

Epidemiology and Etiology of Substance Use among American Indians and Alaska Natives: Risk, Protection, and Implications for Prevention

Nancy Rumbaugh Whitesell, Ph.D.¹, Janette Beals, Ph.D.², Cecelia Big Crow, B.A.², Christina M. Mitchell, Ph.D.³, and Douglas K. Novins, M.D.⁴

¹Centers for American Indian and Alaska Native Health, Colorado School of Public Health, University of Colorado Denver, Aurora, CO, USA, ²Department of Community and Behavioral Health, Centers for American Indian and Alaska Native Health, Colorado School of Public Health, University of Colorado Denver, Aurora, CO, USA, ³Centers for American Indian and Alaska Native Health, Colorado School of Public Health, University of Colorado Denver, Aurora, CO, USA, ⁴Department of Psychiatry, Colorado School of Public Health, University of Colorado Denver, Aurora, CO, USA

Background: The epidemiology and etiology of substance use and disorder in American Indian and Alaska Native (AI/AN) communities have received increasing attention over the past 25 years and accumulating evidence provides important insights into substance use patterns in these populations. **Objectives and methods:** We provide a descriptive sketch of the AI/AN population in the United States today, present a brief review of the literature on the epidemiology and etiology of substance use within these populations, and discuss key implications of this literature for prevention efforts. **Conclusions and Scientific Significance:** Patterns of alcohol use and abuse in AI/AN populations are complex and vary across cultural groups, but alcohol clearly impacts both physical health and mental health within these communities. Tobacco use – and associated health consequences – is typically higher in these populations than among other US groups, although significant variation across Native communities is apparent here as with alcohol. Evidence regarding drug use and disorder is less extensive and thus less conclusive, but evidence demonstrates higher rates of use as well. Etiological explanations for substance use and disorder cut across individual characteristics (e.g., genetics) or experiences (e.g., exposure to trauma), to social contexts (e.g., family disruption), and to cultural factors (e.g., historical trauma). Protective factors likely cut across these multiple levels as well and deserve more focused attention for informing prevention efforts. The development of effective prevention strategies, built through collaboration between researchers and Native communities, drawing from the wisdom of both, is a high priority.

Keywords: American Indian, Alaska Native, alcohol use, drug use, tobacco use, disorder

INTRODUCTION

This review represents a survey of the current landscape of substance use and disorder in American Indian and Alaska Native (AI/AN)¹ populations. Summarizing the epidemiological and etiological literatures regarding AI/ANs in a brief report is, however, a daunting and essentially impossible task. Thus, we provide what is best thought of as an introduction to these literatures, a broad perspective on what is known, and suggestions about how this knowledge might inform prevention efforts.

CONTEMPORARY AI/AN POPULATIONS

AI/ANs were the first inhabitants of North America, but, in many ways, are almost invisible in this country today. They comprise a small but diverse segment of the US population. In Census 2010, 2.9 million Americans identified solely as AI/AN and another 2.3 million as both AI/AN and at least one other race, together accounting for just 1.7% of the US population (1). Yet, within this small population, more than 560 AI/AN tribes and communities are federally recognized (2). Some American Indian (AI) tribes are quite large; the Cherokee Nation of Oklahoma and the Navajo Nation each make up more than 10% of AI/ANs. Other tribes have only a few hundred members (3). Alaska Natives (ANs) comprise about 5% of the total AI/AN population (3). This inherent diversity cannot be trivialized; important differences in language, culture, and customs (4) make generalizations to an overall AI/AN population prone to significant error. Research findings we review below attest to important variations in substance use patterns across tribal groups. Local adaptations of both research and intervention protocols, responsive to this fundamental diversity, are imperative.

Address correspondence to Nancy Rumbaugh Whitesell, Centers for American Indian and Alaska Native Health, Nighthorse Campbell Native Health Building, 13055 E. 17th Ave., Room 336, Aurora, CO 80045, USA. Tel: +(303) 724-1456. Fax: +(303) 724-1474. E-mail: nancy.whitesell@ucdenver.edu

In addition to recognizing diversity among AI/AN populations, it is important to appreciate their distinctive demographic contexts compared with other Americans. AI/ANs live predominantly in the West and South (3) and, while the majority now live in urban or suburban contexts, they remain more likely than other Americans to live in rural areas (5). The urban/suburban AI/AN population is remarkably diffuse, largely because federal relocation policies in the mid-twentieth century purposefully dispersed AI/ANs when they were moved into urban areas to encourage integration (6). AI/AN urban enclaves are rare and, where they do exist, represent a wide array of tribal and cultural backgrounds. Statistical sampling is thus extremely difficult, and national probability samples based on general US residential patterns likely yield biased results with respect to AI/ANs (6). As a result, most research with AI/ANs is conducted within rural reservation and community settings, essentially focusing on the minority of AI/ANs.

AI/AN populations also are, overall, younger, less well educated, and more likely to be poor when compared with other Americans. In 2004, the median age for AI/ANs was 32, compared with 36 for the United States as a whole. Only 14% had at least a Bachelor's degree, compared with 27% for Americans generally. In 2006, the overall poverty rate for AI/ANs was 24.6%, compared with 13.1% for the United States overall (3).

EPIDEMIOLOGY: PATTERNS OF SUBSTANCE USE AND DISORDER AMONG AI/ANS

Mortality statistics and epidemiological research detail disparities in substance use and disorder in AI/AN communities. Ratios of age-adjusted mortality rates for AI/ANs compared with the US "All Races" for alcohol, chronic liver disease and cirrhosis, drugs, and lung cancer have been reported to be 6.2, 4.2, 1.5, and 0.9, respectively (7). Premature death rates (Years of Potential Life Lost) are 90% higher for AI/ANs than for US All Races (7), with alcohol use considered to be the largest contributing factor to increased mortality (8). However, significant variability is evident within AI/AN populations; alcohol-specific death rate estimates range across Indian Health Service (IHS) service areas from 18.3/100,000 (Nashville Area, eastern United States) to 86.4/100,000 (Aberdeen Area, North and South Dakota) (9).

Epidemiological evidence paints a complex picture of substance use and disorder patterns. Research documents higher rates of use and earlier initiation among AI/AN adolescents compared with other US adolescents, but the extent of disparities found varies across studies. Annual surveillance of AI/AN adolescents conducted by the Tri-Ethnic Center has documented higher rates of drug, alcohol, and tobacco use among AI/AN adolescents compared with Hispanic or White youth; AI/ANs living on reservations and those who had dropped out of school reported the highest levels of use (10). In another study, AI/AN adolescents reported similar rates of lifetime alcohol use but higher rates of heavy drinking and drug use compared with

adolescents from a sample of rural White adolescents in Minnesota (11). Joint analyses of the Voices of Indian Teens study in four AI/AN reservation communities and the national Monitoring the Future study showed elevated lifetime and 30-day use of substances among AI/AN youth, but most differences disappeared when analyses were stratified by geographical region (12). Other studies have shown that substance use begins early among AI/ANs, and early use is a clear marker of risk for prolonged and problematic use (13–19).

Research focusing on adult substance use has shown lifetime and current rates of use that are often lower among AI/AN adults compared with other Americans (20,21). However, AI/AN adults who do drink more often show a pattern of heavy, episodic drinking (20–23). Drug use patterns appear to be similar among AI/ANs and other American adults (24), but tobacco use rates are often higher among AI/ANs (25,26). For all substances, clear evidence exists of extensive diversity in rates and patterns of use across AI/AN groups; some tribal communities have markedly lower rates of substance use than the general US population does and others distinctly higher rates (21,24,25). As with adolescent use, geographical variation in adult use has been documented as well. In joint analyses of the National Longitudinal Alcohol Epidemiologic Study and the American Indian Service Utilization, Psychiatric Epidemiology, Risk and Protective Factors Project (AI-SUPERPPF), non-AI/AN drinkers reported drinking more frequently but in smaller quantities than did AI/AN reservation samples, who often reported heavy periodic drinking. AI/ANs residing in urban or suburban areas, on an average, drank more frequently than reservation-based AI/ANs and more heavily than the national sample (27), suggesting that urban AI/ANs may be at particularly high risk for alcohol-related problems.

The National Epidemiologic Survey of Alcohol and Related Conditions found higher rates of drug and alcohol dependence for AI/ANs compared with other Americans but did not find differences in rates of drug or alcohol abuse (28,29). A joint analysis of the National Comorbidity Survey and AI-SUPERPPF showed different risk profiles for two reservation-based samples and a national non-AI/AN sample: Members of Northern Plains tribes were at increased risk for both abuse (alcohol and drug) and dependence (alcohol only), and members of a Southwest tribe were at increased risk only for alcohol dependence (20,30).

It is clear that substance use and disorder threaten the health of AI/AN communities, yet neither are universally pervasive within these communities. AI/ANs are, overall, at increased risk compared with others in the United States (particularly for heavy, episodic alcohol use), but evidence also shows tremendous variability in use and disorder across tribes and across reservation and urban contexts. The diversity and dispersion of AI/AN populations preclude universal pronouncements of rates and risk (31). Clearly, though, substance use and disorder are high-priority targets for intervention research. Efforts to prevent early initiation of substance use are likely to be especially

fruitful in reducing disparities in substance use disorder (17,32,33).

ETIOLOGY: RISK AND PROTECTIVE FACTORS IN AI/AN POPULATIONS

As in other populations, research with AI/ANs has explored potential risk and protective factors ranging from molecular to societal. We highlight etiological factors that have been most extensively studied within AI/AN populations, beginning with individual factors, moving to contextual factors, and, finally to the effects of historical disruptions to AI/AN cultures. At each point, we consider implications for prevention.

Individual Risk and Protective Factors

Biological Processes

It has been long known that some AI/AN populations are less likely than Whites to have the protective variations of genes underlying the alcohol dehydrogenase/aldehyde dehydrogenase process essential for alcohol metabolism (34). Possible genetic associations with differential risk for alcohol and tobacco dependence of various polymorphisms on specific alleles have been investigated (35). Efforts are being made to better understand the genetic pathways by which abuse and dependence develop (36,37), with the eventual goal of targeted interventions for those most at risk. To date, however, clear evidence of critical differential biological processes between AI/AN and other populations is lacking.

Psychiatric Risk

As in other populations, family history of substance use disorder, personality characteristics, and psychiatric comorbidities are all associated with substance use and disorder among AI/ANs (28,38,39). Reflecting the joint influences of biological and environmental forces, such factors can identify those most at risk for substance use and disorder (e.g., children of substance-abusing parents) and may provide important contexts for intervention (e.g., coordinated with treatment for mental health problems).

Demographic Factors

Demographic factors are often markers of underlying risk processes (rather than risk factors themselves), but they can be critical in identifying targets for prevention efforts. Demographic correlates of use and disorder evident in other populations are typically apparent among AI/ANs as well, albeit with notable variations across specific AI/AN groups. AI/AN youth, for example, tend to start substance use earlier and in patterns somewhat distinct from those of other American youth (17,40–42), underscoring the need for early and tailored prevention efforts in AI/AN communities. Gender has been shown to have differential associations across tribes (20). Some demographic risk factors have limited variability and unique patterns in AI/AN populations, making inferences difficult. For instance, poverty is prevalent in AI/AN communities, rendering

attributions about risk challenging. Similar complications are related to the limited educational and employment ecologies within many AI/AN communities. As argued within the Social Determinants of Health (43,44) framework, major inroads into reducing health disparities likely depend on addressing demographic disparities.

Trauma Exposure

AI/ANs are at increased risk for trauma exposure and for posttraumatic stress disorder (PTSD) (30,45,46); given the strong associations with both substance use and disorder, trauma and PTSD have received special attention among AI/ANs (47–49). Interventions specifically designed for AI/ANs who have experienced trauma – particularly children and adolescents – may hold particular promise for reducing risk (50).

Cognitive Behavioral Processes

Among these, substance-related expectancies, in particular, appear to operate similarly among AI/ANs as in other populations. For example, the associations of developmental trajectories of expectancies about alcohol use with quantity and frequency of drinking among AI/AN adolescents are analogous to those observed in other populations (51,52).

Cultural Identity²

Despite widespread belief that culture influences risk and is potentially a powerful protective force, we still know relatively little about the precise roles and mechanisms through which culture impacts risk. Cultural identity has perhaps received the most attention, with attempts to quantify the protective effects of culture at the individual level. Primary Socialization Theory suggests that culture engenders a set of processes, among them cultural identity, that interacts with and influences adolescents' primary socialization contexts (family, peer, and school networks) (53). However, findings to date linking cultural identity to risk for substance use and disorder are somewhat mixed; some evidence anticipated protective effects, but others showed no effect or even hint at risk associated with strong AI/AN identity (perhaps reflecting internalization of negative stereotypes of AI/AN substance use) (52,54). The inclusion of culturally relevant constructs in etiological studies, particularly constructs hypothesized to be protective in nature (e.g., engagement in cultural traditions and adoption of traditional cultural values), and the refinement of measures of these constructs (e.g., disentangling cultural pride from cultural practice from internalized stereotypes), will be critical to illuminating how culture and substance use are intertwined and to identifying prevention strategies that may capitalize on protective effects of culture.

Beyond the Individual: Contextual Risk and Protective Factors

Increasing recognition exists that uncovering the roots of health disparities requires a broad perspective. We must examine how individual risk unfolds within social settings – including families, peer networks, schools,

communities, service systems, and national contexts. For AI/AN populations, individual risk is also situated within the cultural and historical contexts of the tribe, village, or native corporation. Various theoretical frameworks, including Primary Socialization Theory (53,55–57) and Social Determinants of Health (43,44), explicitly embed the individual within such systems and hypothesize specific mechanisms through which important contexts impact individual risk. Also, they highlight the need to intervene at multiple levels within these larger systems.

Social Networks

Familial variables have received special attention in studies of AI/AN populations, reflecting recognition of cultural emphases on family, including extended family (57), and the relative collectivistic nature of many AI/AN cultures. Family environment, parental attachment, family strengths, and family sanctions have all been shown to be protective factors among AI/AN youth (58,59). Peer networks have also been shown to play a critical role in risk for substance use and disorder among AI/ANs, with particularly strong links between deviant peers and risk during adolescent and early adulthood (56). Other networks, such as schools or places of employment are also critical. As encapsulated in Primary Socialization Theory, individuals function within, are influenced by, and have influences on these networks (56); optimal interventions will operate within them as well.

Community Context

AI/AN communities vary in terms of substance availability, presence of substance-using peers, and attitudes toward use (57); they are often somewhat unique compared with other areas of the United States. Many tribes, as sovereign nations, have explicit laws banning the sale or possession of alcohol within reservation boundaries; it remains unclear precisely how such bans influence patterns of alcohol use (60). In contrast to restricting access to alcohol, many tribes promote the sale of cigarettes on tribal lands, capitalizing on lower taxes than found in off-reservation stores to create a revenue source; such policies and associated easy access may inhibit smoking quit attempts (61). While most research on community-level factors has taken place in reservation or AI/AN community settings, the recognition that most AI/ANs live dispersed throughout urban/suburban areas underscores how little we know about how such community contexts may shape risk for substance use problems.

Service Systems

Limited availability of health services for substance use problems is likely a contributing factor to substance use disorder disparities in AI/AN communities. Through treaty agreements with tribes, the federal government committed to provide health care to AI/ANs, primarily in exchange for ceded land; the Indian Health Service (IHS) was established to fulfill this obligation. IHS is, however, extremely underfunded. Recent estimates document per capita expenditures less than half those for Medicaid and

lower than all other federally funded health systems (e.g., prisons) (62). In addition, most IHS facilities are on tribal lands, leaving urban/suburban AI/ANs with little access to these services (63). Substance abuse services in AI/AN communities are often provided by an amalgam of IHS, tribal, and other service systems, all of which struggle with inadequate funding, and coordination across systems is suboptimal (64,65). Traditional healing and ceremonies are important sources of help to many AI/ANs; the integration of these approaches with Western biomedical services is often tenuous.

Despite the potential implications of this complex service milieu, research on AI/AN substance use services is sparse. One study found AI/AN men sought services for substance use disorders as frequently as did other men in the United States (30). Others have shown that cultural identity and spirituality differentiate those who seek help from traditional healing sources (often in combination with biomedical services) from those who seek help from biomedical sources only (30,66–68).

Broader Contexts: Historical Trauma

The contextual factors discussed above remind us that the settings within which individuals operate on a daily basis are critical and that interventions to strengthen family, community, and health service systems hold great promise for reducing risk. Within AI/AN populations, it is important to consider the broader context of historical trauma as well. The legacy of colonization and federal assimilation policies continues to impact lives (69–73). AI/AN scholars suggest that federally mandated boarding schools that removed children far from their families and denied them the language, dress, and customs of their cultures resulted in “lost” generations who neither received the parenting they needed nor learned parenting skills necessary to raise their own children, and who were cut off from cultural practices that supported successful development (74). Acknowledging this history can help focus intervention efforts. For example, interventions to rebuild culturally grounded parenting skills may protect children against early substance use. Recent interventions also show promise in explicitly addressing the contemporary fallout of historical trauma (71).

In concluding this review of etiological research, we note that the bulk of this work has used a deficit-based approach, focusing on *risk* factors. In AI/AN communities, this approach has worn thin. Community partners advocate a shift to a strengths-based approach, focusing on those within their communities who exemplify successful outcomes (in the case of substance use, the vast majority of AI/ANs who do not have active substance use problems) and shining the research spotlight on those individuals, to better understand *protective* factors. This mandate, arising out of collaborative work within the Community-Based Participatory Research (CBPR) paradigm, provides a critical impetus for the development of interventions that build upon cultural, community, and individual strengths to promote positive outcomes for AI/ANs (75).

IMPLICATIONS FOR PREVENTION

Throughout this review, we have noted where the epidemiological and etiological literatures suggest intervention targets or strategies; we conclude by reiterating key prevention implications. First, interventions should be crafted to triangulate on substance use and disorder within AI/AN communities, addressing both the myriad of factors that contribute to risk and protection and the variety of levels within which these influences operate. Second, we join others in the call for the continuing development of integrative theories (56,76), spanning academic disciplines (77), that can serve as guides for coordinated interventions. Finally, the development of effective and sustainable interventions must be grounded within AI/AN communities (both in reservations/villages and in urban/suburban areas), incorporating community and cultural knowledge about effective prevention. CBPR methods must be implemented through genuine partnerships, bringing together the scientific expertise of researchers and the cultural expertise of community members.

ACKNOWLEDGMENTS

The authors thank Dr. Kathy Etz (National Institute on Drug Abuse), who was instrumental in shaping the focus of this review article. This study was supported by the National Institute on Drug Abuse (RC4 DA029974, Whitesell & Beals, PIs; R01 DA022239, Novins, PI). This review was presented, in part, at the *2010 Building Bridges: Advancing American Indian/Alaska Native Substance Abuse Research* (October 5–7th, Rockville, MD).

Declaration of Interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of this article.

NOTES

1. The term “American Indian and Alaska Native” is used throughout. In 1977, the National Congress of American Indians issued a joint resolution that, in the absence of specific tribal names, American Indian is the preferred term of the indigenous populations of the contiguous United States.
2. The distinctions between ethnic, cultural, and racial identities are complex and beyond the scope of this review. In this discussion, we use cultural identity because we believe that it links most directly to cultural influences, but the issues remain much broader.

REFERENCES

1. US Department of Commerce, US Census Bureau. Overview of Race and Hispanic Origin: 2010. Washington, DC: US Census Bureau, 2011.
2. Bureau of Indian Affairs. Indian entities recognized and eligible to receive services from the United States Bureau of Indian Affairs. In 75 FR 60810 – Indian Entities Recognized and Eligible To Receive Services From the United States Bureau of Indian Affairs. Department of the Interior, ed. (Vol 75). Washington, DC: Federal Register, 2010, 60810–60814.
3. US Department of Commerce, U. S. Census Bureau. The American Community–American Indians and Alaska Natives: 2004. American Community Survey Reports. Washington, DC: US Census Bureau, 2007.
4. Kehoe AB. North American Indians: A Comprehensive Account Englewood Cliffs, NJ: Prentice Hall, 1992.
5. US Department of Commerce, US Census Bureau. Profile American: Facts for Features. American Indian and Alaska Native Heritage Month: November 2011. Washington, DC, US Census Bureau, 2011.
6. Snipp CM. The size and distribution of the American Indian population: Fertility, mortality, migration, and residence. In *Changing Numbers, Changing Needs: American Indian Demography and Public Health*. Sandefur GD, Rindfuss RR, Cohen B, eds. Washington, DC: National Academy Press, 1996, 17–52.
7. US Department of Health and Human Services. Trends in Indian Health: 2002–2003. Rockville, MD: Department of Health and Human Services, 2010.
8. Welty TK. The epidemiology of alcohol use and alcohol-related health problems among American Indians and Alaska Natives. In *Alcohol Use Among American Indians and Alaska Natives: Multiple Perspectives on a Complex Problem*. Mail PD, Heurtin-Roberts S, Martin SE, Howard J, eds. (Vol 37). Bethesda, MD: US Department of Health and Human Services, 2002, 49–70.
9. US Department of Health and Human Services. Regional Differences in Indian Health: 2002–2003. Rockville, MD: Department of Health and Human Services, 2009.
10. Beauvais F, Jumper-Thurman P, Burnside M. The changing patterns of drug use among American Indian students over the past thirty years. *Am Indian Alsk Native Ment Health Res: J Natl Center* 2008; 15(2):15–24.
11. Blum RW, Harmon B, Harris L, Bergeisen L, Resnick MD. American Indian–Alaska Native youth health. *JAMA* 1992; 267(12):1637–1644.
12. Plunkett M, Mitchell CM. Substance use rates among American Indian adolescents: Regional comparisons with Monitoring the Future high school seniors. *J Drug Issues* 2000; 30(3):593–620.
13. Hawkins JD, Catalano RF, Kosterman R, Abbott RD, Hill KG. Risk and protective factors for alcohol and other drug problems in adolescence and early adulthood: Implications for substance use prevention. *Psychological Bulletin* 1992; 112:64–105.
14. Kunitz SJ. Risk factors for polydrug use in a Native American population. *Subst Use Misuse* 2008; 43:331–339.
15. Novins DK, Indian Adolescent BA. Substance use: The hazards for progression for adolescents ages 14 to 20. *J Am Acad Child Adolesc Psychiatry* 2004; 43:316–324.
16. Robins LN, Pryzybeck PR. Age of onset of drug use as a factor of drug use and other disorders. In *Etiology of Drug Abuse: Implications for Prevention* (NIDA Research Monograph No. 56). Jones CL, Battjes RJ, eds. Washington, DC: US Government Printing Office, 1985, 178–192.
17. Whitbeck LZ, Yu M, Johnson KK, Hoyt DR, Walls ML. Diagnostic prevalence rates from early to mid-adolescence among indigenous adolescents: First results from a longitudinal study. *J Am Acad Child Adolesc Psychiatry* 2008; 47(8):890–900.
18. Whitesell NR, Beals J, Mitchell CM, Keane EM, Spicer P, Turner RJ. The relationship of cumulative and proximal adversity to onset of substance dependence symptoms in two American Indian communities. *Drug Alcohol Depend* 2007; 91(2–3):279–288.
19. Anthony JC, Petronis KR. Early-onset drug use and risk of later drug problems. *Drug Alcohol Depend* 1995; 40(1):9–15.

20. Spicer P, Beals J, Mitchell CM, Croy CD, Novins DK, Moore L, Manson SM, American Indian Service Utilization, Psychiatric Epidemiology, Risk and Protective Factors Project Team. The prevalence of DSM-III-R alcohol dependence in two American Indian populations. *Alcohol Clin Exp Res* 2003; 27(11):1785–1797.
21. Beals J, Spicer P, Mitchell CM, Novins DK, Manson SM, the AI-SUPERPPF Team. Racial disparities in alcohol use: Comparison of two American Indian reservation populations with national data. *Am J Public Health* 2003; 93(10):1683–1685.
22. Kunitz SJ, Gabriel KR, Levy JE, Henderson E, Lampert K, McCloskey J, Quintero G, Russell S, Vince A. Alcohol dependence and conduct disorder among Navajo Indians. *J Stud Alcohol* 1999; 60(2):159–167.
23. Robin RW, Long JC, Rasmussen JK, Albaugh B, Goldman D. Relationship of binge drinking to alcohol dependence, other psychiatric disorders, and behavioral problems in an American Indian tribe. *Alcohol Clin Exp Res* 1998; 22(2):518–523.
24. Mitchell CM, Beals J, Novins DK, Spicer P, the AI-SUPERPPF Team. Drug use among two American Indian populations: Prevalence of lifetime use and DSM-IV substance use disorders. *Drug Alcohol Depend* 2003; 69:29–41.
25. Nez Henderson P, Jacobsen C, Beals J, the AI-SUPERPPF Team. Correlates of cigarette smoking among selected Southwest and Northern Plains tribal groups: The AI-SUPERPPF study. *Am J Public Health* 2005; 95(5):867–872.
26. Falk DE, Yi HY, Hiller-Sturmhofel S. An epidemiologic analysis of co-occurring alcohol and tobacco use and disorders: Findings from the National Epidemiologic Survey on Alcohol and Related Conditions. *Alcohol Res Health* 2006; 29(3):162–171.
27. O'Connell JM, Novins DK, Beals J, Spicer P, the AI-SUPERPPF Team. Disparities in patterns of alcohol use among reservation-based and geographically dispersed American Indian populations. *Alcohol Clin Exp Res* 2005; 29(1):107–116.
28. Compton WM, Thomas YF, Stinson FS, Grant BF. Prevalence, correlates, disability, and comorbidity of DSM-IV Drug Abuse and Dependence in the United States: Results from the National Epidemiologic Survey on Alcohol and Related Conditions. *Arch Gen Psychiatry* 2007; 64(5):566–576.
29. Grant BF, Dawson DA, Stinson FS, Chou SP, Dufour MC, Pickering RP. The 12-month prevalence and trends in DSM-IV alcohol abuse and dependence: United States, 1991–1992 and 2001–2002. *Drug Alcohol Depend* 2004; 74(3):223–234.
30. Beals J, Novins DK, Whitesell NR, Spicer P, Mitchell CM, Manson SM, American Indian Service Utilization, Psychiatric Epidemiology, Risk and Protective Factors Project Team. Prevalence of mental disorders and utilization of mental health services in two American Indian reservation populations: Mental health disparities in a national context. *Am J Psychiatry* 2005; 162(9):1723–1732.
31. Trimble JE. Prolegomena for the connotation of construct use in the measurement of ethnic and racial identity. *J Couns Psychol* 2007; 54(3):247–258.
32. Whitesell NR, Beals J, Mitchell CM, Spicer P, Novins DK, Manson SM. Disparities in drug use and disorder: Comparison of two American Indian reservation communities and a national sample. *Am J Orthopsychiatry* 2007; 77(1):131–141.
33. Beauvais F. An integrated model for prevention and treatment of drug abuse among American Indian youth. *J Addict Dis* 1992; 11:63–80.
34. Mulligan CJ, Robin RW, Osier MV, Sambuughin N, Goldfarb LG, Kittles RA, Hesselbrock D, Goldman D, Long JC. Allelic variation at alcohol metabolism genes (ADH1B, ADH1C, ALDH2) and alcohol dependence in an American Indian population. *Hum Genet* 2003; 113(4):325–336.
35. Enoch MA, Waheed JF, Harris CR, Albaugh B, Goldman D. Sex differences in the influence of COMT Val158Met on alcoholism and smoking in Plains American Indians. *Alcohol Clin Exp Res* 2006; 30(3):399–406.
36. Ehlers CL, Gilder DA, Gizer IR, Wilhelmsen KC. Heritability and a genome-wide linkage analysis of a Type II/B cluster construct for cannabis dependence in an American Indian community. *Addict Biol* 2009; 14(3):338–348.
37. Ehlers CL, Gizer IR, Gilder DA, Wilhelmsen KC. Linkage analyses of stimulant dependence, craving, and heavy use in American Indians. *Am J Med Genet B Neuropsychiatr Genet* 2011; 156B(7):772–780.
38. Wall TL, Garcia-Andrade C, Wong V, Lau P, Ehlers CL. Parental history of alcoholism and problem behaviors in Native-American children and adolescents. *Alcohol Clin Exp Res* 2000; 24(1):30–34.
39. Goldstein RB, Dawson DA, Saha TD, Ruan WJ, Compton WM, Grant BF. Antisocial behavioral syndromes and DSM-IV alcohol use disorders: Results from the national epidemiologic survey on alcohol and related conditions. *Alcohol Clin Exp Res* 2007; 31(5):814–828.
40. Novins DK, Beals J, Mitchell CM. Sequences of substance use among American Indian adolescents. *J Am Acad Child Adolesc Psychiatry* 2001; 40(10):1168–1174.
41. Novins DK, Spicer P, Beals J, Manson SM. Preventing underage drinking in American Indian and Alaska Native communities: Contexts, epidemiology, and culture. In *Reducing Underage Drinking: A Collective Responsibility*. Bonnie RJ, O'Connell ME, eds. Washington, DC: The National Academies Press, 2004, 678–696.
42. Beauvais F. Comparison of drug use rates for reservation Indian, non-reservation Indian and Anglo youth. *Am Indian Alsk Native Ment Health Res* 1992; 5(1):13–31.
43. Marmot M. Social determinants of health inequalities. *Lancet* 2005; 365(9464):1099–1104.
44. Marmot MG, Bell R, Marmot MG, Bell R. Action on health disparities in the United States: Commission on social determinants of health. *J Am Med Assoc* 2009; 301(11):1169–1171.
45. Manson SM, Beals J, Klein S, Croy CD, the AI-SUPERPPF Team. The social epidemiology of trauma in two American Indian reservation populations. *Am J Public Health* 2005; 95(5):851–859.
46. Robin RW, Chester B, Rasmussen JK, Jaranson JM, Goldman D. Prevalence and characteristics of trauma and posttraumatic stress disorder in a southwestern American Indian community. *Am J Psychiatry* 1997; 154(11):1582–1588.
47. Whitesell NR, Beals J, Mitchell CM, Manson SM, Turner RJ. Childhood exposure to adversity and risk of substance-use disorder in two American Indian populations: The meditational role of early substance-use initiation. *J Stud Alcohol Drugs* 2009; 70(6):971–981.
48. Beals J, Novins DK, Mitchell CM, Shore JH, Manson SM. Comorbidity between alcohol abuse/dependence and psychiatric disorders: Prevalence, treatment implications, and new directions for research among American Indian populations. In *Alcohol Use Among American Indians and Alaska Natives: Multiple Perspectives on a Complex Problem*. Mail P, Heurtin-Roberts S, Martin SE, Howard J, eds. Bethesda, MD: US Department of Health and Human Services, 2002, 371–410.
49. Libby AM, Orton HD, Novins DK, Spicer P, Buchwald D, Beals J, Manson SM, AI-SUPERPPF Team. Childhood

- physical and sexual abuse and subsequent alcohol and drug use disorders in two American Indian tribes. *J Stud Alcohol* 2004; 65(1):74–83.
50. Novins DK, Boyd ML, Brotherton DT, Fickenscher A, Moore L, Spicer P. Walking On: Celebrating the journeys of traumatized Native American adolescents with substance use problems on the winding road to healing. *J Psychoactive Drugs*, 2012; 44(2):153–159.
 51. Mitchell CM, Beals J. The development of alcohol use and outcome expectancies among American Indian young adults: A growth mixture model. *Addict Behav* 2006; 31(1):1–14.
 52. Markstrom CA, Whitesell NR, Galliher RV. Ethnic identity and mental health among American Indian and Alaska Native adolescents. In *American Indian and Alaska Native Children and Mental Health: Development, Context, Prevention, and Treatment*. Sarche MC, Spicer P, Farrell P, Fitzgerald HE, eds. Denver, CO: Praeger, 2011, 101–131.
 53. Oetting ER, Donnermeyer JF, Trimble JE, Beauvais F. Primary socialization theory: IV. Culture, ethnicity, and cultural identification. The links between culture and substance use. *Subst Use Misuse* 1998; 33(10):2075–2107.
 54. Novins DK, Spicer P, Beals J, Manson SM. Preventing underage drinking in American Indian and Alaska Native communities: Contexts, epidemiology, and culture. In *National Research Council and Institute of Medicine, Reducing Underage Drinking: A Collective Responsibility*, Background Papers [CD ROM]. Division of Behavioral and Social Sciences and Education, ed. Washington, DC: The National Academies Press, 2004, 678–696.
 55. Oetting ER, Deffenbacher JL, Donnermeyer JF. Primary socialization theory: II. The role played by personal traits in the etiology of drug use and deviance. *Subst Use Misuse* 1998; 33(6):1337–1366.
 56. Oetting ER, Donnermeyer JF. Primary socialization theory: I. The etiology of drug use and deviance. *Subst Use Misuse* 1998; 33(4):995–1026.
 57. Oetting ER, Donnermeyer JF, Deffenbacher JL. Primary socialization theory: III. The influence of the community on drug use and deviance. *Subst. Use Misuse* 1998; 33(8):1629–1665.
 58. Oetting ER. Primary socialization theory: V. Developmental stages, spirituality, government institutions, sensation seeking, and theoretical implications. *Subst Use Misuse* 1999; 34(7):947–982.
 59. Whitbeck LB. Primary socialization theory: It all begins with the family. *Subst Use Misuse* 1999; 34(7):1025–1032.
 60. Wood DS, Gruenewald PJ. Local alcohol prohibition, police presence and serious injury in isolated Alaska Native villages. *Addiction* 2006; 101(3):393–403.
 61. Hyland A, Higbee C, Li Q, Bauer JE, Giovino GA, Alford T, Cummings KM. Access to low-taxed cigarettes deters smoking cessation attempts. *Am J Public Health* 2005; 95(6):994–995.
 62. Roubideaux Y. Beyond Red Lake – The persistent crisis in American Indian health care. *N Engl J Med* 2005; 353(18):1881–1883.
 63. Zuckerman S, Haley J, Roubideaux Y, Lillie-Blanton M. Health service access, use, and insurance coverage among American Indians/Alaska Natives and Whites: What role does the Indian Health Service play? *Am J Public Health* 2004; 94(1):53–59.
 64. Novins DK, Moore LA, Beals J, Kaufman CE. A sampling framework for conducting a national study of substance abuse treatment programs serving American Indian and Alaska Native communities. *Am J Drug Alcohol Abuse*, under review.
 65. Manson SM. Behavioral health services for American Indians: Need, use, and barriers to effective care. In *Promises to Keep: Public Health Policy for American Indians and Alaska Natives in the 21st Century*. Dixon M, Roubideaux Y, eds. Washington, DC: American Public Health Association, 2001.
 66. Beals J, Novins DK, Spicer P, Whitesell NR, Mitchell CM, Manson SM, American Indian Service Utilization, Psychiatric Epidemiology, Risk, and Protective Factors Project Team. Help seeking for substance use problems in two American Indian reservation populations. *Psychiatr Serv* 2006; 57(4):512–520.
 67. Moy E, Dayton E, Clancy CM. Compiling the evidence: The National Healthcare Disparities Reports. *Health Aff. (Millwood)* 2005; 24(2):376–387.
 68. Novins DK, Beals J, Moore L, Spicer P, Manson SM, the AI-SUPERPPF Team. Use of biomedical services and traditional healing options among American Indians: Sociodemographic correlates, spirituality, and ethnic identity. *Med Care* 2004; 42(7): 670–679.
 69. Brave Heart MYH. The historical trauma response among natives and its relationship with substance abuse: A Lakota illustration. *J Psychoactive Drugs* 2003; 35(1):7–13.
 70. Duran E, Duran B. *Native American Postcolonial Psychology*. Albany, NY: State University of New York Press, 1995.
 71. Gone JP. A community-based treatment for Native American historical trauma: Prospects for evidence-based practice. *J Consult Clin Psychol* 2009; 77(4):751–762.
 72. Walters KL, Simoni JM, Evans-Campbell T. Substance use among American Indians and Alaska Natives: Incorporating culture in an “indigenist” stress-coping paradigm. *Public Health Rep* 2002; 117(Suppl. 1):S104–S117.
 73. Whitbeck LB, Adams GW, Hoyt DR, Chen X. Conceptualizing and measuring historical trauma among American Indian people. *Am J Community Psychol* 2004; 33(3–4):119–130.
 74. Morrisette PJ, Naden M. An interactional view of traumatic stress among First Nations counselors. *J Fam Psychother* 1998; 9(3):43–60.
 75. Thomas LR, Donovan DM, Sigo RL, Austin L, Marlatt GA. The community pulling together: A Tribal Community-University partnership project to reduce substance abuse and promote good health in a reservation Tribal Community. *J Ethn Subst Abuse* 2009; 8(3):283.
 76. Petraitis J, Flay BR, Miller TO. Reviewing theories of adolescent substance use: Organizing pieces of the puzzle. *Psychol Bull* 1995; 117(1):67–86.
 77. Stokols D. Toward a science of transdisciplinary action research. *Am J Community Psychol* 2006; 38:63–77.