Title
Multilevel Context of Depression in Two American Indian Tribes

Journal
Journal of Consulting and Clinical Psychology, 81(6)

ISSN
0022-006X

Authors
Kaufman, Carol E
Beals, Janette
Croy, Calvin
et al.

Publication Date
2013-12-01

DOI
10.1037/a0034342

Peer reviewed

HHS Public Access

Author manuscript

J Consult Clin Psychol. Author manuscript; available in PMC 2015 June 08.

Published in final edited form as:

J Consult Clin Psychol. 2013 December ; 81(6): 1040–1051. doi:10.1037/a0034342.

Multilevel Context of Depression in Two American Indian Tribes

Carol E. Kaufman,
Centers for American Indian and Alaska Native Health, Colorado School of Public Health, University of Colorado Anschutz Medical Campus

Janette Beals,
Centers for American Indian and Alaska Native Health, Colorado School of Public Health, University of Colorado Anschutz Medical Campus

Calvin Croy,
Centers for American Indian and Alaska Native Health, Colorado School of Public Health, University of Colorado Anschutz Medical Campus

Luohua Jiang,
Department of Epidemiology and Biostatistics, Health Scineces Center, Texas A&M

Douglas K. Novins, and
Centers for American Indian and Alaska Native Health, Colorado School of Public Health, University of Colorado Anschutz Medical Campus

The AI-SUPERPFP Team
The AI-SUPERPFP Team, Centers for American Indian and Alaska Native Health, Colorado School of Public Health, University of Colorado Anschutz Medical Campus

Abstract

Objective—Depression is a major debilitating disease. For American Indians living in tribal reservations, who endure disproportionately high levels of stress and poverty often associated with depression, determining the patterns and correlates is key to appropriate clinical assessment and intervention development. Yet, little attention has been given to the cultural context of correlates for depression, including the influence of family, cultural traditions or practices, or community conditions.

Method—We used data from a large representative psychiatric epidemiological study among American Indians in two reservation communities to estimate nested individual and multilevel models of past-year Major Depressive Episode (MDE) accounting for family, cultural, and community conditions.

Results—We found that models including culturally informed individual-level measures significantly improved the model fit over demographics alone. We found significant community-level variation in the probability of past-year MDE diagnosis in one tribe even after accounting for individual-level characteristics.

Correspondence concerning this article should be addressed to Carol E. Kaufman, Centers for American Indian and Alaska Native Health, Colorado School of Public Health, University of Colorado Anschutz Medical Campus, Nighthorse Campbell Native Health Building, MS F800, 13055 E. 17th Ave. Room 346, Aurora, CO 80045-0508. carol.kaufman@ucdenver.edu.

Conclusions—Accounting for culture, family, and community context will facilitate research, clinician assessment, and treatment of depression in diverse settings.

Keywords

Depression; American Indian; culture; multilevel

Major depression is debilitating, costly, and widespread (Breslau, Lane, Sampson, & Kessler, 2008). For American Indians, who experience a disproportionate burden of mental disorder (Beals, Manson, Whitesell, Spicer, et al., 2005) and, especially in reservation settings, endure high levels of stress and poor economic conditions (Gone & Alcantara, 2007; Manson, Garroutte, Goins, & Henderson, 2004), the correlates and context of depression may be critical for assessment, treatment, and retention (U.S. Department of Health and Human Services, 2001). Yet, studies to date have not found a relationship of commonly used sociodemographic indicators, such as income, with depression that occurs in most other populations. In this study, we explore the contextual variability of Major Depressive Episode (MDE) in two American Indian tribal reservations, building directly upon earlier investigations (Beals, Manson, Whitesell, Mitchell, et al., 2005; Beals, Manson, Whitesell, Spicer, et al., 2005).

Depression Prevalence among American Indians

The most recent prevalence estimates of lifetime and 12-month MDE nationally among U.S. adults are 16.1% and 6.7%, respectively, derived from the National Comorbidity Survey (NCS) Replication (Breslau et al., 2008). Valid nationwide estimates of depression among American Indians are difficult to obtain from national surveys since their numbers are few, the population is highly dispersed, and such estimates ignore the considerable cultural variability (Beals, Manson, Whitesell, Mitchell, et al., 2005). For reservation-based American Indians, stressful life events and chronic stress related to poverty, substance abuse, illness, and traumatic events would suggest high levels of depression (Manson, Beals, Klein, & Croy, 2005; Stiffman et al., 2007). However, recently, using the same data as presented in this paper, Beals and her colleagues estimated DSM-IV lifetime and 12-month prevalence of MDE at 10.7% and 6.5%, respectively, in a Southwest Tribe, and 7.8% and 4.3% in a Northern Plains tribe, all lower than those of the US population nationally. Both methodological and cultural factors influenced the diagnostic assessments (Beals, Manson, Whitesell, Mitchell, et al., 2005). To date, however, little empirical investigation has considered the correlates of MDE for this population.

For American Indians in tribal settings examining basic individual-level socio-demographic correlates of depression is likely insufficient (Gone, 2007). Walters and Simoni (Walters & Simoni, 2002), for example, describe an “Indigenist” stress-coping model that conceptualizes mental health and related outcomes as being influenced by historical and contemporary trauma and buffered by cultural resources, such as spirituality, kinship ties, or cultural identity. Cultural and community influences on mental health are likely to be particularly important and complex. Whitbeck and colleagues (2002) theorized that higher levels of American Indian identity are not always protective. In discriminatory environments, it may be associated with greater dissonance and isolation resulting in

increased probability of drug use. In other words, factors likely critical to the social etiology of depression in these communities reach beyond individual experiences and include ongoing and enduring poverty, violence, and substance abuse at individual, family, and community levels (Evans-Campbell, 2008; LaFromboise, Hoyt, Oliver, & Whitbeck, 2006; Walls & Whitbeck, 2012).

In this study, we integrated these ideas into a conceptual framing of depression among reservation-based American Indians. A diagnosis of MDE is the result of an endorsement of specific criteria about individual-level events and feelings. However, in this framing, we view response to these criteria as systematically conditioned by community and family contexts. Prior research points to recent and historical trauma, manifested in social and economic conditions, racial identity or discriminatory environments, and community cultural well-being as integral to the fabric of those contexts. Located within these larger contextual influences are individual correlates of family history, socioeconomic standing, spirituality, and perceptions of community. Each of these elements, which may be associated with the likelihood of an MDE diagnosis, requires interpretation within cultural context. For example, high economic standing within the community may have little to do with reported income. Instead, the economy of the community may attribute wealth in very different ways, which, if unaccounted for, may hinder appropriate treatment plans for those with depression. Thus, a diagnosis of MDE, while conventionally considered an individual ailment, may arise in part from individuals' experiences in stressed communities. In this framing, clinical assessment, treatment of MDE, and retention in treatment are grounded in the lived experience of the cultural meaning of history and community. The implications of this conceptual approach for clinicians are critical. Gone (2007), for example, described the "divergence between the culture of the clinic and the culture of the community". In a clinical setting, common sociodemographic information, such as income or education level, is often considered sufficient to inform an assessment of and treatment plan for, depression, even while lived experiences within a community are often not meaningfully captured by such information. This conceptual framing of depression among American Indians suggests, then, that clinicians serving this population should account for factors within cultural context.

Individual-level Sociodemographic, Familial, and Cultural Correlates to Depression in American Indian Populations

The 2001 Surgeon General's report, *Mental Health: Culture, Race, and Ethnicity* (U. S. Department of Health and Human Services, 2001), brought specific attention to the profound lack of basic information about patterns and correlates of mental health problems among American Indians and Alaska Natives. Indeed, the close links for American Indians among cultural life, family, kin, and community, and mental health have been well documented across multiple disciplines (O'Nell, 1996; Oetzel et al., 2006; Trimble, 2010). In the following we describe empirical work that suggests specific dimensions of American Indian life that may be particularly salient in the assessment of depression, specifically, socioeconomic, familial, and cultural factors.

A few key studies also assist in advancing what we know about the socioeconomic relationship to depression in this population. For example, a comparison of psychiatric

outcomes between American Indian and Anglo children in the Southeast found that the levels of familial mental disorder were lower among the American Indian children than the Anglo comparisons, even while family adversity (poverty, unemployment) was higher, and that rising income did not alleviate depression (Costello, Farmer, Angold, Burns, & Erkanli, 1997; Costello, Compton, Keeler, & Angold, 2003). Complex systems of family and kin support may provide for otherwise impoverished family members; too, culturally-related economic subsistence activities, such as herding or farming, may also contribute to sustenance of a family. Thus the relationship of economic deprivation to depression, common in other settings, may not be accurately estimated in American Indian communities using standard poverty measures. Similar arguments can be made for education where greater prestige may be accorded to the wisdom of elders or healers than to formal educational credentials, or where few economic opportunities may be available to match an individual's educational achievements (Deloria & Wildcat, 2001).

Despite the ascendency of family suggested by observers of (and sometimes participants in) American Indian mental health dynamics, quantitative research on family factors in depression has been scarce (Borowsky, Resnick, Ireland, & Blum, 1999). Yet, understanding the relationship of family history of mental health may illuminate both genetic and historical predisposition to depression in this population (Milne et al., 2009).

Studies considering the relationship of culture or spirituality with mental health have met with enormous challenges in operationalization of these multidimensional concepts (Garroutte et al., 2009). With such multiplicity of measures, it is perhaps not surprising that the results have been ambiguous, finding culture or spirituality sometimes protective and sometimes related to risk-taking (Kaufman et al., 2007; Oetting & Beauvais, 1990-91; Stiffman et al., 2007; Whitbeck et al., 2002). Among adults, spirituality has been noted to have a positive association with help-seeking for substance use (Beals et al., 2006), and uses of traditional forms of healing (Novins et al., 2004).

Community Context

Recent years have witnessed an explosion of research on neighborhood or area effects on health (O'Campo, 2003). Focused primarily on physical health, this research to date has shown consistently that "place" matters to health, net of individual-level factors (Subramanian, 2004) and has triggered expansion in development and application of multilevel interventions, including clinical settings (Trickett, 2009).

Relatively few multilevel studies exist in the field of mental health even though the relationship of environmental conditions to mental health has a long-standing conceptual history (Faris & Dunham, 1939; Hollingshead & Redlich, 1958). Most to date have focused on depressive symptomatology, often measured by a version of the CES-D (Radloff, 1977), and most have theorized a form of stress as a main pathway linking environmental conditions with individual outcomes (Ross, 2000). Multilevel investigations have shown depressive symptoms were related to median neighborhood income and residential mobility (Goldsmith, Holzer, & Manderscheid, 1998; Silver, Mulvey, & Swanson, 2002); neighborhood poverty (Ross, 2000); and racial and ethnic factors (Wight, Aneshensel,

Botticello, & Sepulveda, 2005). In one of the rare multilevel analyses including American Indian samples, drug use of American Indian youth of an urban area of the Southwest found to be less affected by neighborhood characteristics compared to that of their non-American Indian counterparts (Yabiku, Rayle, Okamoto, Marsiglia, & Kulis, 2007). All of these studies have used urban samples or national or regional samples to assess contextual effects. Although some included rural areas or used measures of rurality as statistical controls in models, results did not specifically address variability inherent in rural areas.

Research to date thus provides a framing for assessing key correlates of MDE for this population. While studies have varied substantially in approach and methodology, collectively, they have conceptualized depression or other compromises to health as grounded in culturally-informed sociodemographic measures as experienced within community context. Here, we embraced this framing in our methodological approach. We have capitalized on a rich data source to test hypotheses using psychiatric outcomes and large representative samples of rural American Indians. Specifically, we hypothesized that, as in other settings, family history of violence, depression, or suicide attempt would be strongly associated with past-year MDE. We also hypothesized that economic well-being measured in cultural terms would be negatively associated with the probability of past-year MDE, as found in other populations. We also hypothesized that adherence to cultural spirituality would be protective, following the empirical findings to date for adults. Importantly, employing multilevel techniques, we tested the hypothesis that varying community conditions within rural tribal communities would have an independent effect on the probability of past-year MDE, net of individual characteristics. Finally, although we hypothesized differences in patterns of associations across tribes, we had no a priori assumptions about the direction or magnitude of the differences.

Method

Sample

We used data from the American Indian Service Utilization, Psychiatric Epidemiology, and Risk/Protective Factors Project (AI-SUPERPFP) and from Census 2000. AI-SUPERPFP was a population-based study of two large, culturally distinct American Indian reservation communities; data collection occurred between 1997 and 1999. The populations of inference were 15- to 54-year-old enrolled members of two closely related Northern Plains (NP) tribes and a Southwest (SW) tribe who were living on or within 20 miles of their respective reservations at the time of sampling (1997). (To protect the confidentiality of the participating communities, we refer to these tribes by general descriptors rather than by specific tribal names [Norton & Manson, 1996]).

The SW and NP tribes are some of the largest tribal populations in the U.S. (U.S. Census Bureau, 2000). The choice of these tribes provided a means to demonstrate cultural heterogeneity. The NP and SW belong to different linguistic families, have different histories of migration, subscribe to different principles for reckoning kinship and residence, and have historically pursued different forms of subsistence. Yet, both tribes share many experiences in common, along with other tribes throughout the country, including a long history of colonization and military resistance; externally imposed forms of governance; and

mandatory boarding school education. Traditions of health and healing have a strong and forceful presence, although wide variations exist in beliefs, practices, and ceremonies. The similarities and differences between the tribes provide an opportunity to account simultaneously for both the diversity and common experiences in a population that is at once relatively small (less than 2% of the US population), yet extremely diverse (over 350 federally recognized American Indian tribes in the lower 48 states).

Tribal rolls, the official enumeration of tribal members, were used to define the target population. Records were selected randomly from these rolls for inclusion in replicates, which were then released as needed to reach the goal of about 1,500 interviews per tribe. Of those eligible for the project, 77% in the NP (N = 1,638) and 74% in the SW (N = 1,446) agreed to participate. Sample weights accounted for differential selection probabilities across strata and for differential non-response by gender and age strata (Kish, 1965). AI-SUPERPFP methods are described in greater detail elsewhere (Beals, Manson, Mitchell, Spicer, & The AI-SUPERPFP Team, 2003). The interview instrument and the training manual are available for review (http://www.ucdenver.edu/academics/colleges/PublicHealth/research/centers/CAIANH/NCAIANMHR/ResearchProjects/Pages/AI-SUPERPFP.aspx).

We also used block group (BG) level data from the 2000 Census (U.S. Census Bureau, 2000). The 2000 Census was the closest census temporally to AI-SUPERPFP, albeit following it. However, the estimated undercount rate for American Indians is far smaller in the 2000 Census (2.8%-6.7%) than in 1990 (12.2%); thus, the 2000 data were likely to provide superior estimates (Lowe, 2001). Collection of data for 2000 Census is well documented and described elsewhere (Schneider, 2004). Data used in this sample were collected using the Long Form (LF), a questionnaire provided to approximately one in six households. The LF asked detailed questions about education, employment, income, and housing characteristics. These data were then aggregated to higher levels of geography and released in the public domain. The smallest unit of publicly available data is the BG, a geographic unit consisting of 300-3000 persons (U.S. Census Bureau, 2002) and the unit which most closely approximated administrative boundaries for the communities of the two tribes in this study. BGs here, then, provided measures of “community.” While likely those boundaries did not correspond exactly to social boundaries of communities, these data provided the best available approximation to those borders.

Procedures

Approvals for the AI-SUPERPFP were obtained from the University and from participating tribes prior to commencement of project activities. Written informed consent was obtained from all adult respondents. For minors, parental/guardian consent was obtained before requesting adolescent assent. Participants were interviewed individually by tribal members who had been given intensive training in research and computer-assisted interviewing methods. Extensive quality control procedures verified that location, recruitment, and interview procedures were conducted in a standardized, reliable manner.

For multilevel analysis, we required information about the community in which respondents resided. We converted address information provided by the respondents into longitude and latitude information. For about 5% of the sample, physical address information was missing.

For these cases, we used PO Box information as a proxy for physical address. Geographic location information was then matched to census BG identifiers. Using GeoLytics data extraction software (GeoLytics, 2002), we obtained aggregated social and economic data for each census BG represented in our sample and merged them onto the AI-SUPERPFP sample.

Measures

Psychiatric outcome measure—We used past 12-month MDE as our main outcome variable, adapted from the University of Michigan version of the CIDI (UM-CIDI) used in the baseline NCS (Kessler et al., 1994). Although the UM-CIDI provided for diagnoses based on DSM-III-R criteria, the AI-SUPERPFP team added items to facilitate assessment of DSM-IV disorders. Too, with data from focus group reviews by community members and biomedical and traditional service providers, the AI-SUPERPFP CIDI included minor adaptations in increase its cultural validity in American Indian communities (Beals et al., 2003).

Of specific note in the assessment of MDE were the modifications necessary to the AI-SUPERPFP CIDI diagnostic algorithm to maximize this disorder's clinical validity. The AI-SUPERPFP study design included a reinterview of about 10% of the sample using the Structured Clinical Interview for DSM (Spitzer, Williams, & Gibbon, 1987). This proved especially important in understanding MDE. In particular, we found that the complex manner in which the UM-CIDI accounted for symptom co-occurrence and medical exclusions (depressive symptoms due exclusively to illness, medications, substance use) dramatically decreased the concordance between the UM-CIDI and SCID MDE assessments (Beals, Manson, Whitesell, Spicer, et al., 2005). The final AI-SUPERPFP MDE algorithm, then, disregarded these aspects of the diagnosis. Indeed, soon thereafter, the CIDI used in the NCS Replication study dramatically simplified the approach to measuring co-occurrence and medical exclusions, suggesting the methodological issue identified in AI-SUPERPFP was relevant in other populations as well (Kessler et al., 2003). Examination of the patterns of symptom endorsement suggested important cultural variation as well (Beals, Manson, Whitesell, Mitchell, et al., 2005). As a result of the confluence of these cultural and methodological factors, only some of which were addressable with changes to the diagnostic algorithms, the AI-SUPERPFP estimates should be considered a conservative measure of past-year MDE. That is, the measure was likely to have missed cases of past-year depression since it was unable to account fully for cultural factors. A value of 1 indicated a respondent met the criteria for DSM-IV past 12-month MDE, and a value of 0 indicated a respondent did not.

Individual-level measures—Many of the factors hypothesized to be associated with past-year MDE were captured as single variable measures. Five constructs were represented in our models by scales; for each, exploratory factor analyses were run in SPSS (SPSS, 2010) and results were then subjected to confirmatory factor analyses (Muthén & Muthén, 1998-2008). Study participants received a score on each scale that was the mean of the item values, all items equally weighted.

Gender, age, education level, marital status, employment status, and household poverty status were included in all our models. These characteristics were dummy-coded (1/0) dichotomous indicator variables: gender (1 = female); age 15-24, age 25-34, age 35-44, age 45+ (the referent); less than 12 years education, high school graduate, post high school education; married or living as married, separated/widowed/divorced, never married; employed, unemployed, student; and poverty status (1 = below US poverty level). The poverty measure was adapted from the Census algorithm. Since household income was assessed as a categorical variable, exact replication of the Census algorithm was impossible; instead a "1" signified those clearly meeting these federal poverty guidelines where "0" marked those who are above the poverty level or whose information was indeterminate.

Natal family emotional history was operationalized as a series of three dummy-coded (1/0) indicators of whether the participant's childhood household had contained any of the following: 1) someone who attempted suicide or suffered from depression, 2) someone who had a problem with violent behavior, or 3) someone who had a problem with drugs or alcohol.

Three dummy-coded (1/0) variables capturing various dimensions of traditional ways of living were created, including contributing to their households by hunting or fishing, planting or farming, or by raising sheep or cattle. Guided by community focus groups, we also developed a household basic needs scale (Cronbach's $\alpha = 0.77$) to assess alternative measures to standard poverty measures. Study participants were asked how often they had enough of four necessities: 1) food to eat, 2) health care, 3) clothes, and 4) a decent place to live. Possible responses for each were 0 (*never*), 1 (*almost never*), 2 (*sometimes*), 3 (*often*), and 4 (*almost always*). This scale had little correlation with the income-based poverty measure.

The adherence to cultural spirituality scale measure was also developed in consultation with the community-based focus groups; they recommended use of simple response categories: agree (1) and disagree (0). Eight items were included in the measure: "there is balance and order in the universe," "I am in harmony with living things," "I feel connected with other people in life," "I follow the tribal path," "I know what to do to return to balance," "I feel like I am living the right way," "I give to others and receive in return," and "I am a person of integrity" ($\alpha = .76$). This scale was used successfully in AI-SUPERPFP analyses (Beals et al., 2006).

Three scales measured distinct dimensions of perceptions of community problems, including a general community strains scale, a job and housing scarcity scale, and a racial discrimination scale. Note that perceptions of community conditions corresponded to individual-level data since individuals answered questions. For the community strains scale, participants were asked to rate how big a problem seven issues were in their communities: 1) drug abuse; 2) alcohol abuse; 3) physical violence, abuse, and neglect; 4) broken homes and family breakup; 5) gambling; 6) car accidents; and 7) lack of knowledge about tribal history, tradition, and language. Possible responses were 0 (*not a problem in their community*), 1 (*some problems in their community*), and 2 (*lots of problems in their community*) ($\alpha = .90$). Factor analysis of community perceptions data also yielded a job and housing scarcity scale.

Using the same three response levels for community strains, participants rated how much two items were problems in their community: not enough jobs and not enough good housing (α = .78).

Four questions yielded a racial discrimination scale. Participants were asked to rate how much they experienced four types of discrimination because they were American Indian: 1) problems in stores or restaurants, 2) prejudice from Whites, 3) inability to find work, and 4) problems with the police. Possible responses were 0 (*not at all*), 1 (*some*), and 2 (*a lot*) (α =. 76).

Community-level variables—Community variables were derived from 2000 Census data. We calculated eight proportions (count of a characteristic divided by the population) for each block group: 1) households below the poverty level, 2) population that was unemployed, 3) population that was American Indian, 4) population that was unmarried, 5) population with at least 12 years of education or a GED, 6) renter-occupied housing, 7) households without complete plumbing, and 8) households with liquid propane (LP) gas. Each participant observation from the same BG received the same values of BG measures. Since prior work has shown community-level measures to be highly correlated in some settings (Geronimus & Bound, 1998). we also conducted factor analyses to develop two general scales. The first was based on the eight community-level variables described above (α = .87). The second empirically derived scale was based on a community concentrated disadvantage scale developed in other research (Dembo, Belenko, Childs, Wareham, & Schmeidler, 2009). The scale (α = .79) was created from four items from census data: 1) the proportion of the census BG population below the poverty line, 2) the proportion of the census BG population identifying their race as American Indian, 3) the proportion of the census block group population age 16 or older who were unemployed, and 4) the proportion of census BG female-headed households with children present Both scales were created through the factor analyses process described above in the individual-level measures section.

We also hypothesized that some community influences, beyond measured characteristics, would likely influence past-year MDE. For example, the data did not capture local mental health efforts such as the activities of a trusted local clinician or counselor, which in turn may have had an effect on local levels of past-year MDE. An advantage of multilevel applications is that such unmeasured effects—both their strength and direction—can be estimated statistically.

Analysis

To test our hypotheses, we used Stata (StataCorp, 2009a) to estimate nested logistic models, progressively adding blocks of variables capturing key dimensions of American Indian life. Specifically, we began with demographic controls, representing the common variables found in most studies of correlates of depression. We then added family mental health variables since we hypothesized these would be strongly related to depression as in other populations. Since we hypothesized that the common poverty measure did not adequately capture American Indian economic life, the next block of variables we included were the alternative economic well-being measures (e.g., herding, fishing). Correlations among these three

alternative measures were found to be low for both tribes. Finally, we included adherence to cultural spirituality and then perceptions of community. For each model, we tested the improvement using the likelihood ratio test (Singer & Willett, 2003). In particular, this analytic strategy facilitates an assessment of the incremental contribution of each additional block of variables beyond one using basic demographic controls. We ran separate but identical models for each tribe to facilitate comparison, ceasing to add variables when models for both tribes no longer were improved.

To accurately test model nesting, each must contain the same cases. This resulted in a loss of about 15% of the sample. To explore the implications of missing data, we ran identical models in Stata using multiple imputation via the user-written *ice* and *mim* commands (Royston, 2007). The pattern of coefficients and significant levels did not change. Additionally, AI-SUPERPFP data were weighted and stratified, but the likelihood ratio test is inappropriate for such data (Lehtonen, 2004; StataCorp, 2009b). Again, we estimated identical logistic models using weights and stratification and also found no substantial differences in the pattern of coefficients or significance levels.

Once the individual-level models were estimated, we moved into a multilevel framework. Here, we estimated multilevel random intercept logistic regressions in Mplus (Muthén & Muthén, 1998-2008) separately for the NP and SW tribes. This allowed us to statistically test for differences across communities in past-year MDE, net of individual characteristics. We next tested measured community-level variables, individually and then jointly, to investigate the relationship of specific community characteristics with individual-level MDE. Finally, to assess the impact of the random intercept on the distribution of MDE probabilities across different communities, we calculated probabilities of MDE as distributed across BGs for NP and SW, holding other sample correlates constant (Curtis, Diamond, & McDonald, 1993; Guo & Zhao, 2000).

All multilevel models employed listwise deletion. Again, we checked whether the coefficients calculated using listwise deletion might be biased by comparing them to coefficients calculated using multiple imputation. We used the *ice* command in Stata to construct five replicate datasets with the missing values imputed and then analyzed in Mplus using the Type = Imputation option. The coefficients calculated with listwise deletion were found to be in close agreement with those calculated with the missing data imputed.

Results

Table 1 displays both the differences and similarities across the two tribes. In particular, we note that the SW sample had a significantly lower percentage of women than NP, due primarily to the higher levels of out-migration of men for employment. No significant differences were found in the prevalence of the AI-SUPERPFP operationalization of DSM-IV past 12-month MDE. In Table 2, we show descriptive information about the BGs associated with the sample. In the SW, 249 block groups represent the 1445 participants, with an average of 12 participants per BG. In contrast, the NP had fewer BGs ($N = 84$), but with a higher average number of participants per each (90). Included in Table 2 are selected

BG measures derived from the 2000 Census data demonstrating substantial variation across these remote rural areas.

The results of the individual-level logistic regression analyses are provided in Tables 3 (NP) and 4 (SW). In Model 1, demographic variables did little to explain the variation in past-year MDE for either tribe. In both tribes, family history of emotional problems was significantly and positively related to the likelihood of MDE diagnosis (Model 2). We tested the alternative measures of economic well-being in Model 3. In the SW, those who endorsed "hunting and fishing"—activities actually more typical of the NP—were more likely to have an MDE diagnosis. For the NP, those endorsing pastoral activities—again, activities more common in the other tribe—were more than four times more likely to be diagnosed with MDE. For both the SW and NP, these patterns were sustained across subsequent models. The household needs scale was not found to be consistently significant across models. Overall, adding the alternative measures for economic well-being significantly improved the fit of the data to the model for both tribes. In Model 4, the adherence to cultural spirituality measure was included. In the SW, the estimate was marginally negatively significant ($p = .056$) but strengthened in the final model with the addition of community perception variables. Correspondingly, the variable improved the fit of the model, but only weakly, at $p = .062$. In the NP, however, adherence to cultural spirituality was highly and negatively related to an MDE diagnosis, and retained that relationship in the final full model. The model fit was also significantly improved ($p = .005$). Finally, in Model 5, we included scales measuring individual perceptions of various dimensions of community life. In the SW, only the community strains scale was positively related to MDE diagnosis; however, inclusion of community perception variables greatly improved the model fit ($p < .001$). In the NP, the same variable was positively and significantly related to MDE diagnosis, but the improvement of model fit was only weak ($p = .067$).

Turning to multilevel analysis, we first tested random intercepts models, allowing the intercept to vary across BGs, controlling for all individual-level variables from Model 5, Tables 3 and 4. The random parameter was significant ($p = .001$) for the NP, and marginally significant for SW ($p = .088$). That is, there was a significant effect of unobserved community measures on the probability of a past-year MDE, controlling for individual characteristics. We proceeded to include community-level measures to test their impact on community variation, but none were found to be significant.

To demonstrate the interaction of individual and community factors in past-year MDE, in Table 5, we calculated predicted probabilities of MDE diagnosis across BGs for the NP, holding other model parameters fixed. For example, the average probability of past-year MDE diagnosis was .007, holding sample characteristics at their mean or modal values. However, the distribution of the community effect on past-year MDE showed that persons who lived in some communities in the sample (e.g., at -2 deviations from the mean of the random effect) were more likely to have had a past-year MDE (.042) compared to a similar individual living in a community in the other tail of the distribution (i.e., +2 deviations), with an estimated probability of .001. In other words, on average, an individual living in the NP would have a probability of having had a past-year MDE of .007. However, some communities offered considerable protective conditions, lowering that probability to .001.

Conversely, others appeared to have conditions fostering episodes, elevating the probability to .042. We also included probability estimates based on varying individual-level characteristics such as family history of depression and spirituality. For example, a person with a history of family violence has a higher probability of past-year depression compared to one with no history (.0086 v. .0065). However, if that same person lived in a community with protective qualities, that probability is lowered to .0033, less than that of a person with no family history of violence.

Discussion

These analyses assessed family, cultural, and community influences on depression among American Indians living in reservation communities. In spite of the analytic challenges of using a dichotomous diagnostic outcome, we found several intriguing results. For example, overall, our results indicated that commonly used demographic controls provided little insight into the patterns of depression for these populations. At almost each stage, as we included more culturally relevant measures, the fit of the data improved significantly. As such, our analyses provided quantitative support for prior ethnographic, historical, and clinical investigation into the interrelationships of mental health, family, culture, and community in this population.

The analyses also highlighted relationships that at first may seem counter-intuitive. For example, in the SW, family history of violence was robustly associated with MDE diagnoses. While this supported our hypothesis, SW cultural values emphasize withholding expressions of anger. Similarly, those who endorsed hunting and fishing—not typical cultural activities for this tribe—were also more likely to be diagnosed with MDE. In the SW, then, it appeared that experiences outside of culturally accepted bounds of expectations may be an expression of depression. In the NP, family history of alcohol and drug problems was significant until the final model, which included perceptions of community substance use, itself associated with MDE diagnosis. The evidence supports our earlier hypothesis that family history would be strongly associated with MDE, but it was modified by the perception of alcohol and drug use *in others.* Finally, adherence to spirituality proved to be strongly protective in the NP, while no such relationship was supported in the SW. Our findings suggest cautious and careful advance in quantitative measurement of spirituality.

The multilevel analyses indicated that the probability of an MDE diagnosis was significantly related to community (as operationalized by BGs) for the NP; the random parameter was only marginally significant for the SW. This finding is congruent with the literature addressing depression in a multilevel framework that the variability of MDE across communities is consistently, albeit modestly, related to factors beyond individual characteristics. Our analysis also demonstrated that community-level socioeconomic characteristics, as measured by Census, were inadequate to explain that variation. Conceptually, this is not surprising. For example, although education levels varied considerably across BGs, employment opportunities commonly associated with education may not have existed. As such, a given community's level of education, on average, may not have translated into greater opportunities, increased community mental health resources, or other factors associated with lower MDE levels. Additionally, this work demonstrates the

importance of carefully assessing construct measurement such as poverty or household income as applied to communities of color. In this case, the economic context included several dimensions captured by alternative measures to those typically used.

While the present analysis offers provoking challenges to clinical assessments and epidemiology, it is not without limitations. First, analysis was restricted to two American Indian tribes; we cannot generalize our findings beyond these two groups. Additionally, the data are now over a decade old. Although one must be cautious about the interpretation of the findings because of this, likely the underlying relationships found in these analyses remain. The measure of MDE was influenced by the research methods used and cultural factors; however, in an investigation of MDE correlates, the actual prevalence rates are less important than their relative variation across communities. Similarly, other measures, such as traditional economic activities or adherence to cultural spirituality likely fall short of capturing all aspects of American Indian reservation life. These measures, however, are sentinels for future work in this area—they provide contributions to the ongoing exchange about culture in mental health research. Additionally, the lack of measures with ratio metrics may have constrained analyses; yet, given the clinical importance of DSM-defined disorders, that relationships were found is of considerable importance. Finally, the multilevel component also had shortcomings, including temporal ordering and proscriptive definitions of community. As in other research efforts using cross-sectional data, we cannot assume causality for the relationships noted.

Many researchers and clinicians have noted the challenges of diagnosing depression among American Indians. Indeed, careful clinically-informed ethnography has asserted that depression among American Indians is particularly difficult to measure because of the cultural meaning of the condition (Gone, 2007; Manson, 2003; Sue & Chu, 2003). Our findings provide empirical evidence that depression is related to family, cultural, or community dynamics—most likely all three. While such domains of influence on depression are not unique to American Indians, these findings help to position psychological and psychiatric assessment and treatment for practitioners. For example, family factors may be the target of interventions that address interpersonal relationships and family dynamics (Brakemeier & Frase, 2012; Dirmaier et al., 2012). Residing in a highly stressed community could suggest that clinical programs need to be more assertive in their engagement and follow-up work to ensure that patients receive the full benefit of clinical services despite the considerable adversities that they face in their communities (Hails et al., 2012; Thota et al., 2012). Collaborative Care models may be particularly appropriate given their emerging success in other stressed communities (Woltmann et al., 2012). Facilitating engagement in traditional healing, which is not uncommon in these communities and is often used in combination with biomedical treatments (Novins et al., 2004), would also be an appropriate component of care. Finally, these findings suggest that the division between professional and community life may be artificial with these populations. Knowing community history and participating in community life may most aptly equip clinicians to effectively diagnose and treat depression among American Indians. Clinical researchers should consider exploring the impacts of such approaches on treatment engagement, retention, and outcomes in American Indian communities.

These analyses contribute substantially to the literature in several ways. First, these are among the first to apply multilevel techniques to understanding depression—and specifically the diagnosis of MDE—in rural American Indian settings. Second, this work has underscored the importance of community condition variability to depression and speaks to the challenges inherent in diagnosing and treating depression across cultures. As such, this analysis contributes broadly to the continuing conversations about DSM modification. Finally, this work informs clinical approaches to health and healing in culturally diverse settings. Specifically, clinical approaches that are cognizant of the cultural context informing patterns of depression may help to maximize patient benefit of treatment plans.

Acknowledgments

AI-SUPERPFP would not have been possible without the significant contributions of many people. The following interviewers, computer/data management and administrative staff supplied energy and enthusiasm for an often difficult job: Anna E. Barón, Antonita Begay, Amelia T. Begay, Cathy A.E. Bell, Phyllis Brewer, Nelson Chee, Mary Cook, Helen J. Curley, Mary C. Davenport, Rhonda Wiegman Dick, Marvine D. Douville, Pearl Dull Knife, Geneva Emhoolah, Fay Flame, Roslyn Green, Billie K. Greene, Jack Herman, Tamara Holmes, Shelly Hubing, Cameron R. Joe, Louise F. Joe, Cheryl L. Martin, Jeff Miller, Robert H. Moran Jr., Natalie K. Murphy, Melissa Nixon, Ralph L. Roanhorse, Margo Schwab, Jennifer Settlemire, Donna M. Shangreaux, Matilda J. Shorty, Selena S. S. Simmons, Wileen Smith, Tina Standing Soldier, Jennifer Truel, Lori Trullinger, Arnold Tsinajinnie, Jennifer M. Warren, Intriga Wounded Head, Theresa (Dawn) Wright, Jenny J. Yazzie, and Sheila A. Young. We would also like to acknowledge the contributions of the Methods Advisory Group: Margarita Alegria, Evelyn J. Bromet, Dedra Buchwald, Peter Guarnaccia, Steven G. Heeringa, Ronald Kessler, R. Jay Turner, and William A. Vega. Finally, we thank the tribal members who so generously answered all the questions asked of them.

Design, conduct of study, data collection, and original data management and analyses were supported by National Institute of Mental Health grants R01 MH48174 (SM Manson and J Beals, PIs) and P01 MH42473 (SM Manson, PI). Data analyses and interpretation specific to this manuscript as well as preparation, review and approval were supported by R01 MH075831 (CE Kaufman, PI). Other than the funding support noted above, the authors have no financial involvement with organizations whose financial interest may be affected by the material in the manuscript or which might potentially bias it.

Appendix

In addition to the authors listed above, the AI-SUPERPFP team includes Cecelia K. Big Crow, Dedra Buchwald. Buck Chambers, Michelle L. Christensen, Denise A. Dillard, Karen DuBray, Paula A. Espinoza, Candace M. Fleming, Ann Wilson Frederick, Joseph Gone, Diana Gurley, Lori L. Jervis, Shirlene M. Jim, Suzell A. Klein, Ellen M. Keane, Denise Lee, Spero Manson, Monica C. McNulty, Denise L. Middlebrook, Christina M. Mitchell, Laurie A. Moore, Tilda D. Nez, Ilena M. Norton, Theresa O'Nell, Heather D. Orton, Carlette J. Randall, Angela Sam, James H. Shore, Sylvia G. Simpson, Paul Spicer, Nancy Rumbaugh Whitesell, and Lorette L. Yazzie.

References

Beals J, Manson SM, Mitchell CM, Spicer P. The AI-SUPERPFP Team. Cultural specificity and comparison in psychiatric epidemiology: Walking the tightrope in American Indian research. Culture, Medicine and Psychiatry. 2003; 27:259–289.10.1023/A:1025347130953

Beals J, Manson SM, Whitesell NR, Mitchell CM, Novins DK, Simpson S, Spicer P, et al. Prevalence of Major Depressive Episode in two American Indian reservation populations: Unexpected findings with a structured interview. American Journal of Psychiatry. 2005; 162:1713–1722.10.1176/appi.ajp.162.9.1713 [PubMed: 16135632]

Beals J, Manson SM, Whitesell NR, Spicer P, Novins DK, Mitchell CM. Prevalence of DSM-IV disorders and attendant help-seeking in two American Indian reservation populations. Archives of General Psychiatry. 2005; 62:99–108.10.1001/archpsyc.62.1.99 [PubMed: 15630077]

Beals J, Novins DK, Spicer P, Whitesell NR, Mitchell CM, Manson SM. The AI-SUPERPFP Project Team. Help seeking for substance use problems in two American Indian reservation populations. Psychiatric Services. 2006; 57:512–520.10.1176/appi.ps.57.4.512 [PubMed: 16603747]

Borowsky IW, Resnick MD, Ireland M, Blum RW. Suicide attempts among American Indian and Alaska Native youth: Risk and protective factors. Archives of Pediatric and Adolescent Medicine. 1999; 153:573–580.10.1001/archpedi.153.6.573

Brakemeier E-L, Frase L. Interpersonal psychotherapy (IPT) in major depressive disorder. European Archives of Psychiatry and Clinical Neuroscience. 2012; 262:117–121.10.1007/s00406-012-0357-0 [PubMed: 21901269]

Breslau J, Lane M, Sampson N, Kessler R. Mental disorders and subsequent educational attainment in a US national sample. Journal of Psychiatric Research. 2008; 42:708–716.10.1016/j.jpsychires.2008.01.016 [PubMed: 18331741]

Costello EJ, Compton SN, Keeler G, Angold A. Relationships between poverty and psychopathology: A natural experiment. Journal of the American Medical Association. 2003; 290:2023–2029.10.1001/jama.290.15.2023 [PubMed: 14559956]

Costello EJ, Farmer EMZ, Angold A, Burns BJ, Erkanli A. Psychiatric disorders among American Indian and White youth in Appalachia: The Great Smoky Mountains Study. American Journal of Public Health. 1997; 87:829–836.

Curtis S, Diamond I, McDonald J. Birth interval and family effects on postneonatal mortality in Brazil. Demography. 1993; 30:33–43.10.2307/2061861 [PubMed: 8440397]

Deloria, V.; Wildcat, DR. Power and place: Indian education in America. Golden, CO: Fulcrum Publishing; 2001.

Dembo R, Belenko S, Childs K, Wareham J, Schmeidler J. Individual and community risk factors and sexually transmitted diseases among arrested youths: a two level analysis. Journal of Behavioral Medicine. 2009; 32:303–316.10.1007/s10865-009-9205-8 [PubMed: 19224357]

Dirmaier J, Steinmann M, Krattenmacher T, Watzke B, Barghaan D, Koch U, Schulz H. Non-pharmacological treatment of depressive disorders: A review of evidence-based treatment options. Reviews on recent clinical trials. 2012; 7:141–149.10.2174/157488712800100233 [PubMed: 22353197]

Evans-Campbell T. Historical trauma in American Indian/Native Alaska communities: A multilevel framework for exploring impacts on individuals, families, and communities. Journal of Interpersonal Violence. 2008; 23:316–338.10.1177/0886260507312290 [PubMed: 18245571]

Faris, RE.; Dunham, HW. Mental disorders in urban areas: An ecological study of schizophrenia and other psychoses. Chicago/London: The University of Chicago Press; 1939.

Garroutte EM, Beals J, Keane EM, Kaufman CE, Spicer P, Henderson J, Manson SM, et al. Religiosity in two American Indian populations. Journal for the Scientific Study of Religion. 2009; 48:480–500.10.1111/j.1468-5906.2009.01461.x

GeoLytics. GeoLytics CensusCD 2000 Long Form (Version 2.0). East Brunswick: GeoLytics, Inc; 2002.

Geronimus AT, Bound J. Use of census-based aggregate variables to proxy for socioeconomic group: Evidence from national samples. American Journal of Epidemiology. 1998; 148:475–486. Retreived from http://www.oxfordjournals.org/our_journals/aje/about.html. [PubMed: 9737560]

Goldsmith HF, Holzer CE III, Manderscheid RW. Neighborhood characteristics and mental illness. Evaluation and Program Planning. 1998; 21:211–215. Retrieved from http://www.journals.elsevier.com/evaluation-and-program-planning/.

Gone J. “We never was happy living like a whiteman”: Mental health disparities and the postcolonial predicament in American Indian communities. American Journal of Community Psychology. 2007; 40:290–300.10.1007/s10464-007-9136-x [PubMed: 17906926]

Gone JP, Alcantara C. Identifying effective mental health interventions for American Indians and Alaska Natives: A review of the literature. Cultural Diversity & Ethnic Minority Psychology. 2007; 13:356–363.10.1037/1099-9809.13.4.356 [PubMed: 17967104]

Guo G, Zhao H. Multilevel modeling for binary data. Annual Review of Sociology. 2000; 26:441–462.10.1146/annurev.soc.26.1.441

Hails K, Brill C, Chang T, Yeung A, Fava M, Trinh N-H. Cross-cultural aspects of depression management in primary care. Current Psychiatry Reports. 2012; 14:336–344.10.1007/s11920-012-0276-9 [PubMed: 22580834]

Hollingshead, BB.; Redlich, FC. Social class and mental health: A community study. New York: Wiley; 1958.

Kaufman CE, Desserich J, Big Crow CK, Holy Rock B, Keane E, Mitchell CM, Sam A. Culture, context, and sexual risk among Northern Plains American Indian youth. Social Science & Medicine. 2007; 64:2152–2164.10.1016/j.socscimed.2007.02.003 [PubMed: 17379373]

Kessler RC, Berglund P, Demler O, Jin R, Koretz D, Merikangas KR, Wang PS, et al. The epidemiology of major depressive disorder: Results from the National Comorbidity Survey Replication (NCS-R). Journal of the American Medical Association. 2003; 289:3095–3105.10.1001/jama.289.23.3095 [PubMed: 12813115]

Kessler RC, McGonagle KA, Zhao S, Nelson CB, Hughes M, Eshlemann S, Kendler KS, et al. Lifetime and 12-month prevalence of DSM-III-R psychiatric disorders in the United States: Results from the National Comorbidity Survey. Archives of General Psychiatry. 1994; 51:8–19.10.1192/bjp.188.5.465 [PubMed: 8279933]

Kish, L. Survey sampling. New York: John Wiley and Sons; 1965.

Krieger N. Theories for social epidemiology in the 21st century: An ecosocial perspective. International Journal of Epidemiology. 2001; 30:668–677.10.1093/ije/30.4.668 [PubMed: 11511581]

LaFromboise TD, Hoyt DR, Oliver L, Whitbeck LB. Family, community, and school influences on resilience among American Indian adolescents in the Upper Midwest. Journal of Community Psychology. 2006; 34:193–209.10.1002/jcop.20090

Lehtonen, R.; Pahkinin, E. Practical methods for design and analysis of complex surveys. West Sussex, England: John Wiley & Sons; 2004.

Lowe, TJ. Understanding Census 2000: Coverage issues and growth trends. Washington, D.C.: U.S. Census Bureau; 2001.

Manson SM. Extending the boundaries, bridging the gaps: Crafting Mental Health: Culture, Medicine, and Ethnicity, A supplement to the Surgeon General's report. Culture, Medicine and Psychiatry. 2003; 27:395–408.10.1023/B:MEDI.0000005479.04694.e2

Manson SM, Beals J, Klein SA, Croy CD. Social epidemiology of trauma among 2 American Indian reservation populations. American Journal of Public Health. 2005; 95:851–859.10.2105/AJPH.2004.054171 [PubMed: 15855465]

Manson SM, Garroutte E, Goins RT, Henderson PN. Access, relevance, and control in the research process: Lessons from Indian Country. Journal of Aging and Health. 2004; 16(5 Suppl):58S–77S.10.1177/0898264304268149 [PubMed: 15448287]

Milne BJ, Caspi A, Harrington H, Poulton R, Rutter M, Moffitt TE. Predictive value of family history on severity of illness: The case for depression, anxiety, alcohol dependence, and drug dependence. Archives of General Psychiatry. 2009; 66:738–747.10.1001/archgenpsychiatry.2009.55 [PubMed: 19581565]

Muthén, L.; Muthén, B. MPlus user's guide. 5. Los Angeles: Authors; 1998-2008.

Norton IM, Manson SM. Research in American Indian and Alaska Native communities: Navigating the cultural universe of values and process. Journal of Consulting and Clinical Psychology. 1996; 64:856–860.10.1037/0022-006X.64.5.856 [PubMed: 8916611]

Novins DK, Beals J, Moore L, Spicer P, Manson SM. The AI-SUPERPFP Team. Use of biomedical services and traditional healing options among American Indians: Sociodemographic correlates, spirituality, and ethnic identity. Medical Care. 2004; 42:670–679.10.1097/0l.mlr.0000129902.29132.a6 [PubMed: 15213492]

O'Campo P. Invited commentary: Advancing theory and methods for multilevel models of residential neighborhoods and health. American Journal of Epidemiology. 2003; 157:9–13.10.1093/aje/kwf171 [PubMed: 12505885]

O'Nell, T. Disciplined hearts: History, identity, and depression in an American Indian community. Berkeley: University of California; 1996.

Oetting ER, Beauvais F. Orthogonal cultural identification theory: The cultural identification of minority adolescents. The International Journal of the Addictions. 1990-91; 25:655–685. [PubMed: 2101397]

Oetzel J, Duran B, Lucero J, Jiang Y, Novins DK, Manson SM, Beals J, et al. Rural American Indians' perspectives of obstacles in the mental health treatment process in three treatment sectors. Psychological Services. 2006; 3:117–128.10.1037/1541-1559.3.2.117

Pickering KA. Decolonizing time regimes: Lakota conceptions of work, economy, and society. American Anthropologist. 2004; 106:85–97.10.1525/aa.2004.106.1.85

Radloff LS. The CES-D scale: A self-report depression scale for research in the general population. Applied Psychological Measurement. 1977; 1:385–401.10.1177/014662167700100306

Ross CE. Neighborhood disadvantage and adult depression. Journal of Health and Social Behavior. 2000; 41:177–187. Retrieved from http://www.jstor.org/stable/2676304.

Royston P. Multiple imputation of missing values: Further update of ice, with an emphasis on interval censoring. The Stata Journal. 2007; 7:445–464. Retrieved from http://www.stata-journal.com/.

Schneider, PJ. Census 2000 Testing, Experimentation, and Evaluation Program: Topic Report No. 12. Content and Data Quality in Census 2000. Washington D.C.: U.S. Census Bureau; 2004. p. 1-28.

Silver E, Mulvey EP, Swanson JW. Neighborhood structural characteristics and mental disorder: Faris and Dunham revisited. Social Science & Medicine. 2002; 55:1457–1470.10.1016/S0277-9536(01)00266-0 [PubMed: 12231022]

Singer, JD.; Willett, JB. Applied longitudinal data analysis: Modeling change and event occurrence. New York: Oxford University Press; 2003.

Spiegel D, Giese-Davis J. Depression and cancer: mechanisms and disease progression. Biological Psychiatry. 2003; 54:269–282.10.1016/S0006-3223(03)00566-3 [PubMed: 12893103]

Spitzer, R.; Williams, J.; Gibbon, M. Structured clinical interview for DSM-III-R, version NP-V. New York: New York Psychiatric Institute, Biometrics Department; 1987.

SPSS. SPSS statistics (version 19.0). Somers, NY: IBM; 2010.

StataCorp. Stata: Multiple-imputation reference manual (version special edition 11.0). College Station, TX: Stata Corp; 2009a.

StataCorp. Stata statistical software (verison 11.0). College Station, TX: Stata Corp; 2009b.

Stiffman AR, Brown E, Freedenthal S, House L, Ostmann l, Yu MS. American Indian youth: Personal, familial, and environmental strengths. Journal of Child & Family Studies. 2007; 16:331–346.10.1007/s10826-006-9089-y

Subramanian SV. The relevance of multilevel statistical methods for identifying causal neighborhood effects. Social Science & Medicine. 2004; 58:1961–1967.10.1016/S0277-9536(03)00415-5 [PubMed: 15020011]

Sue S, Chu JY. The mental health of ethnic minority groups: Challenges posed by the Supplement to the Surgeon General's Report on Mental Health. Culture, Medicine and Psychiatry. 2003; 27:447–465.10.1023/B:MEDI.0000005483.80655.15

Thota AB, Sipe TA, Byard GJ, Zometa CS, Hahn RA, McKnight-Eily LR, Wlliams SP, et al. Collaborative care to improve the management of depressive disorders: A Community Guide systematic review and meta-analysis. American Journal of Preventive Medicine. 2012; 42:525–538.10.1016/j.amepre.2012.01.019 [PubMed: 22516495]

Trickett E. Multilevel community-based culturally situated interventions and community impact: An ecological perspective. American Journal of Community Psychology. 2009; 43:257–266.10.1007/s10464-009-9227-y [PubMed: 19333751]

Trimble JE. The virtues of cultural resonance, competence, and relational collaboration with Native American Indian communities: A synthesis of the counseling and psychotherapy literature. The Counseling Psychologist. 2010; 38:243–256.10.1177/0011000009344348

U. S. Department of Health and Human Services. Mental health: Culture, race, and ethnicity—A supplement to Mental health: A report of the Surgeon General (SMA01-3613). Rockville, MD: U.S. Department of Health and Human Services, Substance Abuse and Mental Health Services Administration, Center for Mental Health Services; 2001.

U.S. Census Bureau. Census 2000 Summary Files 1, 2, 3 (SF1, SF2, SF3). Washington, DC: Author; 2000. Retrieved from http://www.census.gov/main/www/cen2000.html

U.S. Census Bureau. Census 2000 Basics. Washington, DC: Author; 2002. p. 1-12.

Walls ML, Whitbeck LB. Advantages of stress process approaches for measuring historical trauma. American Journal of Drug and Alcohol Abuse. 2012; 38:416–420.10.3109/00952990.2012.694524 [PubMed: 22931075]

Walters KL, Simoni JM. Reconceptualizing native women's health: An "indigenist" stress-coping model. American Journal of Public Health. 2002; 92:520–524.10.2105/AJPH.92.4.520 [PubMed: 11919043]

Whitbeck LB, McMorris BJ, Hoyt DR, Stubben JD, Lafromboise T. Perceived discrimination, traditional practices, and depressive symptoms among American Indians in the upper midwest. Journal of Health & Social Behavior. 2002; 43:400–418. Retrieved from http://www.jstor.org/stable/3090187. [PubMed: 12664673]

Wight RG, Aneshensel CS, Botticello AL, Sepulveda JE. A multilevel analysis of ethnic variation in depressive symptoms among adolescents in the United States. Social Science & Medicine. 2005; 60:2073–2084.10.1016/j.socscimed.2004.08.065 [PubMed: 15743655]

Woltmann E, Grogan-Kaylor A, Perron B, Georges H, Kilbourne AM, Bauer MS. Comparative effectiveness of collaborative chronic care models for mental health conditions across primary, specialty, and behavioral health care settings: Systematic review and meta-analysis. American Journal of Psychiatry. 2012; 169:790–804.10.1176/appi.ajp.2012.11111616 [PubMed: 22772364]

Yabiku ST, Rayle AD, Okamoto SK, Marsiglia FF, Kulis S. The effect of neighborhood context on the drug use of American Indian youth of the Southwest. Journal of Ethnicity in Substance Abuse. 2007; 6:181–204.10.1300/J233v06n02_11 [PubMed: 18192210]

Table 1

AI-SUPERPFP sample characteristics, by tribe

	Soutwest n = 1,446		Northern Plains n = 1,638	
	Percent or mean[1]	99% Confidence interval[1]	Percent or mean[1]	99% Confidence interval[1]
Socio-demographic characteristics (percentages)				
Sex				
Men	43.5*	42.6 - 44.4	49.5†	48.8 - 50.3
Women	56.5*	55.6 - 57.4	50.5†	49.7 - 51.3
Age (years)				
15-24	24.5	23.4 - 25.7	24.2	23.2 - 25.2
25-34	26.4	24.6 - 28.3	29.3	27.6 - 31.1
35-44	28.0	26.1 - 30.0	27.6	25.9 - 29.5
? 45	21.1	19.7 - 22.5	18.9	17.9 - 19.9
Education				
< 12 years	28.2	25.2 - 31.4	26.4	23.7 - 29.3
High school graduate or GED	42.1	38.8 - 45.6	47.4	44.1 - 50.8
Post high school	29.7	26.6 - 32.9	26.2	23.4 - 29.3
Poverty Status				
Poor	46.2*	42.6 - 49.7	61.5†	58.0 - 64.9
Employment Status				
Student	10.6	8.8 - 12.8	11.7	10.0 - 13.7
Employed	60.5	57.2 - 63.7	56.3	53.0 - 59.5
Unemployed	28.9	25.9 - 32.1	32.0	29.0 - 35.3
Marital status				
Never married	29.9	27.1 - 32.8	32.8	29.9 - 35.8
Married or living as married	60.2*	56.9 - 63.4	51.3†	48.0 - 54.7
Separated, divorced, widowed	10.0*	8.2 - 12.1	15.9†	13.6 - 18.4
Outcome (percentage)				
Past 12-month DSM-IV Major Depressive Episode	6.5	5.0 - 8.5	4.3	3.1 - 5.9
Individual-level risk or protective factors				
Family History (percentages)				
Someone had a problem with violence	25.3	22.4 - 28.5	28.9	25.9 - 32.1
Someone had a problem with drugs or alcohol	43.5	40.1 - 47.0	47.0	43.6 - 50.4
Someone attempted suicide or suffered from depression	27.6	24.5 - 30.9	29.6	26.7 - 32.8
Traditional Ways of Living (percentages)				
Contributing to household by hunting or fishing	11.3*	9.3 - 13.7	24.7†	22.0 - 27.6
Contributing to household by planting or farming	22.6	19.8 - 25.6	19.2	16.7 - 22.0
Contributing to household by raising sheep or cattle	25.5*	22.6 - 28.6	6.1†	4.7 - 8.0

	Soutwest n = 1,446		Northern Plains n = 1,638	
	Percent or mean[1]	**99% Confidence interval[1]**	**Percent or mean[1]**	**99% Confidence interval[1]**
Basic household needs scale [4]	3.25*	3.20 - 3.30	3.49†	3.45 - 3.53
Spirituality				
Adherence to cultural spirituality scale	0.78	0.76 - 0.80	0.79	0.77 - 0.80
Perceptions of Community Characteristics (means)				
Community strains scale [3] (see text for description)	0.90*	0.86 - 0.95	1.19†	1.15 - 1.23
Job and housing scarcity scale[3] (see text for description)	1.36*	1.31 - 1.40	1.59†	1.55 - 1.63
Racial discrimination scale[2] (see text for description)	0.24*	0.22 - 0.27	0.39†	0.36 - 0.43

Source: AI-SUPERPFP (1996-1999)

* significantly different from the Northern Plains (p > .01)

† significantly different from the Southwest (p > .01)

[1] calculated using sample and nonresponse weights and stratification

[2] 0 = not at all 1 = some 2 = a lot

[3] 0 = not a problem 1 = some problems 2 = a lot of problems

[4] 0 = never 1 = almost never 2 = sometimes 3 = often 4 = almost always

Table 2

Selected 2000 US Census community measures for AI-SUPERPFP sample

	SW				NP			
	AI-SUPERPFP N=1445 Census block groups N=249				AI-SUPERPFP N=1638 Census block groups N=84			
	Average	**SD**	**Min**	**Max**	**Average**	**SD**	**Min**	**Max**
Census pop per block group	1414	797	34	4479	982	627	120	3507
# AI-Superpfp Rs per block	12	8	1	37	90	51	1	149
Average Census block group estimates, %:								
AI ethnicity (alone)[+]	82	29	0	100	79	25	0	100
Living in poverty	29	20	3	100	33	18	0	100
Renting	37	20	10	100	26	20	0	96
With HS diploma or GED	62	17	14	99	72	10	47	100

Source: 2000 US Census and AI-SUPERPFP (1996-1999)

[+]Refers to persons endorsing “American Indian” as only race/ethnicity on 2000 US Census.

Table 3

Fixed-intercept logistic regressions predicting past-year DSM-IV depression, NP tribe

Predictor	Model #1			Model #2			Model #3			Model #4			Model #5		
	LL[1] = -213.285 *p* -value = .411			LL = -189.328 Change *p* -value[2] = < .001			LL = - 183.532 Change *p* -value = .009			LL = -179.562 Change *p* -value =.005			LL = - 175.982 Change *p* -value = .067		
	OR[3]	SE	*p* -value	OR	SE	*p* -value	OR	SE	*p* -value	OR	SE	*p* -value	OR	SE	*p* -value
Socio-demographics															
Female	1.36	0.41	0.297	1.31	0.40	0.380	1.31	0.42	0.406	1.36	0.44	0.353	1.32	0.44	0.414
Age 15-24	0.69	0.36	0.479	0.37	0.20	0.068	0.45	0.25	0.146	0.40	0.23	0.107	0.44	0.25	0.151
Age 25-34	0.96	0.38	0.924	0.65	0.27	0.295	0.74	0.31	0.471	0.66	0.28	0.331	0.71	0.30	0.427
Age 35-44	1.00	0.39	0.997	0.63	0.26	0.263	0.65	0.27	0.299	0.62	0.26	0.254	0.64	0.27	0.283
12 yrs education	0.97	0.38	0.934	1.07	0.43	0.865	1.06	0.43	0.886	1.15	0.48	0.729	1.18	0.49	0.696
Post high school education	1.34	0.58	0.502	1.38	0.61	0.473	1.32	0.59	0.540	1.47	0.68	0.400	1.37	0.63	0.492
Low income (below fed. poverty level)	1.45	0.48	0.270	1.22	0.41	0.561	1.13	0.40	0.733	1.10	0.40	0.795	1.16	0.43	0.684
Student	1.14	0.57	0.790	1.03	0.53	0.954	1.00	0.52	0.995	1.02	0.53	0.970	0.97	0.52	0.957
Unemployed	1.03	0.34	0.936	0.95	0.32	0.878	0.92	0.31	0.803	0.87	0.30	0.677	0.89	0.31	0.749
Separated, widowed, divorced	1.19	0.42	0.617	1.25	0.46	0.551	1.24	0.46	0.562	1.20	0.45	0.631	1.18	0.44	0.658
Never married	0.48	0.21	0.087	0.55	0.24	0.162	0.54	0.24	0.161	0.52	0.23	0.141	0.51	0.23	0.133
Family history															
Natal family violence				1.49	0.49	0.229	1.46	0.49	0.257	1.50	0.50	0.231	1.31	0.45	0.436
Natal family alcohol/drug problem				2.45	0.99	**0.027**	2.35	0.97	**0.037**	2.28	0.94	**0.046**	2.03	0.84	0.090
Natal family suicide/depression				4.14	1.41	**0.000**	4.15	1.43	**0.000**	4.11	1.43	**0.000**	4.13	1.45	**0.000**
Traditional ways of living															
Household basic needs scale							0.64	0.13	**0.023**	0.69	0.14	0.062	0.69	0.14	0.073
Help household by hunting/fishing							0.79	0.30	0.536	0.79	0.31	0.542	0.74	0.29	0.437
Help household by raising cattle/sheep							4.19	1.99	**0.003**	4.75	2.30	**0.001**	4.52	2.21	**0.002**
Spirituality															
Cultural spirituality scale score										0.19	0.11	**0.004**	0.19	0.11	**0.004**
Perceptions of community															

Predictor	Model #1			Model #2			Model #3			Model #4			Model #5		
	LL[1] = -213.285 *p* -value = .411			LL = -189.328 Change *p* -value[2] = < .001			LL = - 183.532 Change *p* -value = .009			LL = -179.562 Change *p* -value =.005			LL = - 175.982 Change *p* -value = .067		
	OR[3]	SE	*p* -value	OR	SE	*p* -value	OR	SE	*p* -value	OR	SE	*p* -value	OR	SE	*p* -value
Community strains scale score													2.48	0.98	**0.021**
Racial discrimination scale score													1.33	0.43	0.380
Job and housing scarcity scale score													0.61	0.23	0.191

[1] LL= Log likelihood; N=1,241 for all models.

[2] P value for log likelihood ratio test that log likelihood is different from that of log likelihood of the preceeding nested model

[3] Odds ratio

Table 4

Fixed-intercept logistic regressions predicting past-year DSM-IV depression, SW tribe

Predictor	Model #1			Model #2			Model #3			Model #4			Model #5		
	LL[1] = -239.624 *p* -value =.255			LL = -219.402 Change *p* -value[2] = <.001			LL = -214.766 Change *p* -value = 0.026			LL = -213.019 Change *p* -value = 0.062			LL = -202.049 Change *p* -value = <0.001		
	OR[3]	SE	*p* -value	OR	SE	*p* -value	OR	SE	*p* -value	OR	SE	*p* -value	OR	SE	*p* -value
Socio-demographics															
Female	1.12	0.30	0.678	1.10	0.30	0.731	1.26	0.36	0.419	1.25	0.36	0.433	1.08	0.31	0.791
Age 15-24	0.69	0.33	0.447	0.51	0.25	0.175	0.57	0.29	0.272	0.51	0.26	0.191	0.54	0.28	0.236
Age 25-34	1.46	0.57	0.332	1.14	0.46	0.749	1.11	0.46	0.795	0.98	0.41	0.960	0.93	0.41	0.866
Age 35-44	1.67	0.63	0.170	1.48	0.57	0.308	1.53	0.59	0.275	1.39	0.54	0.397	1.35	0.54	0.447
12 yrs education	0.76	0.24	0.391	0.66	0.22	0.209	0.65	0.22	0.205	0.63	0.21	0.177	0.57	0.20	0.109
Post high school education	0.94	0.34	0.854	0.76	0.29	0.470	0.80	0.31	0.560	0.79	0.31	0.553	0.61	0.25	0.223
Low income (below fed. poverty level)	1.30	0.37	0.346	1.49	0.44	0.175	1.41	0.43	0.256	1.44	0.44	0.238	1.45	0.45	0.227
Student	1.31	0.62	0.565	1.45	0.69	0.433	1.48	0.71	0.414	1.49	0.72	0.411	1.63	0.81	0.326
Unemployed	1.14	0.34	0.662	1.13	0.35	0.685	1.13	0.36	0.692	1.08	0.34	0.812	1.20	0.39	0.566
Separated, widowed, divorced	1.54	0.65	0.302	1.57	0.68	0.295	1.67	0.73	0.238	1.67	0.73	0.240	1.67	0.75	0.250
Never married	2.15	0.66	**0.013**	2.28	0.74	**0.012**	2.28	0.76	**0.013**	2.10	0.70	**0.026**	2.37	0.82	**0.013**
Family history															
Natal family violence				3.70	1.14	**0.000**	3.48	1.09	**0.000**	3.51	1.11	**0.000**	2.88	0.91	**0.001**
Natal family alcohol/drug problem				1.16	0.37	0.637	1.12	0.36	0.722	1.12	0.36	0.721	1.11	0.36	0.754
Natal family suicide/depression				1.96	0.55	**0.018**	2.00	0.58	**0.017**	2.04	0.59	**0.015**	1.78	0.53	0.053
Traditional ways of living															
Household basic needs scale							0.88	0.17	0.506	0.91	0.18	0.647	0.93	0.19	0.704
Help household by hunting/fishing							2.88	0.97	**0.002**	2.92	0.98	**0.002**	3.04	1.06	**0.001**
Help household by raising cattle/sheep							0.76	0.25	0.402	0.79	0.26	0.489	0.79	0.27	0.481
Spirituality															
Cultural spirituality scale score										0.37	0.19	0.056	0.30	0.16	**0.023**
Perceptions of community															

Predictor	Model #1			Model #2			Model #3			Model #4			Model #5		
	LL[1] = -239.624 *p* -value =.255			LL = -219.402 Change *p* -value[2] = <.001			LL = -214.766 Change *p* -value = 0.026			LL = -213.019 Change *p* -value = 0.062			LL = -202.049 Change *p* -value = <0.001		
	OR[3]	SE	*p* -value	OR	SE	*p* -value	OR	SE	*p* -value	OR	SE	*p* -value	OR	SE	*p* -value
Community strains scale score													2.03	0.66	**0.030**
Racial discrimination scale score													1.46	0.49	0.253
Job and housing scarcity scale score													1.82	0.61	0.075

[1] LL=Log likelihood; N=1,049 for all models.

[2] P value for log likelihood ratio test that log likelihood is different from that of log likelihood of the preceeding nested model

[3] Odds ratio

Table 5

Estimated probabilities of having DSM-IV past-year MDE, NP tribe

Personal Characteristics	Community Effect				
	Protective		Average	Elevated risk	
	-2 Standard deviations	-1 Standard deviation	Average	+1 Standard deviation	+2 Standard deviations
Typical Northern Plains reservation resident[1]	0.0010	0.0025	0.0065	0.0165	0.0416
Never married[2]	0.0005	0.0012	0.0032	0.0082	0.0209
High cultural spirituality scale score (95th percentile)[2]	0.0007	0.0018	0.0045	0.0116	0.0294
Natal family violence[2]	0.0013	0.0033	0.0086	0.0219	0.0547
Natal family suicide or depression[2]	0.0042	0.0108	0.0276	0.0682	0.1591

Note: Probabilities calculated using fixed coefficients in random-intercept logistic regression model.

[1]Most common (modal) characteristics among the participants of the NP tribe: Married, employed female, age 25-34, with highest education = 12 yrs and household income below federal poverty level, no traditional economic contributions to household, and no natal family violence or depression. Mean scores were used for scales.

[2]Values of modal/mean characteristics remain the same except for this difference.