when all cells > 5, else Fischer's Exact test.
[a]Unweighted frequency from the sample.
[b]Column percentages may not add up to 100% due to rounding.
[c]Percentage of variable category *N* reporting substance use.

Knowledge, Attitudes, Beliefs, and Intent

More than half of the respondents reported positive KAB related to TCPs (Table 2). Participants who reported more positive KAB reported lower proportions of all types of substance use. Just over one-third of respondents reported a greater level of intent to participate in TCPs.

Participants who reported a greater level of intent to participate in TCPs reported lower proportions of all types of substance use.

Table 2
Frequency of substance use by knowledge, attitudes, and beliefs (KAB) and Intent

Variable	*N*[a] (%)[b]	Alcohol *N*[a] (%)[c]	Marijuana *N*[a] (%)[c]	Other drugs *N*[a] (%)[c]
KAB				
More positive KAB	106 (54.6%)	61 (57.5%)	51 (48.1%)	8 (7.5%)
Less positive KAB	88 (45.4%)	62 (70.5%)	50 (56.8%)	16 (18.2%)
Intent				
Greater intent	71 (36.6%)	41 (57.7%)	33 (46.5%)	≤ 5
Less Intent	123 (63.4%)	82 (66.7%)	68 (55.3%)	20 (16.3%)

Bolded associations significant at the 0.05 level. *P* values determined by χ^2 test when all cells ≥ 5, else Fischer's Exact test.
[a]Unweighted frequency from the sample.
[b]Column percentages may not add up to 100% due to rounding.
[c]Percentage of variable category *N* reporting substance use.

Substance Use Behavior

Past year alcohol use was reported in 63.4% of the sample, compared to a national prevalence among AI/AN adults (18+ years) of 61.0% (CBHSQ, 2023). Due to small cell values, illicit drug use categories (methamphetamine, inhalants, and prescription medications used in a way not directed by a medical provider) were combined for analyses. Illicit drug use (excluding marijuana) was reported in 12.4% of the sample, compared to the AI/AN adult national prevalence of 11.4% (CBHSQ, 2023). Notably, marijuana use was reported in 52.1% of the sample—almost 1.5 times the 2021 national prevalence for AI/AN adults of 37.6% (CBHSQ, 2023). These results are not unexpected, however, as they are in line with the geographic region of the study. Missoula County, which is home to a large university and has a longstanding liberal attitude toward marijuana use, reports some of the greatest marijuana use in the state (Walker et al., 2024). Additionally, recreational cannabis was legalized in the state during the study period, which has been associated with increased marijuana use rates (Steinberg et al., 2021; Walker et al., 2024).

Logistic Regression Analysis

Bivariate Analyses

At the bivariate level, significant associations were found between both age and household income with select substance use behaviors. Young adults in the sample were more likely to have

used marijuana in the past year compared to elders. Individuals with household incomes of $30,000 or greater were more likely to have consumed alcohol within the past year. Individuals with household incomes less than $30,000 were more likely to have used other drugs (methamphetamine, inhalants, or prescription medication misuse) in the past year.

Relationships between TCP and Substance Use

After adjusting for age and income, logistic regression showed significant associations between the TCP predictor variables and both alcohol and other drugs. Individuals in the sample with more positive KAB were significantly less likely to report alcohol (Adjusted Odds Ratio [AOR]: 0.49; 95% Confidence Interval [CI]: 0.26, 0.93) or other drug use (AOR: 0.30; 95% CI: 0.11, 0.76) in the past year, although confidence intervals were wide (Table 3). Individuals in the sample who reported greater intent to participate in TCP were also significantly less likely to report alcohol (AOR: 0.51; 95% CI: 0.26, 0.98) or other drug use (AOR: 0.31; 95% CI: 0.08, 0.91) in the past year, with accordingly wide confidence intervals. While respondents in the sample who reported more positive KAB or greater levels of intent to participate in TCPs were also less likely to report marijuana use in the past year, these associations were not statistically significant.

Table 3
Crude and adjusted odds ratios for substance use according to knowledge, attitudes, and beliefs (KAB) regarding, and intent to participate in (intent), traditional ceremonial practices

	PAST YEAR SUBSTANCE USE		
	Alcohol OR (95% CI)	**Marijuana** OR (95% CI)	**Other Drugs**[a] OR (95% CI)
KAB			
CRUDE			
Less Positive KAB	Ref	Ref	Ref
More Positive KAB	0.57 (0.31, 1.03)	0.70 (0.40, 1.24)	0.37 (0.14, 0.88)*
ADJUSTED[b]			
More Positive KAB	0.49 (0.26, 0.93)*	0.65 (0.35, 1.18)	0.30 (0.11, 0.76)*
Intent			
CRUDE			
Less Intent	Ref	Ref	Ref
Greater Intent	0.68 (0.37, 1.25)	0.70 (0.39, 1.26)	0.31 (0.09, 0.86)*
ADJUSTED[b]			
Greater Intent	0.51 (0.26, 0.98)*	0.67 (0.36, 1.26)	0.31 (0.08, 0.91)*

[a]Includes methamphetamine, inhalants, and prescription medications not used as directed by a medical provider
[b]Adjusted for age and annual household income
*Significant at the 0.05 level

DISCUSSION

To our knowledge, this is the first study to quantitatively explore the association between TCP indicators and substance use behaviors in an urban AI/AN community in Montana. The findings that protective factors of TCP may be associated with lower levels of substance use align with studies in other urban AI/AN communities that examined participation in TCPs along with substance use behaviors. For example, a 2021 randomized control study out of southern California found that participation in Drum-Assisted Recovery Therapy for Native Americans was associated with fewer alcoholic drinks per day and lower odds of marijuana use among participants, although the finding did not remain significant at 6-month follow-up (Dickerson et al., 2021). Another study of AI/AN adults in northern California found that participation in a culturally adapted holistic system of care was associated with a significant decrease in alcohol and other drug use (Wright et al., 2011).

Within the target community, 54.6% of the sample reported positive KAB regarding TCPs and 36.7% reported a greater level of intent to participate in TCPs. Participants who reported more positive KAB or greater intent to participate in TCPs were significantly less likely to report alcohol or other drug use in the past year. This finding aligns with previous studies exploring TCPs and substance use in both urban and reservation settings (Rowan et al., 2014; Liddell & Burnette, 2017; Chase-Begay et al., 2023). TCPs are generally holistic in nature, addressing all aspects of an individual (i.e., physical, mental, emotional, and spiritual health) (Gone, 2021). In their systematic review, for example, Herron and Venner (2022) highlight research showing how cultural elements, such as spirituality and Indigenous healing traditions, serve as important pathways for trauma recovery among American Indians.

This is especially salient given what is known about the association between trauma and substance use among AI/AN peoples. Recent research highlights the profound impact of historical trauma on substance use among AI/AN communities. Skewes and Blume (2019) found that both historical and contemporary racial trauma were widely recognized by American Indian key informants as root causes of substance use disorders, describing substance use as a symptom of collective grief, loss of identity, and the lingering effects of colonization. Similarly, Gameon and Skewes (2021) examined the role of historical trauma thoughts among American Indian individuals with current substance use problems and found that frequent engagement with these thoughts—especially when not accompanied by high trauma symptoms—was associated with

better substance use outcomes. While the earlier study emphasizes historical trauma as a driving force behind substance use disparities, the later study suggests that culturally grounded reflection on historical trauma—potentially delivered via the context of TCPs, for example—may serve as a protective factor, offering a more nuanced understanding of its role in recovery.

The complex role of AI/AN identity in this study is also of note. In contingency table analyses, AI/AN identity was highly associated with both KAB and level of intent. During the model-building process, the Identity variable did not significantly influence odds ratios during bivariate analysis. This could be the result of high collinearity between the variables. However, as noted in Table 1, substance use outcomes did not differ significantly based on stronger AI/AN identity but, as noted in Table 2, substance use did differ significantly based on KAB and intent. This may potentially highlight a difference between racial identity and cultural identity, but more research is needed to better expound on this finding.

In the study sample, adults (30–55 years) and younger adults (18–29 years) were generally more likely to report substance use than elders (56 years or older). Households with higher incomes were more likely to report alcohol use, and households with lower incomes were more likely to report using marijuana and other drugs. These findings align with prior work exploring age, income, and substance use both nationally and with AI/ANs (Kerr et al., 2009; Cummings et al., 2011; Pacek et al., 2015; Chhatre et al., 2017).

An important note for discussion is the developmental life-course perspective (Kuh et al., 2003). The study results indicate that respondents with more positive KAB or greater levels of intent to participate in TCPs are less likely to report substance use. While this may provide indication of a protective effect, it is not clear whether enculturation *after* initial substance use would be effective—i.e., whether this knowledge can inform only prevention efforts or also treatment efforts. More work is needed to better understand the potential for both TCP-based substance use *prevention* and *treatment* interventions to be effective.

Implications

The study findings have several important implications. First, they suggest that positive KAB and greater levels of intent to participate in TCP may be protective, even absent exposure and actual participation in ceremonies. Efforts to decrease substance use among AI/ANs living in urban settings in Montana potentially may be more effective if they include components that aim to increase participants' KAB or level of intent to participate in TCPs. In the current study,

increases in TCP variables were associated with decreases in self-reported substance use behaviors. AI/AN communities draw on generations of practice-based evidence that help guide TCPs and their potential effectiveness (Brave Heart et al., 2016; Herron & Venner, 2023). However, more work needs to be done to better understand whether and how TCPs can be incorporated appropriately into prevention and treatment efforts, especially in settings with greater tribal heterogeneity. It would also be important to better understand if there are particular factors associated with TCPs—be they physical, mental, social, or spiritual—that drive this association.

To accomplish this, public and private payers need to provide funding and support for AI/AN community-led implementation and evaluation of TCP-based interventions. The current study provides preliminary data about KAB and intent, rather than programming, primarily because the UIHO did not have funding to implement broad TCP-based services. Once this type of programming is supported—and implemented via community-led and culturally reflective methods—future research could explore effectiveness and help inform best practices for this and other urban AI/AN communities.

Additionally, the results highlight the need for more research to better understand community-wide prevalence of substance use, particularly marijuana, within the study population. The potential adverse effects of chronic, non-medical marijuana use include cardiovascular problems, cognitive impairment, and mental illness (Hall & Degenhardt, 2009, 2014). The high prevalence of marijuana use in the study sample may lead to disproportionate disease burden in the future, if not adequately understood or addressed. There is an almost universal stigma against many kinds of substance use (Yang et al., 2017), and a particular stigma around AI/AN people and alcohol use (Gonzalez & Skewes, 2018). Marijuana and cannabis, however, have a reputation for being all-natural or even beneficial (Nalven et al., 2022; Baral et al., 2024). Future research could better explore both the reasons why marijuana use may be frequent among this population and possible interventions to reduce rates of marijuana use.

Limitations

Because there is no single sampling frame of all AI/AN individuals in the target community, the research team took the approach of drawing from the UIHO's EHR system to identify potential participants. The sampling frame was the largest available and included about one-fourth of the total AI/AN census population for the area. The cross-sectional survey design also has limitations, including recall bias, response bias, and social desirability. Attempts to reduce

bias included asking for both exposure and outcome information over the same time period, taking steps to make the survey easily accessible, providing appropriate financial compensation upon completion, and not only making the survey anonymous but including language throughout the questionnaire reminding participants of their anonymity.

We recognize that the moderately-sized sample limited our ability to detect statistically significant findings for some of the identified protective factors of KAB and Intent. Post-hoc power analysis suggested that we would have required over 1,000 survey respondents to detect ORs of 0.7 or lower. Nevertheless, our findings across several substances suggested consistently protective effects for KAB and Intent despite the wide confidence intervals.

The survey scales were developed by the research team via a literature review, discussion, feedback, and consensus process. However, the KAB, Access, and Intent scales did not undergo full psychometric testing and validation. It is also important to note that these data come from a broader survey that included questions related not only to substance use but also intimate partner violence (IPV), which might have caused distress to some respondents and/or led to lower completion rates. The survey included a list of both IPV and substance use counseling resources—including some that are AI/AN-specific and others that are available 24 hours a day—as well as trigger warnings letting respondents know what kind of questions to expect and an option to skip the entire IPV section if they were uncomfortable.

Because the questionnaire measured KAB and intent, rather than behavior, it is not possible to know how many respondents will actually participate in TCPs when provided the opportunity. Research indicates that an important moderator of the association between intent and behavior is the strength of the intention (Conner & Norman, 2022). To address this, the intent variable was dichotomized at the upper quartile of scale score, rather than the median, to capture those individuals with the greatest likelihood of actual TCP participation in the intent category.

Finally, it is unclear to what extent, if any, the generalizability of the results from this study may be to other urban AI/AN communities nationally. While tribal heterogeneity is more common in urban, off-reservation settings, each urban community experiences their own historical and political influences as to who relocated there, at what time, and for what purpose. It may be more likely that the knowledge derived from this study will generalize more appropriately to other urban communities throughout Montana or other Rocky Mountain states, for example, than locations such as California or New York. More research is needed to better understand the generalizability of studies between urban AI/AN populations in the United States overall.

CONCLUSION

Within the target population of an urban, multi-tribal AI/AN community in Montana, this study was able to identify proportions of KAB and level of intent to participate in TCPs among the respondents, which showed a measurable association with substance use behaviors. AI/AN communities, including urban multi-tribal communities, possess inherent strengths and assets that can be leveraged in efforts to reduce substance use. While rigorous epidemiological investigation of prevention or treatment interventions that draw on culturally centered approaches, such as TCPs, is not yet prolific in the literature, this represents a promising opportunity for future research and evaluation.

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CONFLICT OF INTEREST

The authors declare that they have no conflicts of interest.

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Examining Correlations of Historical Trauma and Ethnic Identity with Symptoms of Depression in American Indian/Alaska Native College Students

Nerissa Ann Dolney, MS, and Justin Douglas McDonald, PhD

Abstract: *The purpose of this study was to gain an understanding of how historical trauma and one's degree of ethnic identity relate to symptoms of depression, due to controversy in the literature about such variables. Participants in this study self-identified as American Indian/Alaska Native (AI/AN), were over the age of 18, and were currently enrolled or had been previously enrolled at a university. Participants completed a survey online via Qualtrics to gather information about their ethnic identity, frequency of historical loss thinking, and symptoms of depression. Survey data was analyzed using multiple regressions, correlation analyses, mediation analyses, and follow-up t-tests. Historical loss thinking was found to be very prevalent among this sample, and this was found to contribute significantly to depressive symptoms in AI/AN college students. Various aspects of ethnic identity may contribute to an increase or decrease in historical loss thinking and subsequent depressive symptoms, and this has significant implications for clinicians working with AI/AN college students.*

INTRODUCTION

The literature addressing historical trauma and ethnic identity in American Indian and Alaska Native (AI/AN) peoples contains contradicting ideas. Both concepts are difficult to define due to their complexity, subjectivity, and multidimensional nature, and are thus difficult to measure across a group of people. A review of the literature indicates many ways of measuring and conceptualizing either concept, which likely contributes to the contradictions.

Historical Trauma

Historical trauma is generally understood as the accumulation of trauma from historic events passed down through generations of Native peoples (Whitbeck et al., 2004). Maria Yellow Horse Brave Heart pioneered the discussion of historical trauma, conceptualizing it as "…collective and compounding emotional and psychic wounding over time, both over the life span and across generations" (1996). This trauma has stemmed from the actions of White colonizers who aimed to assimilate AI/AN peoples into White culture or eradicate them from the population. This included mass killings of AI/AN peoples, assimilation policies that led to land dispossession and the removal of AI/AN children to boarding schools, and the criminalizing of religion and languages (Kirmayer et al., 2014). Many also experienced deaths from diseases introduced by the settlers, as well as violence at the hands of the settlers (Swanson & Saus, n.d.). Kirmayer et al. (2014) describe the diseases and violence that led to the deaths of millions of AI/AN peoples as cultural genocide. The intergenerational transmission of trauma hindered the intergenerational transmission of culture, still affecting AI/AN peoples today. Kirmayer et al. (2014) suggest trauma can be transmitted at various levels, including epigenetically, interpersonally, within families, in the community, and nationally. Intergenerational trauma is evident in structural, systemic factors such as the forced assimilation to Western modes of agriculture and subsistence, the loss of tribal agency and sovereignty, the allocation of land and resources, and economic inequalities.

Historical trauma is thought to contribute to mental health disparities in AI/ANs by increasing stress responses to events (John-Henderson & Ginty, 2020). Ehlers et al. (2022) found that participants who had higher rates of historical loss thinking experienced more psychological

distress that was associated with suicidal behaviors. AI/AN peoples have been found to have rates of suicidal ideation, suicide attempts, and suicide deaths that are 50% higher than that of Whites, due to higher rates of depression, anxiety, substance use, perceived discrimination, and acculturation stress (Wexler et al., 2015). Suicidality often correlates with rates of depression; one study found that depression was present in 66% of AI/AN peoples who committed suicide (Roh et al., 2015). Suicidality and depression can be tied to historical trauma by way of intergenerational transmission of trauma, as well as structural and systemic inequities present in the United States today, such as the lack of mental health resources (Wexler et al., 2015). A lack of culturally competent mental health resources can be a risk factor for suicidality, creating a cycle within AI/AN communities (Shaw et al., 2019).

Historical trauma is also linked to educational disparities due to the history of educational trauma via the boarding school era, as well as the ongoing educational trauma via content such as racist or incorrect history lessons. According to Flynn et al. (2014), AI/AN peoples who attend higher education at predominantly White institutions must go through a unique acculturation process. AI/AN peoples often experience acculturative stress when facing this challenge, which is described as psychocultural stress due to the cultural differences of the person and the environment they are entering, leading to loss of identity and mental health issues.

Ethnic Identity and Historical Trauma

Cultural identity is a difficult and complex concept to measure. Ethnic identity is typically defined as how an individual understands and relates to their membership in a social, ethnic group (Jaramillo, 2015; Kenyon & Carter, 2011). Biculturalism is a relevant concept when discussing AI/AN ethnic identity, and refers to one's identifying with two cultures, although the extent generally differs from person to person (LaFromboise et al., 1993).

Some studies have examined the interactions between ethnic identification and historical trauma, and their effects on AI/AN peoples. However, different authors suggest differing results on whether thinking about these historical losses, as well as one's degree of ethnic identification, has a negative effect on one's mental health. Many researchers believe that having a strong collective identity with other AI/AN peoples and having the knowledge of historical trauma narratives can be a source of resilience (Mohatt et al., 2014; Swanson & Saus, n.d.). For example, West et al., (2012) found a sense of belonging within a community, or a strong degree of cultural identification, can serve as a protective factor against many mental health difficulties. A sense of

community, including knowledge of traditions, background, history, and feelings of belonging and attachment within a community is of high importance in AI/AN communities (Kenyon & Carter, 2011). Engaging in cultural practices, as well as a having high degree of social support and connectedness, has been found to be protective against mental health difficulties, including suicidal ideation (Bogic et al., 2024). Bombay et al. (2014) suggest knowledge of historical trauma and its consequences may improve relationships among Native peoples, by providing recognition of and explanation for current conditions. Many researchers believe that healing must occur at the community level rather than just the individual level (Bookman & Smith, 2024).

Tucker et al. (2016), however, found that Native peoples with a high degree of cultural identification engage in more historical loss thinking and, therefore, experience more symptoms of depression. Ehlers et al. (2013) found AI/AN peoples with a high degree of cultural identification do think more frequently of historical losses, but this thinking has only minimal influence on their emotional experiences of the trauma. Gameon & Skewes (2021) suggest a high degree of ethnic identity may be protective when thoughts of historical losses contribute to lower levels of distress, though ethnic identity may not be as impactful when distress is high.

This project examines these contradicting ideas by measuring rates of historical loss thinking and ethnic identification, as well as symptoms of depression, in Native college students. The literature suggests historical trauma affects peoples today through intergenerational transmission, including higher rates of anxiety, depression, and substance use (Roh et al., 2015; Wexler et al., 2015; John-Henderson & Ginty, 2020; Gameon et al., 2021; Ehlers et al., 2022). It is crucial to understand if ethnic identification serves as a protective factor for historical loss thinking, or if it exacerbates historical loss thinking and symptoms of depression. This understanding can increase cultural competence and inform clinicians on how to best treat Native peoples presenting with symptoms of depression. The incorporation of this knowledge into a clinical setting can lead to better mental health treatment for AI/AN peoples.

Current Study

Purpose

The purpose of this study was to gain an understanding of how historical trauma and one's degree of ethnic identity relate to symptoms of depression, as well as how historical trauma and ethnic identity relate to each other. This data can be used to inform clinicians as well as

programming and support services to reflect a deeper understanding and acknowledgement of the legacies of historical trauma.

This study also extends research on historical trauma and ethnic identity by studying an intertribal group of people, when previous studies (Ehlers et al., 2013) have focused on AI/AN peoples from the same community. Studying historical trauma and ethnic identity from an intertribal standpoint can lead to an increase in external validity and allow the research to benefit more people.

Hypotheses

It was hypothesized that AI/AN peoples with higher rates of ethnic identification and a greater sense of community will have higher rates of historical loss thinking due to an increase in knowledge and understanding of traumatic histories. It was also hypothesized that increasing one's sense of community and rates of ethnic identification will lead to a reduction of depressive symptoms, despite the higher rates of historical loss thinking (West et al., 2012; Bombay, Matheson, & Anisman, 2014; Ehlers et al., 2013).

METHODS

Design

This study utilized a cross-sectional methodology to obtain a snapshot of the relationship among the variables of historical trauma, ethnic identity, and symptoms of depression in a sample of AI/AN college students. After recruitment, the participants completed a survey, providing mainly quantitative data with some qualitative components. SPSS was used for data analysis.

Sample

Subjects for this study were recruited primarily from one university in the Midwest, though a small portion of data was gathered from another Midwest university. Data collection occurred during the Fall semester of 2023. Students were recruited through utilizing a participant pool of students called the SONA research system, as well as flyers and word-of-mouth. AI/AN students also received emails asking for voluntary participation via the universities' student listservs. This email outlined the requirements for being included in the study, a short description of what the participants would be asked to contribute, and the benefits and risks of taking part. In order to be eligible for participation, the participants had to be currently or previously enrolled at a university,

over the age of eighteen, and must self-identify as AI/AN. Those not meeting the eligibility criteria were excluded from this study. Students were compensated for participation with the opportunity to win one of eight $25 VISA Gift Cards, and psychology students could choose compensation by way of class credit. This study was reviewed and approved by the university's Institutional Review Board (Project # IRB0005593).

Measures

Demographics

Participants completed an initial demographics questionnaire assessing age, gender identity, ethnicity, tribal affiliation, cumulative GPA, years of education completed, and institutional support. They were also asked if they lived off, on, or near a reservation prior to attending the university, as well as their prior housing status. They were asked about boarding school history in their families and if this history has a negative effect.

American Indian Biculturalism Inventory-Northern Plains (AIBI-NP)

Participants completed the AIBI-NP, which was developed by McDonald et al. (2015). The AIBI-NP is a 27-item self-administered questionnaire with a four-point Likert scale designed for an individual to choose the degree to which they agree with a statement. This scale assesses worldviews, beliefs, and participation in cultural practices associated with American Indian culture and with White culture.

Multigroup Ethnic Identity Measure- Revised (MEIM-R)

Participants received the MEIM-R (Phinney, 2007), an 8-item questionnaire with six Likert-scaled questions and two open-ended questions. The first six questions ask the individuals to choose how much they strongly agree or strongly disagree with each statement, while the last two questions ask for a write-in response. The MEIM-R is meant to assess a sense of membership and belonging in any group. The MEIM-R has been utilized in past research with AI/AN adolescents to examine ethnic identity and the connection to well-being (Brown et al., 2019; Hunter et al., 2022; Angelino et al., 2024).

Historical Losses Scale

Participants received the Historical Losses Scale (Whitbeck et al., 2004), a 12-item questionnaire with a six-point Likert scale ranging from "never" to "several times a day". This

scale is meant to assess perceived losses and the frequency of thinking about these losses in relation to historical trauma experienced by AI/AN peoples.

Historical Loss Associated Symptoms Scale

Participants received the Historical Loss Associated Symptoms Scale immediately following the Historical Losses Scale. This scale was developed for use in conjunction with the Historical Losses Scale, referring back to it with the statement, "Now I would like to ask you about how you feel when you think about these losses" (Whitbeck et al., 2004). The Historical Loss Associated Symptoms Scale is a 12-item questionnaire with a six-point Likert scale ranging from "never" to "always." This scale is meant to identify the emotional responses to thoughts and reminders of historical losses.

Patient Health Questionnaire-9 (PHQ-9)

Participants received the PHQ-9, developed by Kroenke & Spitzer (2002). The PHQ-9 is a 9-item self-administered questionnaire with a four-point Likert scale ranging from "not at all" to "nearly every day." This scale is meant to assess major depressive symptoms based on DSM-IV criteria. The PHQ-9 has been found to have adequate reliability for use in multiethnic populations (Shaff et al., 2024) as well as AI/AN populations specifically (Harry & Waring, 2019).

Beck's Depression Inventory (BDI-II)

Participants received the BDI-II, developed by Beck et al. (1996). The BDI-II is a 21-item self-administered questionnaire with a four-point Likert scale ranging from 0 to 3. This scale is meant to measure the severity of depression based on DSM-IV criteria. The validity of the BDI-II has been found to be adequate for use in AI/AN populations (Gray et al., 2019; Gray et al., 2023).

Procedure

Participants were able to access the survey online via Qualtrics. All participants were required to provide consent via Qualtrics prior to participation in this study. Anyone who did not consent was unable to complete the survey. Participants were compensated and provided with a list of mental health resources following participation in this study.

Analysis

SPSS was used to perform multiple regressions. Ethnic identification and historical trauma were used as independent variables and depressive symptoms were the dependent variable. All

continuous variables were centered and used to test the interaction between ethnic identification and historical trauma, and the effects of this interaction on depressive symptoms. A One-Way Analysis of Variance (ANOVA) was conducted on the ethnic identification and historical trauma variables to test if there were independent variable differences among the college students. Follow-up tests were conducted on significant variables. While regional data were analyzed, no tribal-specific data were analyzed.

RESULTS

Sample

Participants included 100 (78 females, 16 males, 2 identifying as two-spirit, 1 identifying as queer, and 3 did not report a gender identity) self-identified AI/AN college students. Ages ranged from 18 to 51 with a mean of 26.40 years. Collectively, participants reported 33 different tribal affiliations.

Frequencies and Descriptives

Historical loss thinking was highly prevalent in this sample, as evidenced by descriptive statistics on the frequency of historical loss thinking (see Table 1). Between 40% and 50% of the sample endorsed thinking weekly or more about the following losses: loss of family ties due to boarding schools (47.4%), loss of families due to government relocation (49.5%), loss of respect for elders (49.5%), loss of land (55.7%), loss of self-respect due to poor treatment by the government (56.8%), loss of respect for traditional ways (56.8%), and loss of trust in whites (56.8%). Over 60% of the sample endorsed thinking weekly or more about the following losses: loss of language (68.4%), loss of traditions (68.4%), and loss of people from early death (68.4%). The thoughts of historical loss most prevalent in this sample were the loss of culture (73.7%) and the loss of people from alcoholism (75.8%), both occurring weekly or more.

Related to thoughts of historical loss thinking, 65% of the sample were raised on or near a reservation (see Table 2). When queried about having a family member who attended a boarding school, 55% responded “yes,” while 20% responded “maybe.”

Utilizing the BDI-II to determine levels of depression across the sample, 54% of participants were found to meet scoring criteria for mild to severe depression (see Table 3).

Table 1
Frequencies of Historical Loss Thinking, obtained from the Historical Losses Scale

	Frequency of losses (% of sample)					
Thoughts of Historical Losses	**Several times a day**	**Daily**	**Weekly**	**Monthly**	**Yearly**	**Never**
Loss of our land	6.3	18.9	30.5	27.4	14.7	2.1
Loss of our language	15.8	22.1	30.5	17.9	2.1	11.6
Losing our traditional spiritual ways	20	18.9	29.5	16.8	4.2	10.5
The loss of our family ties because of boarding schools	11.6	18.9	16.8	27.4	11.6	13.7
The loss of families from the reservation to government relocation	8.4	14.7	26.3	28.4	14.7	7.4
The loss of self-respect from poor treatment by government officials	16	16	25.5	27.7	7.4	7.4
The loss of trust in whites from broken treaties	9.5	17.9	29.5	12.6	13.7	16.8
Losing our culture	16.8	27.4	29.5	15.8	6.3	4.2
The losses from the effects of alcoholism on our people	18.9	30.5	26.3	17.9	-	6.3
Loss of respect by our children and grandchildren for elders	10.5	15.8	23.2	27.4	7.4	15.8
Loss of our people through early death	12.6	20	35.8	15.8	8.4	7.4
Loss of respect by our children for traditional ways	12.6	13.7	30.5	21.1	8.4	13.7

Table 2
Frequencies of demographic data related to thoughts of Historical Loss Thinking

	Yes	**No**	
Raised on or near a reservation?	65%	35%	
	Yes	**No**	**Maybe**
Did anyone in your close family attend a boarding school?	55%	25%	20%
	Yes, but it only comes up occasionally	**Yes, we talk about it frequently**	**Yes, it affects us every day**
Did this negatively affect your family?	36%	8%	13%

Table 3
Frequencies of symptoms of depression according to BDI-II scoring criteria

BDI-II Scoring Criteria	**Frequency (%) in sample**
No depression	46%
Mild depression	18%
Moderate depression	22%
Severe depression	14%

Pearson Correlations

Within the variables of ethnic identification, historical loss, and depression, each measure was examined to determine Pearson Correlation analyses. The variable of ethnic identification was broken down into the Multigroup Ethnic Identity Measure (MEIM-R), the American Indian Cultural Identification (AICI), and the European American Cultural Identification (EACI), as the MEIM-R and American Indian Biculturalism Inventory (AIBI) subscales are thought to function differently. The Historical Loss Scale (HLS) was utilized as the primary measure for historical trauma, as the Historical Loss Associated Symptoms Scale was thought to correlate too highly with the measures of depression.

When examining the Pearson Correlations for these variables, the PHQ-9 was not significantly correlated with the measures of ethnic identity and historical trauma. Because of this, the BDI-II was primarily used for the analyses in this study

Historical loss was found to be positively associated with symptoms of depression ($r=.369$, $p<.001$). The MEIM-R was found to be positively correlated with the BDI-II ($r=.208$, $p<.05$), and the HLS ($r=.488$, $p<.001$). The AICI was positively correlated with the BDI-II ($r=.274$, $p<.01$) and the HLS ($r=.512$, $p<.001$). The EACI was not significantly correlated with the BDI-II or the HLS, suggesting the indicators of European American cultural identification in the AIBI were not significantly correlated with depressive symptoms or thoughts of historical loss.

Mediation Analyses

Mediation analyses indicated ethnic identification had an indirect effect on symptoms of depression mediated through historical loss thinking. The MEIM-R, HLS, and BDI-II demonstrated a Sobel statistic of 2.89, $p=.004$ (see Figure 1). The observed p-value suggests that the association between the MEIM-R and BDI-II is significantly mediated by the HLS. The AICI, HLS, and BDI-II demonstrated a Sobel statistic of 2.54, $p=.01$, suggesting the association between the AICI and BDI-II is significantly mediated by the HLS (see Figure 2). The EACI, HLS, and BDI-II did not demonstrate a significant Sobel statistic, suggesting that HLS was not acting as a mediator amongst these measures (see Figure 3).

Sobel tests were also run to determine if the ethnic identity variable is acting as a mediator between historical trauma and depressive symptoms. With HLS acting as the independent variable, the various measures of ethnic identity acting as a mediator, and the BDI-II acting as a dependent

variable, none of the Sobel tests showed significance. This suggests the effect of historical trauma on depressive symptoms is not mediated by levels of ethnic identity.

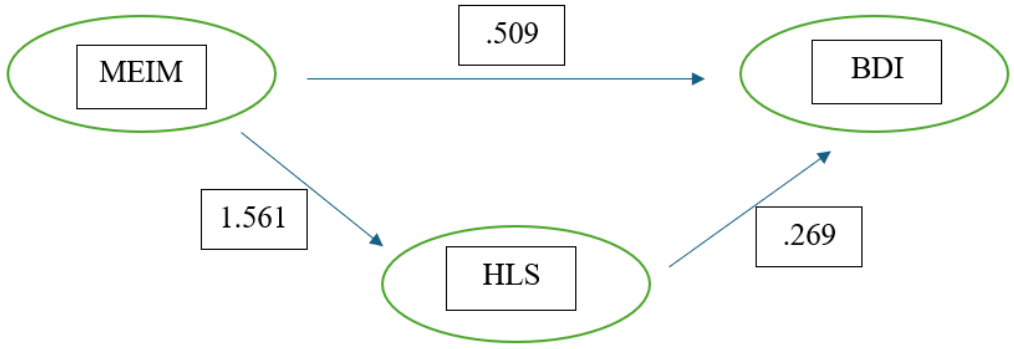

Figure 1. Mediation Analysis of the MEIM-R, HLS, and BDI-II

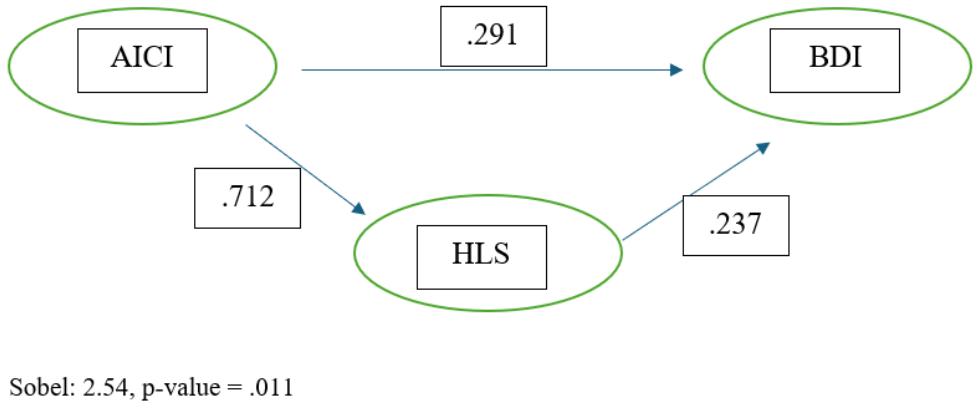

Figure 2. Mediation Analysis of the AICI, HLS, and BDI-II

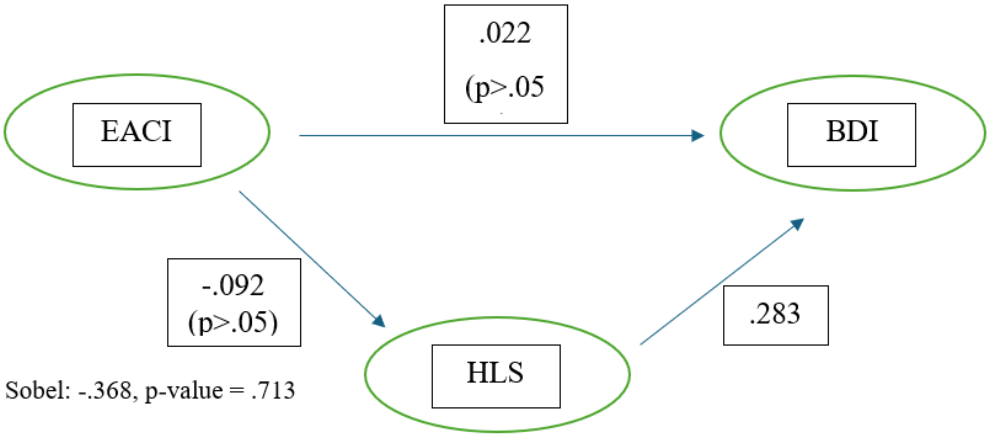

Figure 3. Mediation Analysis of the EACI, HLS, and BDI-II

Multiple Regression Models

Due to the HLS acting as a mediator, this was utilized as the second block in hierarchical multiple regression analyses, with the ethnic identity variable as block one, and the interaction of the two variables as block three. Three multiple regression models were run and examined.

Multiple Regression 1

The first regression model examined the MEIM-R, HLS, and BDI-II. All variables were positively correlated, but there were no substantial correlations ($r<.9$). HLS was found to correlate best with the outcome ($r = .369$, $p<.001$), so it is likely this variable will best predict depressive scores on the BDI-II. When examining the first block of this model, the MEIM-R accounted for 4.3% of the variation in depressive scores. However, when HLS is added, this value increased to 13.7%, suggesting the HLS accounts for an additional 9.4%. Adding the interaction variable only increased the value to 14.5%, suggesting that the interaction only accounts for an additional 0.8% of variation in depressive symptoms. The inclusion of HLS explained a larger amount of variation in depressive symptoms, but the inclusion of the interaction variable to this model did not account for a significant amount of variance in depressive symptoms.

Multiple Regression 2

The second regression model examined the AICI, HLS, and BDI-II. All variables were positively correlated, but there were no substantial correlations ($r < .9$). The HLS was found to correlate best with the outcome ($r= .369$, $p<.001$), so it is likely this variable will best predict depressive scores on the BDI-II. When examining the first block of this model, the AICI accounts for 6.5% of the variance in depressive scores. When the HLS is added, this value increased to 14.6%, suggesting the HLS accounts for an additional 7.1% of the variance. This suggests the AICI and HLS account for similar amounts of variance in depressive scores. Adding the interaction variable did not increase this value at all, suggesting the inclusion of the interaction variable did not account for any additional variance in the sample.

Multiple Regression 3

Although the EACI was not found to be significantly correlated with the HLS or the BDI-II, and the HLS was not found as a mediator between the EACI and the BDI-II, a multiple regression was run on these variables.

HLS correlates best with the outcome (r=.369, p<.001), suggesting this variable will best predict depressive symptoms. When examining the first block of the model, the EACI accounts for 0% of the variance in depressive symptoms. When HLS is added, this value increased to 13.6%, suggesting that the HLS accounts for 13.6% of the variance in depressive scores. Adding the interaction variable only increased the value to 13.8%, suggesting the interaction only accounts for an additional 0.2% of variation in depressive symptoms. The inclusion of the interaction variable did not account for a significant amount of variance in depressive symptoms.

Further Analyses

The data were further examined to determine additional variables that may be influencing the data. A regression analyzing the HLS on BDI-II scores amongst participants endorsing living on or near a reservation versus off the reservation was completed. This analysis found that for those who grew up on or near a reservation, historical loss thinking accounted for a significant 37.2% of variance in BDI-II scores. The variance found for off-reservation participants was not significant.

A t-test was performed to further examine the differences in historical loss thinking between those who lived on or near a reservation and those who did not. Levene's test was not significant, suggesting that the variances are roughly equal, and the assumption of homogeneity is tenable. On average, participants who lived on or near a reservation reported higher levels of historical loss thinking (M = 47.35, SE = 1.82) than participants who did not live on or near a reservation (M = 38.72, SE = 2.36). This difference was significant (t(95) = 2.81, p<.01) and represents a small effect size (r=.28)

A t-test was also performed to further examine differences in historical loss thinking based on participants from tribal nations in the Midwest and participants from tribal nations not in the Midwest. Levene's test is not significant, suggesting the variances are roughly equal, and the assumption of homogeneity is tenable. On average, participants from this area reported higher levels of historical loss thinking (M=46.6197, SE=1.62) than participants not from this region (M=46.6197, SE=3.44). This difference was not significant (t(88) = -1.533, p>.05) and does not represent a significant effect size. This suggests those from the Midwest region and those not from this region exhibited similar levels of historical loss thinking.

DISCUSSION

The current study examined the relationship between ethnic identification, historical trauma, and symptoms of depression in AI/AN college students. It was thought AI/AN peoples with higher rates of ethnic identification would have higher rates of historical loss thinking due to an increase in knowledge and understanding of one's history. It was also hypothesized increased ethnic identity would lead to a reduction of depressive symptoms.

Relationships Between Variables

The results of this study indicated historical loss thinking acted as a mediator between ethnic identification and depressive symptoms. This suggests an indirect effect of ethnic identification on depressive symptoms in AI/AN college students.

Interaction effects were further analyzed to clarify the mediating effect of historical loss symptoms. Overall, it is unlikely that ethnic identification and historical loss had a significant interaction effect among this sample. Within all three models, the HLS appears to be a better predictor of depressive symptoms than the ethnic identity variables. The interaction variables did not improve the regression models, nor did they have significant effects on depressive symptoms among this sample. This further supports the idea that historical loss symptoms mediate the effects of ethnic identification on depressive symptoms.

Ethnic Identity

In examining these regression models, it was found the AICI accounted for more variance in depressive symptoms than the MEIM-R. It is likely this difference in variance occurs due to the variation of ethnic identity predictors examined in the AIBI and the MEIM-R. The AIBI examines American Indian culture specifically, based on data from AI/AN peoples from the Northern Plains and their Caucasian counterparts (Gourneau, 2002). As the current study had a high percentage of AI/AN peoples from the Northern Plains region, it is likely the AIBI was better suited for the population and better reflects the ethnic identification of the current sample.

Due to the AIBI including questions about European American identity as well, the EACI was examined to determine the effects of one's level of European American identification on historical loss thinking and depressive symptoms. The results suggest the EACI accounted for 0% of the variance among depressive symptoms and had no significant correlation with historical loss symptoms. While higher rates of AI/AN ethnic identification led to higher rates of historical loss

thinking and subsequently more depressive symptoms, higher rates of European American identification did not affect historical loss thinking or depressive symptoms.

Historical Loss Thinking

Historical loss thinking was very prevalent in this sample. More than 70% of the sample indicated thinking about loss of culture and losses from alcoholism at least weekly or more. The least frequent thoughts of historical losses were tied to loss of family ties because of boarding schools and government relocation, as well as loss of respect for elders. Though these were the least frequent thoughts, almost 50% of the sample endorsed thinking of these losses weekly or more. A previous study by Tucker et al. (2016) found the most prevalent losses in their sample were endorsed at least monthly by only around 20% of participants. Comparing the current study to the study by Tucker et a. (2016), it appears historical losses were endorsed more frequently by participants at this university. These results suggest that historical loss thinking is still very prevalent among younger generations who have not experienced these traumas, such as boarding schools, firsthand. The difference in prevalence rates among these two studies raises the question of why historical loss thinking is so prevalent amongst this sample.

While the high rates of historical loss thinking cannot be explained directly by the data obtained from this sample, inferences can be made based on the sample demographics. In this sample, 65% endorsed that they were raised on or near a reservation. Follow-up t-tests suggested that participants living on or near a reservation reported higher thoughts of historical loss thinking, and this thinking accounted for a significant amount of variance in depressive symptoms. On the other hand, participants not living near or on a reservation reported lower amounts of historical loss thinking, and this thinking did not account for a significant amount of variance in depressive symptoms. This suggests that growing up and living on or near a reservation has a significant impact on the depressive symptoms that one experiences. Being raised near or on a reservation may suggest feeling more connected to their home communities, more conversations about historical losses among family members and elders, and more frequent reminders of historical losses.

Similarly, when asked if anyone in their close family attended a boarding school, 55% of participants responded yes, and 20% responded maybe. The high number of participants who responded “maybe” is of note, as this may indicate uncertainties with one’s family history, which may contribute to difficulties and uncertainties with one’s ethnic identity. The high rates of

participants who positively endorsed a close family member attending a boarding school may contribute to the higher rates of historical loss thinking among this sample. When one has a family member who attended a boarding school, conversations about losses might be more prevalent among their family, and the emotional turmoil in the whole family may be evident. Often, when one attends a boarding school, they lose aspects of their culture, including language, and these aspects are then not passed down to future generations. Losing these aspects of one's culture, such as not knowing the language, may contribute to difficulties with ethnic identification, higher rates of historical loss thinking, and subsequent depressive symptoms.

Regional differences were examined to determine if the location of one's tribal home community made a difference in rates of historical loss thinking. These differences were not found to be significant, suggesting that participants from the Midwest region and those from farther away experience similar rates of historical loss thinking and subsequent depressive symptoms.

These frequent reminders of historical losses and the treatment of AI/AN peoples in the past and present are likely to contribute to higher rates of depressive symptoms. Throughout the regression models, thoughts of historical losses contributed to significant variance in depressive symptoms and were found to be positively correlated with depressive symptoms.

Depressive Symptoms

Both the PHQ-9 and the BDI-II data were collected and examined to determine prevalence of symptoms of depression among this sample. The PHQ-9 did not correlate significantly with the measures of ethnic identity or historical trauma in this sample. However, the BDI-II did correlate significantly with the MEIM-R and the AIBI, as well as the HLS. This suggests that the BDI-II may be better representative of depressive symptoms in AI/AN peoples than the PHQ-9. Further analyses were conducted to determine which items in the AIBI and the MEIM-R correlated with the items on the BDI-II and the PHQ-9. Zero items on the MEIM-R correlated with any items on the PHQ-9, suggesting that the general commonalities across ethnic groups measured by the MEIM-R do not correlate significantly with depressive symptoms on the PHQ-9. There were positive and negative correlations with items on the AIBI and the PHQ-9. This could be due to the items on the AIBI that represent White culture, such as "how strongly do you identify with White culture," and "how important is your European or White American heritage and history to you," rather than the items that represent AI/AN culture. While the PHQ-9 is thought to adequately

represent depressive symptoms in Whites, this may not be the best measure of depression for AI/AN populations.

Implications

Using the BDI-II to examine the frequency of depressive symptoms in the current sample resulted in 54% of the sample meeting the scoring criteria for depression, ranging from mild to severe. For comparison, Shannon et al. (2025) found that 15.8% of working age AI/AN adults reported depressive symptoms. A literature review by Ka'apu & Burnette (2019) suggested that rates of depression range from 10-30% in AI/AN populations, and Tucker et al. (2015) found that 37.4% of their sample of AI/AN college students indicated depressive symptoms. While the current study only used one measure of depression, this still provides valuable information about the frequency and experiences of depressive symptoms in AI/AN college students. Utilizing this information about depressive symptoms and historical loss thinking can be beneficial for clinicians working with AI/AN students in a mental health capacity. Often, when AI/AN peoples present with depressive symptoms in a clinical setting, historical trauma may not be acknowledged or even recognized. As historical trauma has been found to account for variance in depressive symptoms, it is necessary that this be a focus of therapeutic interventions. As losses from the effects of alcoholism on AI/AN people was endorsed the highest, this should be examined and focused on. Many AI/AN peoples have family members who have difficulties with alcoholism, and this may even span multiple generations. AI/AN clients themselves may present with difficulties with alcoholism, and the foundation of this and what it means for AI/AN peoples should be understood by the clinician.

Loss of culture was also a highly prevalent thought amongst this sample. As previously discussed, many AI/AN peoples have difficulties with ethnic identification due to a loss of culture, such as traditions and language not being passed down. Difficulties with ethnic identity may lead to more thoughts of loss of culture, which in turn may lead to higher rates of depressive symptoms. Items on the BDI-II were further analyzed to determine correlations between specific depressive symptoms and aspects of ethnic identity. Bogic et al. (2024) suggests connecting high risk AI/AN individuals with their cultural traditions as a component of therapy. AI/AN people may not respond well to evidence-based interventions, instead preferring traditional healing practices (Gone, 2023).

A strong sense of belonging to one's ethnic group and a strong understanding of one's membership in an ethnic group were negatively correlated with symptoms of depression. These

symptoms included thinking of past failures, self-criticalness, crying, feelings of worthlessness, and suicidal worries or thoughts. It is thought that working on increasing one's sense of belonging and their understanding of their belonging to their ethnic group may lead to a reduction in these depressive symptoms. Bookman-Zandler & Smith (2024) suggest a critical component of trauma recovery is community, and restoring identity with the community is necessary for healing. John-Henderson & Ginty (2020) found the relationship between historical trauma and psychological stress is moderated by social support, suggesting that social support may dampen stress responses. Feeling connected and supported by one's community has been found to be protective against suicidal ideation as well (Bogic et al., 2024).

Aspects of ethnic identity such as needing to search for an understanding of one's identity and seek out information to learn more were positively correlated with symptoms of depression such as sadness, feelings of guilt, and feelings of punishment. This further supports the idea that not feeling a strong sense of belonging to one's ethnic identity may lead to more thoughts of historical loss, such as loss of culture, and subsequently more symptoms of depression, such as guilt or punishment for not knowing the culture. Many researchers suggest having a strong ethnic identity and understanding of one's group membership may serve as a protective factor for AI/AN peoples (Bogic et al, 2024; Bookman & Smith, 2024; Gameon & Skewes, 2021; John-Henderson & Ginty, 2020; Mohatt et al., 2014; West et al., 2012; Kenyon & Carter, 2011). In therapy, clinicians can focus on increasing these aspects, such as finding groups to increase a sense of community, helping the client learn about their history, and helping them process their feelings about historical losses. Increasing one's ethnic identity may reduce certain thoughts of historical loss, such as loss of culture, and subsequently reduce one's depressive symptoms.

Limitations and Future Research

The interpretation and discussion of the results of this study should be understood within the framework of the study's limitations. This study was based on data gathered from the limited population of AI/AN college students at primarily one university, which influences the generalizability of this data to populations outside of AI/AN college students. Similarly, this study examined historical losses generalizable to most AI/AN populations, but did not examine historical loss specific to various tribal communities, such as particular wars or battles. Future research should seek to replicate study results in other age groups and other universities or tribal colleges and should obtain data on more specific losses. Furthermore, as this study used a cross-sectional

methodology, future research should use an experimental design to determine causal relationships among variables rather than just inferences. Future research should also gather longitudinal data to understand how ethnic identification fluctuates over time in relation to historical loss and symptoms of depression.

Another limitation of this study is the measures used. The measures of historical loss thinking only measure frequency of historical loss thinking and not intensity, which could provide much more information about historical loss thinking overall. Future research should gather qualitative information along with the measures developed by Whitbeck et al. (2004) to gain a better understanding of one's experience of historical trauma. Similarly, the AIBI-NP could provide a better understanding of ethnic identity if qualitative data was obtained along with the quantitative information. The AIBI-NP may also represent a limitation of this study, as this measure has not been utilized frequently in the literature, and there is not much data to support the use of this measure among AI/AN college students. Future research should utilize the AIBI-NP to determine if these results replicate and can determine a solid measure of ethnic identification in AI/AN peoples.

CONCLUSIONS

Historical loss thinking was found to be very prevalent among this sample of AI/AN college students. While it was initially thought that historical loss thinking may have a significant interaction with ethnic identification, multiple regression analyses did not support this idea. In general, it appears as though the inclusion of an interaction variable does not account for a significant amount of variance in depressive symptoms. Overall, the historical loss scale appeared to be a better predictor of depressive symptoms than whichever measure of ethnic identity was included in the model.

However, the AICI and the MEIM-R accounted for more variance in depressive symptoms than the EACI, suggesting that a higher AI/AN ethnic identity correlates more with symptoms of depression than a White identity. The historical trauma variable was found to serve as a mediator when included with the AICI and the MEIM-R, suggesting that while ethnic identity does have an effect on depressive symptoms, it is likely that this effect is explained by the mediating influence of historical loss thinking.

Overall, it appears as though historical loss thinking contributes significantly to depressive symptoms in AI/AN college students. Various aspects of ethnic identity may contribute to an increase or decrease in historical loss thinking and subsequent depressive symptoms. These results can have significant implications for clinicians working with AI/AN college students. It is thought that increasing certain aspects of one's ethnic identity, such as a strong sense of belonging and confidence in one's group membership, may lead to a reduction in depressive symptoms among AI/AN college students.

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CONFLICT OF INTEREST

The authors declare they have no known conflicts of interest.

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