PREVALENCE AND CORRELATES OF LIFETIME METHAMPETAMINE USE AND NONMEDICAL USE OF PRESCRIPTION PAIN RELIEVERS AMONG AMERICAN INDIANS AND ALASKA NATIVES

by

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A THESIS

Presented to the Department of Public Health & Preventive Medicine

and the Oregon Health & Science University

School of Medicine

in partial fulfillment of

the requirements for the degree of

Master of Public Health

May 2008

Department of Public Health and Preventive Medicine

School of Medicine

Oregon Health & Science University

CERTIFICATE OF APPROVAL

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LIST OF ABBREVIATIONS

ACASI	Audio computer-assisted self-interviewing
Add Health	National Longitudinal Study on Adolescent Health
AI	American Indian
AIAN	American Indian or Alaska Native
AI-SUPERPFP	American Indian Service Utilization, Psychiatric Epidemiology, Risk and Protective Factors Project
CAPI	Computer-assisted personal interviewing
CBSA	Core-based statistical area
CI	Confidence interval
DSM-IV	American Psychiatric Association's Diagnostic and Statistical Manual of Mental Disorders
DU	Dwelling unit
HL	Hosmer and Lemeshow
HS	High school
IHS	Indian Health Service
IRB	Institutional review board
LT	Lifetime
MA	Methamphetamine
MDE	Major depressive episode
MTF	Monitoring the Future study
NESARC	National Epidemiologic Survey on Alcohol and Related Conditions
NSDUH	National Survey on Drug Use and Health
OHSU	Oregon Health and Science University
OR	Odds ratio
PM	Past month
PTSD	Posttraumatic stress disorder
PY	Past year
SAMHSA	Substance Abuse and Mental Health Services Administration
SAS	Statistical Analysis Software
SDU	Sample dwelling unit
SPD	Serious psychological distress
SS	State sampling
SUDAAN	Survey Data Analysis

ACKNOWLEDGMENTS

I am honored to have been surrounded by many wonderful people throughout the course of this program, without whose support I wouldn't have succeeded in this project. I extend my gratitude…

To my thesis chair, William Lambert, PhD, for providing unending encouragement and support, mentoring me through an internship and encouraging some of my first teaching experiences as a T.A. under your guidance. Your tireless enthusiasm for research is contagious, and you ignited in me an excitement for American Indian culture and health. To Jodi Lapidus, PhD, for being always available with excellent statistical and practical advice; your focus certainly helped maintain mine. To Dennis McCarty, PhD, for providing valuable guidance through your expertise of substance abuse, a complicated field with which I'd had no prior experience. And to Victoria Warren-Mears, PhD, for keeping me on track and providing invaluable cultural insight, ensuring that the research would be relevant and helpful to the communities in need of it. Working with each of you has been a privilege.

To all the administrators and instructors in the Department of Public Health and Preventive Medicine at OHSU, I thank you for accepting me into this program, providing an excellent (and challenging!) education, and opening the door to many valuable experiences. To my classmates, I have greatly enjoyed learning from and with you – thanks for all those study sessions and for becoming friends.

To my family, who have been so supportive from afar, even going so far as to read drafts of my thesis! You may not always be here, but I know you are behind me every step of the way, and that means so much.

And finally, I couldn't have done any of this without the unbelievable love and support of my husband, Joe. For silently taking over all the little things around the house which I've neglected, for providing a listening ear and a many a much-needed hug at the end of a long day, and for walking alongside me for every step of this often self-absorbed journey.

Thank you.

ABSTRACT

Background – American Indians and Alaska Native (AIANs) as a group are at increased risk for many drug abuse and mental health disorders relative to other races. The abuse and production of methamphetamine in the U.S. has surged in the past decade, presenting major challenges to health care, criminal justice, and public health systems. Survey data and anecdotal accounts suggest that methamphetamine poses a disproportionate burden in Indian country (Colliver, 2007), and the drug is widely cited by tribal agencies as the single greatest drug threat to their communities (Evans, 2006). Additionally, anecdotal accounts increasingly identify nonmedical use of prescription pain relievers as a growing problem in Indian Country (AP, 2007; Melmer, 2007), and tribal leaders have expressed concern that the high availability of prescription analgesics may be fueling a new illicit drug trade on some reservations (AP, 2007). Risk factors and correlates for methamphetamine and prescription pain reliever abuse have been well described in the general population but less is known about correlates of the use of these two drugs among AIANs.

Methods – The National Survey on Drug Use and Health (NSDUH) is a nationally representative, cross-sectional survey conducted annually by the Substance Abuse and Mental Health Services Administration; the survey collects information on the prevalence and correlates of drug use in the U.S. population ages 12 years and older and includes sampling on Indian reservations. Lifetime and past-year prevalence of methamphetamine use and nonmedical use of prescription pain relievers among AIANs were estimated from 2005-2006 NSDUH public-use data (n=1609, weighted=1.27 million). Multivariable logistic regression analyses were conducted using all AIAN participants to model correlates of lifetime methamphetamine use and lifetime nonmedical use of prescription

pain relievers. Measures of mental health status were included in the range of potential correlates. Interactions with county type (rural, small metropolitan, large metropolitan), gender, and age were examined to describe potentially differing patterns of drug use in varying subpopulations of AIANs.

Results – Nearly 12% of AIANs reported using methamphetamine at least once in their lives, and over 18% had used a prescription pain reliever nonmedically. AIANs with a history of methamphetamine and/or nonmedical prescription pain reliever use were more likely to have experienced mental health problems. Important correlates of the drug use outcomes included gender, age, abuse of other substances, history of arrest, and mental health symptomology, though associations with these factors varied between the two drug outcomes. Additionally, some correlates were found to differ by county type of residence in the methamphetamine model, and by gender in the pain reliever model. Measures of socioeconomic status were not highly correlated with either drug use outcome.

Conclusion – This study has described a range of factors associated with the use of two drugs of current concern in many AIAN communities, and highlighted associations between mental health morbidities and drug use. Several interactions were identified, suggesting that drug availability, accessibility, and initiation factors may differ by county type and gender. Improved recognition and treatment of mental health symptomology may represent an important intervention strategy against drug abuse. We anticipate that these results will assist tribal health leaders in identifying those at highest risk and inform culturally-specific prevention and intervention strategies.

INTRODUCTION

The Methamphetamine Problem

U.S. Trends

Methamphetamine (MA) is a cheap, highly addictive stimulant that has emerged as a public health concern in recent years, particularly in some western and mid-western states (Barr et al., 2006; Booth et al., 2006); continued eastward sprawl of MA use in the United States is predicted (Gettig et al., 2006). An estimated 12 million Americans (4.9% of the population ages 12 and older) have tried MA at least once in their lives (Colliver, 2007), and in 2005, approximately 1.3 million adolescents and adults had used MA in the past year (NSDUH, 2007). Methamphetamine abuse imposes a huge burden on the communities in which it is prevalent, challenging public health, health care and treatment, law enforcement, and criminal justice systems (Barr et al., 2006; Booth et al., 2006; OAS, 2005). In 2002, MA ranked third among drugs seized in law enforcement operations, behind marijuana and cocaine (OAS, 2005).

Methamphetamine can be produced in home laboratories through a simple reduction process using ingredients found in common products such as over-the-counter decongestants and farming fertilizer (Gettig et al., 2006). Rural areas can provide relatively easy access to raw materials, geographic isolation, and quick dispersal of odorous byproducts, leading to high numbers of clandestine MA labs in less populated areas of the country (Denehy, 2006). Home manufacture of the drug causes serious environmental problems and hazards to children (Barr et al., 2006; Denehy, 2006). Recent federal legislation, enacted in 2006, limits consumer access to ephedrine and pseudoephedrine, and has resulted in declining reports of MA labs in the U.S. (Gettig et al., 2006; Drug Policy Alliance, 2006). This trend, however, has led to an increase in the criminal trafficking of

high-purity MA from "super lab" organizations in Mexico (Barr et al., 2006; Drug Policy Alliance, 2006; Evans, 2006).

Effects & Comorbidity

Methamphetamine is a psychostimulant drug that acts on the central nervous system, causing acute feelings of euphoria and well-being (Barr et al., 2006). The effects can last from 4 to 16 hours, after which a state of agitation and violence may follow (Herman-Stahl et al., 2006). MA abusers are susceptible to extensive neural damage (Barr et al., 2006), psychological distress (Booth et al., 2006), and may tend to exhibit violent behavior (Cartier et al.,2006; Cohen et al., 2003).

Associations between substance abuse and mental health morbidity have been increasingly recognized (e.g., Gilder et al., 2004; Gilder et al., 2006). Depression is prevalent among users of various illicit substances (Falck et al., 2002; Parrot et al., 2002), and thought to be associated with MA use as well, both as a risk factor and as a comorbid condition (Massis, 2005; Dekker, 2006). Qualitative research has revealed that some MA users take the drug to help them deal with traumatic experiences and depression, suggesting that the initiation of MA, like some other drugs, may act as a causal outcome of depression (Barr et al., 2006). Additionally, long-term exposure to MA is associated with extensive cognitive impairment and the development of drug-related psychosis (Chen et al., 2003; Grant et al., 2007); psychotic symptoms have been shown to increase with duration of MA use (Barr et al., 2006). Additionally, psychotic symptoms may persist after discontinuation of the drug and even past use of MA may render individuals more susceptible to environmental stress (Barr et al., 2006). Physical manifestations of long-term MA use include dental caries, malnutrition, infection, and cardiovascular problems (Barr et al., 2006; Iritani et al., 2007).

Identified Risk Factors

Several studies have been conducted to examine risk factors and correlates for MA use in the general population. Identified risk factors include low educational attainment (Herman-Stahl et al., 2007), cigarette smoking (Grant et al., 2007), binge drinking, multiple drug use (Iritani et al., 2007), high family conflict (Herman-Stahl et al., 2006), sensation-seeking attitudes (Herman-Stahl et al., 2006; Iritani et al., 2007), and criminal justice involvement (Booth et al., 2006). Young adults are at increased risk for methamphetamine use, and those who use the drug are likely to have lower self-esteem, increased psychological distress, and engage in riskier sexual behaviors than their non-MA using counterparts (Garofalo et al., 2007).

Nonmedical Use of Prescription Pain Relievers

Definitions

"Nonmedical use," as defined by the National Survey on Drug Use and Health (NSDUH) and throughout this paper, is "any use of a prescription-type drug not prescribed for you or used only for the experience or feeling it caused." The definition excludes over-the-counter drugs (NSDUH, 2004). Notably, this definition differs from the formal diagnosis of drug abuse and/or dependence given in the Diagnostic and Statistical Manual of Mental Health Disorders, Fourth Edition (DSM-IV), and wording used to assess nonmedical use and/or abuse in other national surveys (e.g., Compton & Volkow, 2006; McCabe et al., 2007; Zacny et al., 2003).

NSDUH asks respondents about their nonmedical use of several prescription pain relievers by name (see Appendix C), in addition to providing an open-ended question for others not on the list (NSDUH, 2004). The term "analgesic" is used synonymously with pain relievers throughout this paper. Prescription opioids represent a similar drug class in

the literature, and include all of the prescription pain relievers listed in NSDUH with the exception of Fioricet® and Fiorinal® (Tetrault et al., 2008).

U.S. Trends

Prescription analgesics represent the most commonly abused class of prescription drugs in the U.S. (Isaacson et al., 2005). Nonmedical use of prescription pain relievers has increased dramatically in recent years, from an estimated 600,000 new users in 1990 to over 2 million in 2001. An estimated 13 percent of the U.S. population ages 12 and older have used pain relievers nonmedically at some time in their lives (NSDUH, 2004). Although most users of prescription opioids use the drugs legitimately and effectively as part of medically-directed pain management, nonmedical use can lead to dependence, addiction and compulsive drug-seeking behavior (NIDA, 2006; Isaacson et al., 2005).

Rates of nonmedical pain reliever use are similar in men and women (Isaacson et al., 2005; NSDUH, 2004; Dowling et al., 2006), though women are more likely to be prescribed controlled analgesics than men (Isaacson et al., 2005) and may be at greater risk of progressing to dependence (McCabe et al., 2007). The most common demographic misusing these drugs is generally White young adults (Simoni-Wastila et al., 2004; Dowling et al., 2006; Tetrault et al., 2008). Although nonmedical opioid use is prevalent throughout the U.S., several researchers have described notable geographic differences including concentrated prevalence in the eastern and southeastern U.S., and increased odds of misuse in rural areas relative to urban locations (Cicero et al., 2005; Havens et al., 2007). Others have found higher lifetime prevalence in the western U.S., and no differences between rural and urban areas (Huang et al., 2006).

Several pathways leading to abuse of these controlled substances have been described in the literature, and range from legitimate physician-directed treatment of pain

to "black market" purchase over the internet (Compton & Volkow, 2005; Cicero et al., 2005). Leukefeld and colleagues (2007) identified two differing motivations of nonmedical pain reliever initiation: response to physical pain and recreational use. Drug-abuse-prone individuals may be attracted to prescription analgesics because they are relatively easy to obtain (compared to illicit drugs such as heroin), less closely monitored by law enforcement, and more socially acceptable among peers (Cicero et al., 2005). Survey evidence indicates that young adults often obtain illicit prescriptions for free from friends or relatives (NSDUH, 2006).

Identified Risk Factors & Comorbidities

Characteristics associated with nonmedical use of analgesics include low income, being unmarried/widowed/divorced, low educational attainment, cigarette use, alcohol abuse, and use of other illicit drugs (Dowling et al., 2006; Huang et al., 2006; Tetrault et al., 2008). Many comorbidities have been described in the literature, including drug use disorders, depression, serious psychological distress, and mood and anxiety disorders (Dowling et al., 2006; Huang et al., 2006). Evidence suggests that mental disorders and psychiatric symptoms usually precede analgesic abuse; affected individuals may self-medicate to alleviate symptoms and for the mood-altering effects of many prescription pain relievers (Dowling et al., 2006).

Trends among American Indians and Alaska Natives

Substance Abuse

Although tribes differ greatly in their use and abuse of substances, American Indians and Alaska Natives (AIANs) as a group are at increased risk for many alcohol and drug abuse disorders relative to other races. Methamphetamine abuse and production on tribal lands has surged in the past decade, causing it to be cited by many tribal agencies as

the single greatest drug threat to their communities. In a report to the Bureau of Indian Affairs Law Enforcement Services, Evans (2006) revealed that MA was highly available, highly distributed, and responsible for an increase in many crimes according to the majority of sampled tribal law enforcement officials. Although largely a rural problem, Spear and colleagues (2006) documented a trend of increasing MA treatment admissions from 2001 through 2005 among American Indians living in urban Los Angeles County, surpassing admissions in which alcohol was the primarily abused substance during that period.

Anecdotal accounts increasingly identify nonmedical use of prescription pain relievers as a growing problem in Indian Country (AP, 2007; Melmer, 2007). Compared to the general population, much higher rates of lifetime use and related disorders have been found among American Indians when this subpopulation was sampled (Huang et al., 2006). Tribal leaders have expressed concern over the high availability of prescription analgesics in communities, fueling a new illicit drug trade on some reservations (AP, 2007).

Mental Health

AIANs are also disproportionately affected by mental health conditions, including major depressive episodes (Beals et al., 2005a; Beals et al., 2005b), psychological distress (Mitchell et al., 2002), trauma (Deters et al., 2006), and posttraumatic stress disorder (Beals et al., 2005a; Beals et al., 2005b; Deters et al., 2006). Many AIANs face difficult life circumstances, which include poverty, poor educational and employment opportunities, and separation from traditional activities. They may be confronted with racial discrimination and cultural identity tensions that result from domination by a technological society. The health disparities observed in AIAN populations are generally believed to be related, in both simple and complex ways, to these circumstances of cultural and social trauma (Jones, 2006; Herman-Stahl et al., 2003). Epidemiologic studies among minorities have described

health disparities by levels of acculturation; that is, the degree to which individuals have assimilated their beliefs, views, and lifestyle to those of the dominant society (Barrett, 2003; Henderson et al., 2005; Herman-Stahl et al., 2003). Measures that have been used to assess this complex characteristic include socioeconomic development, use of Western allopathic medical services, and reservation versus city dwelling (Nelson & Manson, 2000; Henderson et al., 2005).

Mood and anxiety disorders are common among AIANs (Gilder et al., 2006; Deters et al., 2006), and can have serious consequences (e.g., loss of social contacts, increased risk of suicide, and loss of employment), in addition to increasing the risk of alcohol and substance abuse (Nelson &Manson, 2000; Beals et al., 2005a; Beals et al., 2005b). Despite their increased risk, the association between mental health morbidity and illicit drug use among AIANs nationally has not been well described in the literature. Because highly effective treatments for psychiatric and depressive disorders are available, a focus on treatment and prevention of mental health morbidity may be a particularly important strategy to reduce the risk of drug abuse in this population.

Study Rationale and Objectives

The majority of AIAN health research has compared this subpopulation to other racial/ethnic groups in the dominant society, resulting in the many well-documented disparities. Descriptions of the correlates of problematic drug use specific to this population, comparing AIAN users to non-users, remain largely unavailable. A large epidemiologic study conducted in the late 1990s, the American Indian Service Utilization, Psychiatric Epidemiology, Risk and Protective Factors Project (AI-SUPERPFP), surveyed and compared two distinct American Indian tribal populations, one from the Northern Plains and the other from the Southwest. Multiple publications resulting from this study

have helped identify correlates of drug use specific to these AI populations, as well as marked differences between the two tribal groups (e.g., Whitesell et al., 2007; Mitchell et al., 2003; Henderson et al., 2005), and expanded our understanding of drug behavior processes unique to AIs. However, a review of factors associated with the current situation of illicit use of methamphetamine and prescription pain relievers among AIANs has not been conducted. These drugs are the cause of much concern among AIAN leaders and communities, and an investigation of their risk factors is both warranted and timely.

The National Survey on Drug Use and Health (NSDUH), conducted annually by the Substance Abuse and Mental Health Services Administration (SAMHSA), is one of the few national surveys to sample AIANs in large enough numbers for inferential analysis. In addition to containing rich information on demographic characteristics and substance use behavior, NSDUH also collects information on mental health symptomology including psychiatric distress and depression among adults and adolescents. This allows for the examination of a broad range of potential correlates of methamphetamine use and nonmedical prescription analgesic use.

The objectives of the present study are to analyze data from AIAN participants in NSDUH to (1) quantify the prevalence of lifetime methamphetamine use, lifetime nonmedical prescription pain reliever use, and co-occurring mental health morbidity with each class of drugs; (2) examine a range of potential correlates associated with lifetime use of each substance separately; and (3) evaluate and explain any modification of effects between county type of residence (rural, small metropolitan, large metropolitan), gender, and age group. The results of this analysis are expected to contribute to the understanding of the epidemiology of the use of these two classes of drugs among AIANs, and have direct application in the development of intervention efforts.

METHODS

NSDUH Research Design and Purpose

The National Survey on Drug Use and Health (NSDUH) is a nationally representative, cross-sectional survey conducted by the Substance Abuse and Mental Health Services Administration (SAMHSA). The primary purpose of the survey is to measure the prevalence, correlates, and trends of drug use in the U.S. It has been administered periodically since 1971, and, since 1999, has been collected annually using a 50-state multi-stage cluster design to support representative national estimates. Prior to 2002, NSDUH was called the "National Household Survey on Drug Abuse".

NSDUH Sampling and Weighting Methodology

The target population of NSDUH is the U.S. civilian, noninstitutionalized population ages 12 years and older, a population representing almost 98% of the total U.S. population in this age range. Participants are randomly selected for interview through a four-stage sampling process:

(1) Each state is partitioned into approximately equal-sized state sampling (SS) regions, each projected to yield roughly the same number of interviews per data collection period. Within each SS region, a sample of 48 census tracts is selected with probabilities proportional to size.

(2) Second-stage sampling units are obtained by combining or subdividing census tracts into segments meeting a minimum dwelling unit (DU) requirement (150 DUs in urban areas and 100 DUs in rural areas).

(3) All DUs within each second-stage sampling unit are counted and listed; sample dwelling units (SDUs) are selected from these lists for inclusion in the study, comprising third-stage sampling units.

(4) Eligible participants are selected from household rosters of selected DUs based on 5 age-group strata (defined as: 12 to 17, 18 to 25, 26 to 34, 35 to 49, and 50 years or older) sampled at different rates. Up to 2 persons per household may be selected for participation.

Dwelling units were initially contacted by introductory letters, briefly explaining the nature and methods of the study; these first-class letters alerted residents to the projected visit of a field interviewer. However, neither receipt nor acknowledgement of a lead letter was related to inclusion in the study. Field interviewers hand-carried copies of this introductory letter, in both English and Spanish, to all DUs, including group housing units and DUs lacking a complete mailing address. Upon approaching SDUs, field interviewers asked to speak with an adult resident (age 18 or older) who could serve as the screening respondent. The screening respondent was given a one-page Study Description, which served as the informed consent document for the screening process. If consent was obtained, the screening respondent was asked to compile a roster of all residents in his/her each dwelling unit. Finally, a hand-held computer was used by field interviewers to automatically select zero, one, or two members of each household for interview, using a within-DU selection algorithm based on household composition.

The 2005 and 2006 surveys were designed to oversample younger age groups by requiring equal sample sizes for three age categories, consistent with previous NSDUHs: 12 to 17, 18 to 25, and 26 years and older. NSDUH has not oversampled racial/ethnic groups since 1999 because of the large sample size associated with each survey year. Weighted screening and interview response rates for each year are presented in Table 1. Response rates among AIANs have not been published.

Table 1. NSDUH response rates, 2005-2006 (RTI, 2007)

	2005	***2006***
Eligible DUs	146,912	151,288
Complete Screenings	134,055	137,057
Screening Response Rate	91.33%	90.55%
Selected Persons	83,805	85,034
Completed Interviews	68,308	67,802
Interview Response Rate	76.19%	74.24%
Overall Response Rate	69.58%	67.22%

Sampling weights were created by taking the product of the four stagewise sampling weights, each equal to the inverse of the probability of selection for that stage. Adjustments were made for DU- and person-level nonresponse, DU- and person-level poststratification, and DU- and person-level extreme weight treatment. Final adjusted sample weights were derived from a generalized exponential model utilizing each of the described weight components. Additional detail on NSDUH weighting methodology has been described elsewhere (RTI, 2006b; RTI, 2007).

De-identified public use data files were created for each survey year; these files are designed to protect respondents' personal information while maintaining most of the collected data. SAMHSA applies standardized procedures to create confidential public use files of NSDUH data and makes them available free of cost on the internet (OAS, 2005).

Inclusion/Exclusion Criteria and Informed Consent

The public use data files for the combined 2005 and 2006 survey years contained 111,184 total respondents; 1,609 identified themselves as single-race American Indian or Alaska Native, representing 1,265,000 AIANs from the U.S. population. Ethnicity was determined by two questions: "Are you of Hispanic, Latino, or Spanish descent?" and "Which of these groups describes you?" Participants who answered "no" to the first

question were shown a card listing six possible responses to the second: (1) White, (2) Black or African American, (3) American Indian or Alaska Native (American Indian includes North American, Central American, and South American Indians), (4) Native Hawaiian, (5) Other Pacific Islander, (6) Asian (including: Asian Indian, Chinese, Filipino, Japanese, Korean, and Vietnamese). Respondents had the ability to select more than one response (RTI, 2006a). Table 2 presents inclusion and exclusion criteria for NSDUH and the present study among AIAN participants.

Table 2. Inclusion and exclusion criteria

Inclusion Criteria	*Exclusion Criteria*
NSDUH	
Age 12 or older	Under age 12
Primary residence at selected dwelling unit (defined as "most of the time during the quarter")	Institutionalized
	U.S. military active duty personnel
Citizens of foreign countries who are living/studying/working in the U.S. and reside at the selected dwelling unit for most of the time during the quarter	Citizens of foreign countries who are visiting the U.S. or foreign citizens living on the premises of an embassy, ministry, legation, chancellery, or consulate
Completion of minimum item response questions in interview (see next section)	
AIAN Study	
Met inclusion criteria for NSDUH and completed interview in 2005 or 2006	Two or more races/ethnicities selected
Not of Hispanic, Latino, or Spanish descent	Any race/ethnicity other than American Indian or Alaska Native
American Indian or Alaska Native	

Informed consent was obtained from each participant. For youth participants (ages 12 to 17), verbal consent was also obtained from a parent or guardian prior to the youth being contacted. Confidentiality was stressed in all written and oral communication with participants, and names and other identifying information were not captured in the interview record. Participants were informed of their freedom to withdraw at any time. If the interview could not be completed during the first visit, a

minimum of four follow-up visits was made in attempt to complete the interview. Participants were given a $30 cash incentive after completing the survey. NSDUH documents including the introductory letter, study description, and informed consent forms can be found in Appendix A.

NSDUH Data Collection and 'Useable' Cases

Data collection for NSDUH was carried out in participants' homes using a combination of computer-assisted personal interviewing (CAPI) with trained interviewers hired from the local areas, and audio computer-assisted self-interviewing (ACASI) for the more sensitive questions (e.g., illicit drug use and criminal activity). Field interviewers asked participants to identify a private room or area of their homes in which to complete the interview. During the CAPI portion, which primarily collected sociodemographic information, field interviewers read questions from a handheld computer and entered respondents' answers. Substance use, risk behavior, and mental health questions were assessed using ACASI, in which participants responded to an audio computerized questionnaire after completing a brief tutorial. Answers given in the ACASI portion were entered privately by the respondent, so that in most cases the field interviewer did not know the responses; however, interviewers were present to help with any questions or problems that the respondent might have. The entire interview was structured to accommodate varying levels of reading and comprehension literacy. These methods provided participants with a highly private and confidential way to respond to sensitive questions, in an effort to increase the level of honesty and completeness in reporting. If other household members were present for the interview or privacy was otherwise compromised, these circumstances were recorded by the field interviewer along with her

assessment of the reliability of the interview. The average time it took to complete the survey was approximately one hour (RTI, 2007a).

The survey was structured as a set of core questions and supplemental modules. The core items, which comprised the first part of the interview, collected information for basic prevalence estimates and trends. Core items included questions about demographics, and the use of tobacco, alcohol, marijuana, cocaine, crack cocaine, heroin, hallucinogens, inhalants, pain relievers, tranquilizers, stimulants, and sedatives. These questions have remained unchanged since the 1999 survey. Supplemental questions and modules provide a way for SAMHSA to tailor the survey, as they can be revised, dropped or added from year to year.

The requirement of minimum item response was incorporated into the survey to eliminate cases with undesirable amounts of missing data due to nonresponse. "Useable" cases were those who responded "yes" or "no" to the lifetime cigarette use question ("Have you ever smoked part or all of a cigarette?") plus at least 9 of 13 additional lifetime use questions regarding various classes of substances. These were referred to as "gate" questions because a "yes" response would direct respondents to more specific questions about that substance. In order to maximize the number of useable cases, standardized follow-up probes were included for respondents who initially refused to answer a gate question.

Prior to 2005, methamphetamine use was ascertained in the core survey as part of the stimulant prescription drugs section. Concerns were raised by NSDUH staff that MA was being underreported by the survey, because some users of MA may not consider it a prescription drug. Therefore, the 2005 and subsequent NSDUHs included new supplemental questions about the use of MA separate from the prescription drug

classification. The 2005 and 2006 surveys also included supplemental modules on mental health and depression for both adolescent and adult respondents. Data based on these new items were analyzed in the current study, and provided the basis for the selection of data from years 2005 and 2006.

Data Management

Institutional review board (IRB) approval was obtained from the Oregon Health and Science University (OHSU) IRB on February 11, 2008. Public use data files of NSDUH 2005 and 2006 data were downloaded from the Substance Abuse and Mental Health Data Archive website (http://www.icpsr.umich.edu/SAMHDA/archive.html) as SAS transport files. SAS syntax files included with the download were used to read in each year of data, and a master dataset was created by combining the files from the two years and retaining only those variables needed for analysis. Despite the restriction of the analysis to AIANs, all respondent records were maintained in the master dataset as required by SUDAAN for correct variance estimation of complex survey data. SUDAAN takes into account the stratified, clustered sampling design of NSDUH by utilizing the stratification and clustering variables for all observations. Therefore, a "subpopulation" statement was used to restrict analyses to AIANs, rather than creating a new subsetted dataset.

Data management included recoding and creating new variables (described below) and documenting all changes made to the dataset. All code used for data management and analysis was saved as SAS syntax files. Data management was conducted using SAS version 9.1 (SAS Institute Inc., Cary, NC, USA) and all statistical analysis was carried out with SAS-callable SUDAAN version 9.0 (Research Triangle Institute, Research Triangle Park, NC, USA).

Variables and Coding

Outcome Variables

Two outcome variables were utilized to reflect lifetime use of methamphetamine and lifetime non-medical use of prescription pain relievers. Methamphetamine use was ascertained by two different items in the 2005 and 2006 NSDUHs. The core item was assessed by the following question in the Stimulants section: "Have you ever, even once, used Methamphetamine, Desoxyn, or Methedrine that was **not** prescribed for you or that you took only for the experience or feeling it caused? Methamphetamine is also known as crank, crystal, ice, or speed." Respondents were referred to a showcard with pictures of several prescription stimulants and listed of names of some others (Appendix B). Those who responded "no" or refused to answer this question were later routed to the second MA question in the supplemental Special Drugs section: "Methamphetamine, also known as crank, ice, crystal meth, speed, glass, and many other names, is a stimulant that usually comes in crystal or powder forms. It can be smoked, "snorted," swallowed or injected. Have you ever, even once, used methamphetamine?" A lifetime use variable was created by combining all those who answered "yes" to either question. Data were available for 1,607 AIAN respondents on this item (representing 99.97% of weighted AIANs in dataset).

The second outcome of interest, non-medical use of prescription analgesics, was ascertained with the following question: "Have you ever, even once, used any type of prescription pain reliever that was not prescribed for you or that you took only for the experience or feeling that it caused?" Respondents were referred to a showcard with pictures of various prescription pain relievers (Appendix C). A recoded binary variable for lifetime use of pain relievers was included with the NSDUH public use datasets and

was used in this analysis. There were complete data for all AIAN respondents on this item (n=1609). Both outcome variables were coded as"1=yes" and "2=no" to facilitate the calculation of statistics based on contingency tables, and "1=yes" and "0=no" for use as dependent variables in logistic regression models.

Independent Variables

Potential correlates were selected based on results of previous studies (e.g., Herman-Stahl et al., 2007; Grant et al., 2007; Herman-Stahl et al., 2006; Iritani et al., 2007; Dowling et al., 2006; Huang et al., 2006; Tetrault et al., 2008) and our interest in exploring associations with mental health measures. After examination of frequency distributions, some independent variables were recoded into broader categories more appropriate to the subset of respondents. Because the number of AIAN respondents was very small relative to the entire NSDUH study population, this was necessary to achieve more evenly distributed categories and, in some cases, eliminate small cell sizes. Table 3 lists all independent variables and their coding used in statistical analysis. Variable source indicates whether variables were used in their original values from the NSDUH data, recoded or collapsed into different categories, or newly created from multiple NSDUH variables. In some cases, binary (yes/no) variables were coded as "1=yes" and "0=no" in the NSDUH dataset; these were recoded to "1=yes" and "2=no" for descriptive and regression analyses but remain "original" NSDUH variables in the table. A measure of sensation-seeking was created from the combined responses to two separate questions, following the methods of prior investigators (Herman-Stahl et al., 2006).

Descriptive Analysis and Statistical Significance of Differences

Frequency distributions and cross-tabulations were examined between each independent variable and both outcomes. Unweighted counts and weighted proportions with 95% confidence intervals (CIs) were generated both before and after variable recoding. Frequency distributions of sample characteristics stratified by county type were also generated by cross-tabulations; differences between proportions were tested with χ^2 statistics. Population prevalence estimates of lifetime and past-year methamphetamine use, and lifetime and past-year nonmedical use of prescription pain relievers among AIANs were obtained by cross-tabulations.

Table 3. Summary of independent variables

Variable	Variable source	Questions/additional information	Possible responses	Coding for analysis
Gender	NSDUH		-Male -Female	1=Male 2=Female
Age	NSDUH		Continuous values reported, generated from birth date	1=12-17 years old 2=18-25 years old 3=26-34 years old 4=35 or older
Educational attainment	Recoded	"What is the highest grade or year of school you have completed?"	Continuous values reported, range = 0 (never attended) – 17 (college or university/5th or higher year completed)	1=Less than HS 2=HS graduate 3=Post-high school 4=12-17 year-olds
Employment status	NSDUH	Imputed from questions asking whether respondents worked in the past week, whether they usually work 35 or more hours per week, and relevant reasons why they did not work in the past week		1=Full time (35+hours/week) 2=Part time 3=Unemployed 4=Other* 5=12-17 year-olds
Overall health status	Recoded	"This question is about your overall health. Would you say your health in general is excellent, very good, good, fair, or poor?"	-Excellent -Very good -Good -Fair -Poor	1=Excellent/Very good 2=Good 3=Fair/Poor
Current cigarette smoking	NSDUH	Past month daily cigarette use: Recoded from questions asking respondents about cigarette smoking amount and recency.	Yes/No	1=Yes (used daily in the past month) 2=No (did not use daily in the past month)
Heavy alcohol use	NSDUH	Defined as drinking 5 or more drinks on the same occasion on each of 5 or more days in the past 30 days. "Occasion" means at the same time or within a couple hours of each other. Note: all heavy alcohol users are also "binge" alcohol users.	Yes/No	1=Yes 2=No
Lifetime marijuana use	NSDUH	"Have you ever, even once, used marijuana?"	Yes/No	1=Yes 2=No

Continued, next page

Table 3. *continued*

Variable	Variable source	Questions/additional information	Possible responses	Coding for analysis
Lifetime use of other illicit drug(s)	New	Recoded from lifetime use questions about hallucinogens, heroin, cocaine, or inhalants. Coded to exclude those who only ever used marijuana, stimulants, and/or prescription-type drugs.	Yes/No for each drug class	1=Yes (any "yes" response) 2=No (no "yes" responses)
Religiosity	New	"Your religious beliefs are a very important part of your life." Created from combined youth and adult responses.	-Strongly disagree -Disagree -Agree -Strongly agree -Don't know/skipped	1=High ('strongly agree' or 'agree') 2=Low ('disagree' or 'strongly disagree')
Sold illegal drugs	NSDUH	"During the past 12 months, how many times have you sold illegal drugs?"	5 categories, ranging from 0 times to 10 or more times	1=Yes, sold illegal drugs in past year 2=No, didn't sell illegal drugs in past year
Approached by seller of illegal drugs	NSDUH	"In the past 30 days, has anyone approached you to sell you an illegal drug?"	Yes/No	1=Yes 2=No
History of arrest	NSDUH	"Not counting minor traffic violations, have you ever been arrested and booked for breaking the law? Being 'booked' means that you were taken into custody and processed by the police or someone connected with the courts, even if you were then released."	Yes/No	1=Yes 2=No
Sensation-seeking behavior	New	"How often do you get a real kick out of doing things that are a little dangerous?" and "How often do you like to test yourself by doing something a little risky?"	For each: -Never -Seldom -Sometimes -Always -Don't know/refused	2=Low ('never' or 'seldom' to both questions) 1=High ('sometimes' or 'always' to either question)
Use of physical violence	New	"During the past 12 months, how many times have you attacked someone with the intent to seriously hurt them?" Created from combined youth and adults.	5 categories, ranging from 0 times to 10 or more times	1=Yes, used physical violence in past year 2=No, didn't use physical violence in past year

Continued, next page

Table 3. *continued*

Variable	Variable source	Questions/additional information	Possible responses	Coding for analysis
Stole/attempted to steal	New	"During the past 12 months, how many times have you stolen or tried to steal anything worth more than $50?" Created from combined youth and adult responses.	5 categories, ranging from 0 times to 10 or more times	1=Yes, stole/attempted to steal in past year 2=No, didn't attempt to steal in past year
Serious psychological distress (SPD)	Binary variable present in NSDUH for adults; Recoded to include category for 12-17 year-olds	Based on data from a 6-question series known as the K6 indicator; asked how frequently respondents experienced symptoms of psychological distress† during the one month in the past year when they were at their worst emotionally.	Continuous score range from 0 – 24. Serious psychological distress defined as K6 score ≥ 13.	1=Yes (SPD score ≥ 13) 2=No (SPD score < 13) 3=Not assessed/ages 12-17
Major depressive episode (MDE)	NSDUH	Based on 9 DSM-IV criteria‡ used to define a person having had a MDE in their lifetime, assessed with variations of two questions: "Have you ever in your life had a period of time lasting several days or longer when most of the day you felt [symptom]?" and "Think about the times when you felt [symptom]. Did you ever have a period of time like this that lasted for most of the day, nearly every day, for two weeks or longer?"	Lifetime MDE defined as those experiencing at least 5 out of the 9 criteria nearly every day for a period of 2 weeks or longer	1=Yes 2=No

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Table 3. *continued*

Variable	Variable source	Questions/additional information	Possible responses	Coding for analysis
Mental health treatment	New	Youth: binary NSDUH variable created from whether respondents reported receiving treatment/counseling in the past year from any of 10 specific sources§ for emotional/behavioral problems not caused by alcohol or drugs. Adults: binary NSDUH variable from receiving inpatient care, outpatient care, and/or prescription medication for mental health treatment. New variable created from combined youth and adult responses, past year.	Yes/No	1=Yes 2=No

* "Other" includes retired, disabled, in school/training, full-time housekeeping, and any other reasons for not being in the workforce

† Symptoms of psychological distress: nervousness, hopelessness, feeling restless or fidgety, feeling so sad or depressed that nothing could cheer you up, feeling that everything was an effort, and feeling no good or worthless

‡ MDE criteria: feeling sad/empty/depressed most of the day, lost interest in most things, changes in appetite or weight, sleep problems, others noticed restlessness/lethargy, felt tired/low energy most days, felt worthless most days, inability to concentrate/make decisions, any thoughts or plans of suicide

§ Youth mental health treatment sources: hospital, residential treatment facility, foster care, day treatment facility, mental health clinic, private therapist, in-home therapist, family doctor, through special education, or school counselor

Logistic Regression Analysis

Univariable Logistic Regression Analysis

Univariable logistic regression models were built to examine associations between each independent variable and both outcomes separately. Wald F statistics and their associated *p*-values were used to assess statistical significance, and associations were expressed as unadjusted odds ratios (ORs) and 95% CIs. The criterion for inclusion in multivariable regression modeling was set at $p<0.25$. Decisions were made *a priori* to include gender, age, and population density of county in multivariable regression

independent of their unadjusted significance, since they have social importance and we were interested in evaluating potential effect modification by these variables.

Multivariable Logistic Regression Analysis

All variables meeting the significance level of $p<0.25$ in unadjusted analyses, in addition to those of social importance, were entered simultaneously in multivariable logistic regression models for each of the outcomes, respectively. Independent variables were then removed one at a time from the full model, starting with the least significant, until the model contained only variables with β coefficient *p*-values ≤ 0.10 and those chosen *a priori*. We chose this conservative significance level because of our intent to describe a range of characteristics associated with lifetime use of each drug, rather than to model associations with a specific independent variable or generate predictive models of drug use outcomes.

After arriving at preliminary main effects models for each outcome, interactions were assessed between each remaining independent variable and gender, age category, and county type. After being adjusted for main effects terms, interaction coefficients with *p*-values <0.25 were entered simultaneously into full models and removed stepwise based on lowest level of significance. The final models contained only main effects and interaction terms with *p*-values <0.10. At this point, all statistically significant interactions were assessed for sufficient cell size and public health importance prior to be retained in the final models. Interaction odds ratios, adjusted for all other model covariates, were obtained by subtracting the logit equation for the reference level from that of the comparison categories within each level of the modifying variable.

Finally, comparative models were constructed for each of the drug use outcomes to examine effect differences between them. All main effects variables that had been

found to be significant in either drug model were entered simultaneously into logistic regression models fit for each of the outcomes.

Model fit was assessed by comparing Hosmer and Lemeshow Goodness-of-Fit test statistics and -2 Log Likelihood values.

RESULTS

Sample Characteristics

A total of 1,609 respondents to the 2005 and 2006 NSDUHs identified themselves as single-race American Indian or Alaska Native, representing 1,265,377 individuals in the target population (weighted percent of NSDUH respondents, 0.52%). The AIAN subsample was relatively evenly distributed by gender (52% female), age (56% older than age 35), and employment status (47% employed full-time). The majority of respondents had an annual family income of less than $50,000 (75%), reported a high degree of religiosity (82%), and reported good overall health status (79% good to excellent). Substance use was common in this population; approximately one-quarter reported that they were current cigarette smokers (24%), over half reported having used marijuana in their lifetime (52%), and one-third reported having used another illicit drug in their lifetime (33%). Mental health symptoms were also common, with 15% reporting at least one lifetime major depressive episode (MDE), 21% experiencing serious psychological distress (SPD) within the past year, and 14% reporting having received mental health treatment in the past year. The geographic variable of interest was county type, classified by population size. The highest proportion of AIANs in this sample resided in small metro areas (49%), followed by non-metro and large metro counties (29% and 22%, respectively). The raw and weighted distributions of all sample characteristics are presented in Table 4.

Table 4. Distribution of sample characteristics, AIAN respondents, NSDUH, 2005-2006* (Unless specified, data complete for all 1,609 respondents)

Characteristic	n (unweighted)	Weighted percent	95% CI of percent
Gender			
Male	773	48.0%	41.3 – 54.7
Female	836	52.0%	45.3 – 58.7
Age			
12-17	534	11.7%	9.9 – 13.8
18-25	559	16.1%	13.6 – 18.9
26-34	156	16.7%	11.2 – 24.2
35 or older	360	55.6%	48.9 – 62.0
Education			
Less than high school	354	25.5%	19.8 – 32.1
High school graduate	382	28.7%	23.3 – 34.9
Post-high school	339	34.2%	28.2 – 40.6
12-17 year-olds	534	11.7%	9.9 – 13.8
Total family income, PY			
<$20,000	621	38.2%	33.0 – 43.7
$20,000-$49,999	609	36.9%	31.0 – 43.1
≥$50,000	379	24.9%	20.6 – 29.7
Employment status			
Full time	509	47.1%	41.5 – 52.7
Part time	148	8.9%	6.4 – 12.3
Unemployed	117	7.3%	4.9 – 10.7
Other†	301	25.1%	20.8 – 29.9
School-aged (12-17)	534	11.7%	9.9 – 13.8
County type‡			
Large metropolitan	265	22.4%	17.8 – 27.8
Small metropolitan	802	49.0%	42.3 – 55.8
Non-metropolitan	542	28.6%	21.8 – 36.4
Overall health status			
Excellent/Very good	901	48.9%	43.7 – 54.2
Good	501	30.3%	26.0 – 35.1
Fair/Poor	207	20.8%	16.0 – 26.6
Current cigarette use			
No	1300	76.5%	68.4 – 82.9
Yes	309	23.5%	17.1 – 31.6
Heavy alcohol use, PM			
No	1453	88.6%	82.4 – 92.8
Yes	156	11.4%	7.2 – 17.6
Marijuana use, LT			
No	740	47.9%	40.8 – 55.2
Yes	869	52.1%	44.8 – 59.2
Other illicit drug use§, LT			
No	1036	63.7%	58.5 – 68.6
Yes	573	36.3%	31.4 – 41.5
Religiosity¶ (n=1575)			
Low	373	18.1%	14.2 – 22.7
High	1202	81.9%	77.3 – 85.8

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Table 4. *continued*

Characteristic	n (unweighted)	Weighted percent	95% CI of percent
Sold illegal drugs, PY (n=1603)			
No	1498	94.7%	90.8 – 97.0
Yes	105	5.3%	3.0 – 9.2
Approached by someone selling illegal drugs, PM (n=1608)			
No	1307	89.2%	85.9 – 91.8
Yes	301	10.8%	8.2 – 14.1
Ever arrested and 'booked,' LT (n=1604)			
No	1113	69.6%	61.6 – 76.6
Yes	491	30.4%	23.4 – 38.4
Sensation-seeking behavior‖ (n=1604)			
Low	1260	86.6%	83.2 – 89.5
High	344	13.4%	10.5 – 6.8
Use of physical violence, PY (n=1606)			
No	1475	94.5%	89.4 – 97.3
Yes	131	5.5%	2.7 – 10.6
Stole/attempted to steal something worth ≥$50, PY (n=1605)			
No	1532	96.2%	91.6 – 98.4
Yes	73	3.8%	1.6 – 8.4
Major depressive episode, LT (n=1590)			
No	1341	84.5%	80.5 – 87.9
Yes	249	15.5%	12.2 – 19.50
Serious psychological distress, PY			
No	867	66.6%	60.2 – 72.5
Yes	208	21.7%	16.5 – 28.0
Unknown/ages 12-17	534	11.7%	9.9 – 13.8
Any mental health treatment, PY (n=1604)			
No	1316	85.8%	81.3 – 89.5
Yes	288	14.2%	10.5 – 18.7

* PM, past month; PY, past year; LT, lifetime

† Includes retired, disabled, in school/training, full-time housekeeping, and any other reasons for not being in the workforce

‡ Large metropolitan: CBSA with ≥ 1 million residents; Small metropolitan: CBSA with >10,000 but < 1 million residents; Non-metropolitan: rural area with < 10,000 residents

§ Includes hallucinogens, heroin, cocaine, and inhalants

¶ Based on degree of agreement to the statement "Your religious beliefs are a very important part of your life."

‖ Based on the questions "How often do you get a real kick out of doing things that are a little dangerous?" and "How often do you like to test yourself by doing something a little risky?"

Because we were particularly interested in examining differences between county type, sample characteristic distributions were also stratified on this variable in accordance with our third specific aim (Table 5). Several notable differences were seen, although none were statistically significant (p>0.05). For example, large metro areas had higher proportions of female residents and respondents employed full-time than the lesser

populated areas. Disproportionate numbers of low educational attainment, unemployment, and recent heavy alcohol use were seen in non-metropolitan (rural) counties. Respondents in rural counties were also more likely to have sold illegal drugs in the past year, have a history of arrest, and to have used physical violence in the past year, relative to their urban counterparts. Interestingly, AIANs residing in large metro areas were more likely to report that their religious beliefs were an important part of their lives than their rural counterparts. Mental health status was relatively evenly distributed across the county types, though those in large and small metropolitan areas were more likely to have received past-year mental health treatment than rural residents. As expected, both lifetime and past-year MA users were disproportionately represented in non-metropolitan areas; no substantial differences were seen for nonmedical analgesic use by county type.

Table 5. Distribution of sample characteristics by county type*, AIAN respondents, NSDUH, 2005-2006†

	Large Metropolitan		*Small Metropolitan*		*Non-Metropolitan*		
Characteristic	**n‡**	**Percent‡**	**n**	**Percent**	**n**	**Percent**	**p-value#**
Total sample	**265**	**22.4%**	**802**	**49.3%**	**542**	**28.6%**	
Gender							0.115
Male	125	37.6%	385	52.0%	263	49.3%	
Female	140	62.4%	417	48.0%	279	50.7%	
Age							0.059
12-17	74	11.3%	274	10.5%	186	13.9%	
18-25	99	14.9%	254	13.2%	206	21.9%	
26-34	22	20.3%	93	18.0%	41	11.7%	
35 or older	70	53.5%	181	58.3%	109	52.5%	
Education							0.195
Less than high school	52	25.9%	169	22.1%	133	30.9%	
High school graduate	52	25.1%	188	32.0%	142	26.0%	
Post-high school	87	37.7%	171	35.5%	81	29.2%	
12-17 year-olds	74	11.3%	274	10.5%	186	13.9%	
Total family income, PY							0.501
<$20,000	75	39.3%	293	36.2%	253	40.8%	
$20,000-$49,999	102	32.4%	309	37.3%	198	39.6%	
≥$50,000	88	28.3%	200	26.4%	91	19.6%	
12-17 year-olds	74	11.3%	274	10.5%	186	13.9%	

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Table 5. *continued*

	Large Metropolitan		*Small Metropolitan*		*Non-Metropolitan*		
Characteristic	**n‡**	**Percent‡**	**n**	**Percent**	**n**	**Percent**	**p-value#**
Employment status							0.075
Full time	103	58.1%	249	48.3%	157	36.3%	
Part time	20	6.5%	81	9.6%	47	9.7%	
Unemployed	18	7.8%	49	4.8%	50	11.0%	
Other§	50	16.3%	149	26.8%	102	29.1%	
School-aged (12-17)	74	11.4%	274	10.5%	186	13.9%	
Overall health status							0.114
Excellent/very good	143	46.6%	468	50.8%	290	47.6%	
Good	83	35.1%	225	23.9%	193	37.7%	
Fair/Poor	39	18.3%	109	25.4%	59	14.7%	
Current cigarette use							0.917
No	208	77.0%	649	75.3%	443	77.9%	
Yes	57	23.0%	153	24.7%	99	22.1%	
Heavy alcohol use, PM							0.061
No	239	93.3%	722	89.8%	492	82.8%	
Yes	26	6.7%	80	10.2%	50	17.2%	
Marijuana use, LT							0.083
No	131	38.2%	368	54.8%	241	43.8%	
Yes	134	61.8%	434	45.2%	301	56.2%	
Other illicit drug use¶, LT							0.421
No	167	57.1%	498	65.1%	371	66.4%	
Yes	98	42.9%	304	34.9%	171	33.6%	
Religiosity††‖							0.175
Low	70	14.2%	185	15.7%	118	25.2%	
High	191	85.8%	602	84.3%	409	74.8%	
Sold illegal drugs, PY‖							0.530
No	245	96.6%	751	96.3%	502	90.5%	
Yes	20	3.4%	50	3.7%	35	9.5%	
Approached by someone selling illegal drugs, PM‖							0.963
No	211	89.7%	661	89.4%	435	88.5%	
Yes	54	10.3%	141	10.6%	106	11.5%	
Ever arrested and 'booked,' LT‖							0.051
No	199	69.6%	567	70.3%	347	61.7%	
Yes	65	21.9%	234	29.7%	192	38.3%	
Sensation-seeking behavior**‖							0.560
Low	215	90.1%	624	86.4%	421	84.4%	
High	49	9.9%	176	13.6%	119	15.6%	
Use of physical violence, PY‖							0.214
No	247	97.9%	742	96.6%	486	88.4%	
Yes	18	2.1%	58	3.4%	55	11.6%	
Stole/attempted to steal something worth ≥$50, PY‖							0.436
No	252	98.4%	763	97.9%	517	91.6%	
Yes	13	1.6%	38	2.1%	22	8.4%	
Major depressive episode, LT‖							0.770
No	216	83.9%	667	83.6%	458	86.7%	
Yes	47	16.1%	126	16.4%	76	13.3%	

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Table 5. *continued*

	Large Metropolitan		*Small Metropolitan*		*Non-Metropolitan*		
Characteristic	**n‡**	**Percent‡**	**n**	**Percent**	**n**	**Percent**	**p-value#**
Serious psychological distress, PY							0.487
No	158	69.0%	399	66.5%	310	65.0%	
Yes	33	19.7%	129	23.0%	46	21.1%	
Unknown/ages 12-17	74	11.3%	274	10.5%	186	13.9%	
Any mental health treatment, PY‖							0.059
No	212	87.9%	643	82.1%	461	90.7%	
Yes	51	12.1%	157	17.9%	80	9.3%	
Methamphetamine use, LT‖							0.108
No	237	91.9%	697	89.6%	463	83.4%	
Yes	28	8.1%	105	10.4%	77	16.6%	
Methamphetamine use, PY							0.398
No	257	98.9%	778	98.7%	521	95.8%	
Yes	8	1.1%	24	1.3%	21	4.2%	
Nonmedical analgesic use, LT							0.811
No	206	83.4%	621	81.0%	431	81.8%	
Yes	59	16.6%	181	19.0%	111	18.2%	
Nonmedical analgesic use, PY							0.631
No	237	93.2%	719	92.3%	491	90.7%	
Yes	28	6.8%	83	7.7%	51	9.3%	

* By population size; Large metropolitan: CBSA with ≥ 1 million residents; Small metropolitan: CBSA with >10,000 but < 1 million residents; Non-metropolitan: rural area with < 10,000 residents

† PM, past month; PY, past year; LT, lifetime

‡ Unweighted numbers and weighted percents

p-value corresponding to χ^2 test

§ Includes retired, disabled, in school/training, full-time housekeeping, and any other reasons for not being in the workforce

¶ Includes hallucinogens, heroin, cocaine, and inhalants

‖ Contains some incomplete data due to nonresponse

†† Based on degree of agreement to the statement "Your religious beliefs are a very important part of your life."

**Based on the questions "How often do you get a real kick out of doing things that are a little dangerous?" and "How often do you like to test yourself by doing something a little risky?"

Substance Use and Mental Health Status

Table 6 presents prevalence estimates of lifetime and past-year use of each drug of interest among AIAN respondents. A total of 210 (weighted, 12%) of the sample reported using methamphetamine at least once in their lives, and 53 (weighted, 2%) had used the drug within the past year. Overall, nonmedical prescription analgesic use was more common than MA, with an estimated 18% ever using them, and 8% within the past year.

Table 6. Prevalence of methamphetamine use and nonmedical use of prescription pain relievers, AIAN respondents, NSDUH, 2005-2006

	Unweighted number of respondents reporting 'yes'	Weighted percent (95% CI)
Methamphetamine use (n=1607)		
Lifetime	210	11.7% (8.5 – 15.7)
Past year	53	2.1% (1.1 – 3.9)
Nonmedical prescription pain reliever use (n=1609)		
Lifetime	351	18.2% (15.1 – 21.9)
Past year	162	7.9% (5.8 – 10.9)

Prevalence of mental health morbidities among AIANs with and without a history of methamphetamine and nonmedical prescription analgesic use are presented in Tables 7 and 8, respectively. Both major depressive episode and serious psychological distress were common among users of these drugs; 28% of lifetime MA users had had a lifetime MDE, and 37% of adult users had experienced SPD in the past year. SPD was also prevalent among lifetime prescription analgesic misusers, with 45% of adults reporting these symptoms. MDE was slightly less common in this group, at 24%. Both mental health measures were more common among those who had used these drugs relative to nonusers.

Table 7. Mental health status among users and nonusers of methamphetamine, AIAN respondents, NSDUH, 2005-2006

	Methamphetamine users				Nonusers of methamphetamine	
	Lifetime (total=210)		*Past Year (total=53)*		*(total=1397)*	
	n*	**Percent* (95% CI)**	**n**	**Percent (95% CI)**	**n**	**Percent (95% CI)**
Major depressive episode†						
Lifetime	56	27.7% (20.5 – 36.2)	13	28.3% (11.8 – 54.0)	193	13.9% (10.3 – 18.4)
Past year	40	22.3% (15.4 – 31.1)	11	19.6% (4.6 – 42.1)	121	9.0% (6.4 – 12.4)
Serious psychological distress‡, past year	56	37.2% (25.0 – 51.3)	12	32.3% (11.7 – 63.2)	152	22.8% (16.0 – 31.3)

* Unweighted numbers and weighted percents

† Based on self-report of 9 DSM-IV criteria used to define MDE; missing data excluded 17 respondents from lifetime figures and 18 respondents from past year figures

‡ Measured among adults only; K6 indicator score ≥ 13, based on a 6-question series assessing the frequency that respondents experienced symptoms of psychological distress during the one month in the past year when they were at their worst emotionally

Table 8. Mental health status among nonmedical users and nonusers of prescription pain relievers, AIAN respondents, NSDUH, 2005-2006

	Nonmedical users of prescription pain relievers				No nonmedical use of prescription pain relievers	
	Lifetime (total=351)		*Past year (total=162)*		*(total=1258)*	
	n*	**Percent* (95% CI)**	**n**	**Percent (95% CI)**	**n**	**Percent (95% CI)**
Major depressive episode†						
Lifetime	76	23.7% (16.6 – 32.6)	37	20.8% (12.0 – 33.7)	173	13.6% (9.8 – 18.6)
Past year	54	18.2% (12.7 – 25.4)	32	15.9% (10.4 – 23.6)	107	8.8% (6.1 – 12.6)
Serious psychological distress‡, past year	74	44.6% (34.3 – 55.4)	36	48.6% (27.9 – 69.8)	134	20.0% (13.5 – 28.6)

* Unweighted numbers and weighted percents

† Based on self-report of 9 DSM-IV criteria used to define MDE; missing data excluded 17 respondents from lifetime figures and 18 respondents from past year figures

‡ Measured among adults only; K6 indicator score ≥ 13, based on a 6-question series assessing the frequency that respondents experienced symptoms of psychological distress during the one month in the past year when they were at their worst emotionally

Logistic Regression Analysis: Methamphetamine

Age, employment status, lifetime marijuana use, lifetime other illicit drug use, recent approach by someone selling illegal drugs, and history of arrest were each highly associated with the outcome in univariable logistic regression models (all $p<0.001$). Methamphetamine use was also significantly associated with each of the three mental health indicators individually (all $p<0.05$). Weighted percentages and unadjusted odds ratios (ORs) are presented in Table 9 for all variables meeting the preliminary screening criteria described previously ($p<0.25$). Gender was considered socially important and retained, despite it not achieving statistical significance.

Table 9. Summary of unadjusted associations between significant* independent variables and lifetime methamphetamine use, AIAN respondents, NSDUH, 2005-2006

Characteristic	Lifetime MA use (n, % responding 'yes')†	Odds Ratio (95% CI)
Gender		
Male	98 (11.5%)	Referent
Female	112 (11.8%)	1.04 (0.59 – 1.82)
Age		
12-17	34 (6.6%)	0.62 (0.29 – 1.30)
18-25	93 (17.1%)	1.81 (0.97 – 3.35)
26-34	27 (14.7%)	1.52 (0.78 – 2.94)
35 or older	56 (10.2%)	Referent
Education		
School aged (12-17)	34 (6.6%)	0.45 (0.22 – 0.94)
Less than high school	73 (15.3%)	1.17 (0.58 – 2.35)
High school graduate	53 (8.5%)	0.60 (0.28 – 1.32)
Post-high-school	50 (13.4%)	Referent
Employment status		
Full time	92 (10.6%)	Referent
Part time	27 (20.1%)	2.12 (0.84 – 5.36)
Unemployed	21 (29.8%)	3.58 (1.28 – 9.96)
Other, including not in workforce	36 (7.7%)	0.70 (0.30 – 1.65)
School aged (12-17)	34 (6.6%)	0.59 (0.30 – 1.16)
County type‡		
Large metropolitan	28 (8.1%)	Referent
Small metropolitan	105 (10.4%)	1.33 (0.59 – 2.99)
Non-metropolitan	77 (16.6%)	2.27 (0.99 – 5.19)
Current cigarette smoking status		
No	140 (9.0%)	Referent
Yes	70 (20.2%)	2.56 (1.37 – 4.81)

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Table 9. *continued*

Characteristic	Lifetime MA use (n, % responding 'yes')†	Odds Ratio (95% CI)
Heavy alcohol use, PM§		
No	166 (9.7%)	Referent
Yes	44 (27.1%)	3.47 (1.33 – 9.05)
Marijuana use, LT		
No	6 (0.9%)	Referent
Yes	204 (21.6%)	30.64 (13.22 – 70.99)
Other illicit drug use¶, LT		
No	32 (2.1%)	Referent
Yes	178 (28.4%)	18.36 (8.25 – 40.86)
Sold illegal drugs, PY		
No	166 (10.4%)	Referent
Yes	44 (34.6%)	4.57 (1.63 – 12.81)
Approached by seller, PM		
No	135 (8.7%)	Referent
Yes	75 (36.2%)	5.97 (3.19 – 11.17)
Arrested & booked, LT		
No	70 (5.5%)	Referent
Yes	140 (25.8%)	6.01 (3.16 – 11.42)
Sensation-seeking‖		
Low	147 (10.9%)	Referent
High	63 (16.7%)	1.64 (0.80 – 3.35)
Use of physical violence, PY		
No	175 (11.0%)	Referent
Yes	35 (23.1%)	2.43 (0.84 – 7.03)
Serious psychological distress**, PY		
No	120 (10.3%)	Referent
Yes	56 (18.7%)	2.01 (0.93 – 4.34)
Unknown/ages 12-17	34 (6.6%)	0.61 (0.31 – 1.23)
Major depressive episode††, LT		
No	151 (9.9%)	Referent
Yes	56 (20.7%)	2.38 (1.41 – 4.00)
Any mental health treatment, PY		
No	155 (10.6%)	Referent
Yes	54 (18.0%)	1.86 (1.05 – 3.30)

* Wald F test $p<0.25$ in simple logistic regression, or *a priori* variables of social significance

† Unweighted numbers and weighted percents

‡ Large metropolitan: CBSA with ≥ 1 million residents; Small metropolitan: CBSA with >10,000 but < 1 million residents; Non-metropolitan: rural area with < 10,000 residents

§ PM, past month; PY, past year; LT, lifetime

¶ Includes hallucinogens, heroin, cocaine, and inhalants

‖ Based on the questions "How often do you get a real kick out of doing things that are a little dangerous?" and "How often do you like to test yourself by doing something a little risky?"

** Measured among adults only; K6 indicator score ≥ 13, based on a 6-question series assessing the frequency that respondents experienced symptoms of psychological distress during the one month in the past year when they were at their worst emotionally

†† Based on self-report of 9 DSM-IV criteria used to define MDE

A main effects model was constructed as previously detailed; results are presented in Table 10. The multivariable model included gender (p=0.212), age (p=0.173), county type (p=0.063), marijuana use (p<0.001), other illicit drug use (p<0.001), history of selling drugs (p=0.012), approached by someone selling drugs (p=0.027), history of arrest (p=0.022), and major depressive episode (p=0.087). Rural residents had over three times the odds of lifetime MA use as residents of large urban areas, lifetime marijuana and other illicit drug use were each associated with a 9-fold higher odds of MA use, and those with a lifetime major depressive episode had nearly twice to the odds of lifetime MA use, after adjusting for all other variables in the model. This main effects model provided a reasonably good fit of the data, using the Hosmer and Lemeshow goodness-of-fit test (HL Wald F=0.804, p=0.614).

Table 10. Multivariable logistic regression modeling results for lifetime methamphetamine use, AIAN respondents, NSDUH, 2005-2006*

	Main effects model		*Final model with interactions*	
Variable	**OR (95% CI)**	***p*-value**	**OR (95% CI)**	***p*-value**
Gender		0.2124		
Male	Referent		-	
Female	1.44 (0.81 – 2.56)		-	
Age		0.1731		0.1180
12-17	0.58 (0.24 – 1.40)		0.46 (0.20 – 1.08)	
18-25	1.14 (0.49 – 2.68)		1.03 (0.45 – 2.40)	
26-34	1.24 (0.61 – 2.51)		1.27 (0.60 – 2.66)	
35+	Referent		Referent	
County type†		0.0625		
Large metro	Referent		-	
Small metro	1.65 (0.73 – 3.71)		-	
Non-metro	3.07 (1.20 – 7.90)		-	
Marijuana use, LT		<0.0001		<0.0001
No	Referent		Referent	
Yes	9.44 (3.68 – 24.17)		11.14 (4.03 – 30.80)	
Other illicit drug use‡, LT		<0.0001		<0.0001
No	Referent		Referent	
Yes	9.15 (4.1 – 20.42)		9.64 (4.26 – 21.79)	
Sold drugs, PY		0.0121		0.0128
No	Referent		Referent	
Yes	2.78 (1.26 – 6.12)		3.05 (1.28 – 7.27)	
Approached by seller, PM		0.0270		
No	Referent		-	
Yes	2.42 (1.11 – 5.27)		-	

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Table 10. *continued*

	Main effects model		*Final model with interactions*	
Variable	**OR (95% CI)**	***p*-value**	**OR (95% CI)**	***p*-value**
Arrested & booked, LT		0.0224		0.0162
No	Referent		Referent	
Yes	2.29 (1.13 – 4.66)		2.47 (1.19 – 5.14)	
Major depressive episode**, LT		0.0869		0.0400
No	Referent		Referent	
Yes	1.81 (0.91 – 3.60)		2.00 (1.03 – 3.87)	
Effect of gender for:				0.0332
Large metro				
Male			Referent	
Female			4.62 (1.63 – 13.13)	
Small metro				
Male			Referent	
Female			0.97 (0.43 – 2.18)	
Non-metro				
Male			Referent	
Female			1.39 (0.44 – 4.35)	
Effect of being approached by seller for:				0.0031
Large metro				
Not approached, PM			Referent	
Approached, PM			13.00 (4.51 – 37.51)	
Small metro				
Not approached, PM			Referent	
Approached, PM			1.27 (0.48 – 3.32)	
Non-metro				
Not approached, PM			Referent	
Approached, PM			2.91 (0.79 – 10.64)	
HL Wald F (*p*-value)	0.804 (p=0.614)		0.497 (p=0.871)	

* PM, past month; PY, past year; LT, lifetime
† Large metropolitan: CBSA with ≥ 1 million residents; Small metropolitan: CBSA with >10,000 but < 1 million residents; Non-metropolitan: rural area with < 10,000 residents
‡ Includes hallucinogens, heroin, cocaine, and inhalants
** Based on self-report of 9 DSM-IV criteria used to define MDE

The assessment of interactions revealed multiple significant modifications of effects, particularly by county type. When entered individually into the main effects model, eight interactions were significant at the preliminary level (p<0.15): county type modified the effects of gender, age, lifetime marijuana use, other illicit drug use, approached by someone selling illegal drugs, and major depressive episode. The two additional interactions were observed between age and approached by seller, and age and illicit drug use. With the exception of the interaction with county type, no effects were

significantly modified by gender. When concurrently included in the model, five interactions remained significant ($p<0.1$): county type modified the effects of gender ($p=0.04$), having been approached by an illegal drug seller ($p=0.01$), lifetime marijuana use ($p=0.07$), and lifetime other illicit drug use ($p=0.04$), and age modified the effects of other illicit drug use ($p=0.002$). The resulting model was quite complex; we then examined cell sizes and considered the public health relevance of each interaction term in our attempt to define an informative, yet parsimonious model. Three statistically significant interaction terms were ultimately excluded because (1) their parameter estimates were imprecise, (2) their inclusion contributed only negligibly to the overall fit of the model, and (3) we determined that they provided little new information of public health importance.

The final logistic regression model for lifetime MA use, presented in Table 10, contained nine main effects and two interactions, those between county type and gender, and county type and approached by a seller of illegal drugs. With the exception of age, which was included *a priori*, each term was significant at the 0.05 level. Females had nearly five times the odds of lifetime MA use of males in large metro counties (OR = 4.62, 95% CI: 1.6 – 13.1), but both genders had similar odds of use in small metro and rural counties (OR = 0.97 and 1.39, respectively). Additionally, MA users in large urban areas had much higher odds of having been recently approached by a seller of illegal drugs (OR = 13.07, 95% CI: 4.5 – 37.5), relative to their counterparts in small urban and non-urban areas (OR=1.27 and 2.92, respectively). This final model provided a good fit of the data (HL Wald F=0.497, $p=0.871$).

Because there was so much variation in effects according to county population size, separate main effects models were also constructed for each county type from the full list of independent variables (see Table 5). Results of this analysis are included in Appendix D.

Logistic Regression Analysis: Nonmedical use of Prescription Pain Relievers

Important unadjusted associations between independent variables and lifetime nonmedical prescription pain reliever use are presented in Table 11. Age, lifetime marijuana use, other illicit drug use, approached by someone selling illegal drugs, history of arrest, and serious psychological distress were strongly associated with the outcome (all $p<0.001$). High religiosity appeared to be protective against use of these drugs (OR = 0.69, 95% CI: 0.5 – 1.3), and a sensation-seeking attitude increased the odds of the outcome by 2.92 (95% CI: 1.5 – 5.8). As in the unadjusted analyses of MA use, all three mental health measures – SPD, MDE, and mental health treatment – were significantly associated with nonmedical prescription analgesic use ($p<0.001$, 0.032, and 0.011, respectively).

A main effects model for nonmedical prescription analgesic use included gender, age, county type, heavy alcohol use, other illicit drug use, history of arrest, serious psychological distress, and past year mental health treatment (Table 12). This model, however, did not provide a good fit of the data (HL Wald F=2.048, $p=0.049$). Removing county type from the model resulted in a marginally better fit (HL Wald F=1.902, $p=0.069$), but this variable was ultimately retained because its presence substantially improved the fit of the final multivariable model after testing for interactions.

Table 11. Summary of unadjusted associations between significant* independent variables and lifetime nonmedical use of prescription pain relievers, AIAN respondents, NSDUH, 2005-2006

Characteristic	Lifetime Rx analgesic misuse (n, % responding 'yes')†	Odds Ratio (95% CI)
Gender		
Male	180 (18.0%)	Referent
Female	171 (18.4%)	1.03 (0.62 – 1.71)
Age		
12-17	93 (15.8%)	1.38 (0.74 – 2.57)
18-25	164 (29.0%)	3.01 (1.78 – 5.11)
26-34	41 (30.5%)	3.24 (1.57 – 6.69)
35 or older	53 (12.0%)	Referent
Education		
School aged (12-17)	93 (15.8%)	0.87 (0.47 – 1.61)
Less than high school	97 (22.4%)	1.34 (0.65 – 2.76)
High school graduate	80 (16.1%)	0.89 (0.36 – 2.19)
Post-high-school	81 (17.7%)	Referent
Total family income		
<$20,000	143 (24.5%)	2.07 (1.03 – 4.15)
$20,000 - $49,999	131 (14.9%)	1.12 (0.54 – 2.34)
≥$50,000	77 (13.6%)	Referent
Employment status		
Full time	124 (19.3%)	Referent
Part time	38 (28.8%)	1.70 (0.77 – 3.77)
Unemployed	36 (26.8%)	1.54 (0.62 – 3.85)
Other, including not in workforce	60 (11.3%)	0.53 (0.25 – 1.13)
School aged (12-17)	93 (15.8%)	0.79 (0.50 – 1.23)
County type‡		
Large metropolitan	59 (16.6%)	Referent
Small metropolitan	181 (19.0%)	1.18 (0.69 – 2.03)
Non-metropolitan	111 (18.2%)	1.12 (0.63 – 1.98)
Heavy alcohol use, PM§		
No	287 (16.4%)	Referent
Yes	64 (32.9%)	2.51 (1.09 – 5.80)
Marijuana use, LT		
No	65 (8.1%)	Referent
Yes	286 (27.6%)	4.32 (1.86 – 10.00)
Other illicit drug use¶, LT		
No	108 (7.5%)	Referent
Yes	243 (37.1%)	7.29 (3.06 – 17.37)
Religiosity‖		
Low	117 (23.1%)	Referent
High	227 (17.3%)	0.69 (0.47 – 1.03)
Sold illegal drugs, PY		
No	291 (16.8%)	Referent
Yes	57 (43.0%)	3.74 (1.14 – 12.31)
Approached by seller, PM		
No	231 (15.0%)	Referent
Yes	120 (45.3%)	4.71 (2.10 – 10.55)
Arrested & booked, LT		
No	172 (11.9%)	Referent
Yes	179 (32.8%)	3.60 (2.33 – 5.57)

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Table 11. *continued*

Characteristic	Lifetime Rx analgesic misuse (n, % responding 'yes')†	Odds Ratio (95% CI)
Sensation-seeking**		
Low	238 (15.6%)	Referent
High	112 (35.1%)	2.92 (1.48 – 5.79)
Use of physical violence, PY		
No	296 (17.3%)	Referent
Yes	54 (33.4%)	2.39 (0.73 – 7.75)
Stole/attempted to steal ≥ $50 value, PY		
No	313 (17.4%)	Referent
Yes	36 (38.9%)	3.02 (0.70 – 13.03)
Serious psychological distress††, PY		
No	184 (13.6%)	Referent
Yes	74 (33.7%)	3.22 (1.79 – 5.78)
Unknown/ages 12-17	93 (15.8%)	1.19 (0.76 – 1.87)
Major depressive episode‡‡, LT		
No	273 (16.5%)	Referent
Yes	76 (28.0%)	1.96 (1.06 – 3.63)
Any mental health treatment, PY		
No	263 (16.2%)	Referent
Yes	87 (30.6%)	2.28 (1.22 – 4.26)

* Wald F test $p<0.25$ in simple logistic regression, or *a priori* variables of social significance
† Unweighted numbers and weighted percents
‡ Large metropolitan: CBSA with ≥ 1 million residents; Small metropolitan: CBSA with >10,000 but < 1 million residents; Non-metropolitan: rural area with < 10,000 residents
§ PM, past month; PY, past year; LT, lifetime
¶ Includes hallucinogens, heroin, cocaine, and inhalants
‖ Based on degree of agreement to the statement "Your religious beliefs are a very important part of your life."
** Based on the questions "How often do you get a real kick out of doing things that are a little dangerous?" and "How often do you like to test yourself by doing something a little risky?"
†† Measured among adults only; K6 indicator score ≥ 13, based on a 6-question series assessing the frequency that respondents experienced symptoms of psychological distress during the one month in the past year when they were at their worst emotionally
‡‡ Based on self-report of 9 DSM-IV criteria used to define MDE

Preliminary analyses of potential interactions resulted in seven significant interactions ($p<0.15$): three by gender (with age, heavy alcohol use, and SPD), three by age (with heavy alcohol use, history of arrest, and mental health treatment), and one between county type and other illicit drug use. Backward elimination of interaction terms from the full model resulted in a multivariable model with three statistically significant interactions ($p<0.1$). County type modified the effects of other illicit drug use ($p=0.046$), the effects of heavy alcohol use differed by gender ($p=0.010$), and age modified the associations between mental health treatment and the outcome ($p=0.006$). As previously discussed, each interaction term was evaluated for adequate cell sizes, public health

importance and explanatory power in the model. The effects of two interactions – county type on other illicit drug use, and age on mental health treatment – were not easily explained and their inclusion had no meaningful influence on other parameter estimates or the fit of the model. We therefore decided on a final model including eight main effects and the interaction between gender and past month heavy alcohol use (Table 12).

The interaction revealed that females with recent heavy alcohol consumption had over 10 times the odds of nonmedical prescription analgesic use than did their non-heavy-drinking counterparts, adjusted for all other covariates (OR = 10.32, 95% CI: 2.64 – 40.29); among men this association was near unity (OR = 1.07, 95% CI: 0.48 – 2.39). The final model describing correlates of lifetime non-medical use of prescription pain relievers provided a reasonable fit of the data (HL Wald F=1.367, p=0.223).

Table 12. Multivariable logistic regression modeling results for lifetime nonmedical use of prescription pain relievers, AIAN respondents, NSDUH, 2005-2006*

	Main effects model		*Final model with interactions*	
Variable	**OR (95% CI)**	***p*-value**	**OR (95% CI)**	***p*-value**
Gender		0.992		
Male	Referent		-	
Female	1.0 (0.62 – 1.62)		-	
Age		<0.001		<0.001
12-17	2.82 (1.32 – 6.01)		2.75 (1.28 – 5.89)	
18-25	4.11 (2.45 – 6.91)		4.14 (2.47 – 6.93)	
26-34	3.10 (1.55 – 6.20)		3.03 (1.40 – 6.54)	
35+	Referent		Referent	
County type†		0.907		0.772
Large metro	Referent		Referent	
Small metro	1.16 (0.58 – 2.31)		1.27 (0.64 – 2.52)	
Non-metro	1.08 (0.60 – 1.94)		1.09 (0.58 – 2.04)	
Heavy alcohol use, PM		0.003		
No	Referent		-	
Yes	2.38 (1.37 – 4.13)		-	
Other illicit drug use‡, LT		<0.001		<0.001
No	Referent		Referent	
Yes	5.80 (2.85 – 11.82)		6.27 (3.35 – 11.75)	
Arrested & booked, LT		0.001		0.001
No	Referent		Referent	
Yes	2.35 (1.46 – 3.79)		2.43 (1.46 – 4.03)	
Serious psychological distress**, PY		0.037		0.024
No	Referent		Referent	
Yes	2.69 (1.07 – 6.79)		2.45 (1.13 – 5.32)	
Unknown/ages 12-17	1.00 (1.00 – 1.00)		1.00 (1.00 – 1.00)	
Any mental health treatment, PY		0.042		0.030
No	Referent		Referent -	
Yes	2.18 (1.03 – 4.61)		2.24 (1.08 – 4.64)	
Effect of heavy alcohol use (PM) for:				0.011
Male				
No			Referent	
Yes			1.07 (0.48 – 2.39)	
Female				
No			Referent	
Yes			10.32 (2.64 – 40.29)	
HL Wald F (*p*-value)	2.048 (*p*=0.049)		1.367 (*p*=0.223)	

* PM, past month; PY, past year; LT, lifetime

† Large metropolitan: CBSA with ≥ 1 million residents; Small metropolitan: CBSA with >10,000 but < 1 million residents; Non-metropolitan: rural area with < 10,000 residents

‡ Includes hallucinogens, heroin, cocaine, and inhalants

** Measured among adults only; K6 indicator score ≥ 13, based on a 6-question series assessing the frequency that respondents experienced symptoms of psychological distress during the one month in the past year when they were at their worst emotionally

Comparative Analysis: Methamphetamine and Nonmedical Use of Prescription Pain Relievers

A comparative model, containing all significant main effects variables from the analysis of each drug outcome, was constructed to compare effects between MA use and nonmedical use of prescription pain relievers. Results of this analysis are presented in Table 13. In general, parameter estimates and statistical significance of covariates did not change substantially between these and the models built for each outcome separately (see Tables 10 and 12). Age was an important correlate of prescription analgesic misuse, but highly non-significant in the MA model. As predicted, county type played an important role in the MA model, with the highest odds of use seen among rural residents, but no differences were found between county types for nonmedical pain reliever use. Marijuana use, interestingly, was only associated with MA use, while use of other illicit drugs was a significant correlate for both drug outcomes. Methamphetamine users, but not pain reliever misusers, were likely to have been recently approached by someone selling illegal drugs and to have sold illegal drugs themselves. Each of the mental health outcomes was associated with use of a different drug: SPD was a significant correlate of prescription pain reliever abuse (OR = 2.7, 95% CI: 0.8 – 9.3), while MDE was associated with somewhat increased odds of MA use (OR = 1.6, 95% CI: 0.7 – 3.5).

Table 13. Comparison of correlates: Lifetime methamphetamine use and lifetime nonmedical use of prescription pain relievers, AIAN respondents, NSDUH, 2005-2006*

	Methamphetamine		*Prescription pain relievers*	
Variable	**OR (95% CI)**	***p*-value**	**OR (95% CI)**	***p*-value**
Gender		0.158		0.852
Male	Referent		Referent	
Female	1.56 (0.84 – 2.92)		1.05 (0.60 – 1.85)	
Age		0.768		0.001
12-17	0.71 (0.25 – 1.95)		2.55 (0.99 – 6.56)	
18-25	1.23 (0.55 – 2.74)		3.34 (1.86 – 6.00)	
26-34	1.25 (0.64 – 2.45)		3.03 (1.45 – 6.33)	
35+	Referent		Referent	
County type†		0.079		0.771
Large metro	Referent		Referent	
Small metro	1.62 (0.73 – 3.57)		1.27 (0.66 – 2.45)	
Non-metro	2.79 (1.13 – 6.87)		1.12 (0.62 – 2.02)	
Heavy alcohol use, PM		0.102		0.024
No	Referent		Referent	
Yes	2.01 (0.87 – 4.64)		1.96 (1.10 – 3.51)	
Marijuana use, LT		<0.001		0.201
No	Referent		Referent	
Yes	9.17 (3.30 – 25.47)		1.85 (0.71 – 4.80)	
Other illicit drug use‡, LT		<0.001		<0.001
No	Referent		Referent	
Yes	10.01 (4.38 – 22.86)		4.56 (2.08 – 10.02)	
Sold illegal drugs, PY		0.019		0.316
No	Referent		Referent	
Yes	2.65 (1.18 – 5.96)		1.61 (0.63 – 4.15)	
Approached by seller, PM		0.044		0.282
No	Referent		Referent	
Yes	2.02 (1.02 – 4.00)		1.56 (0.69 – 3.55)	
Arrested & booked, LT		0.046		0.027
No	Referent		Referent	
Yes	2.12 (1.01 – 4.42)		1.96 (1.08 – 3.55)	
Serious psychological distress**, PY		0.579		0.102
No	Referent		Referent	
Yes	1.28 (0.52 – 3.15)		2.76 (0.81 – 9.34)	
Unknown/ages 12-17	1.00 (1.00 – 1.00)		1.00 (1.00 – 1.00)	
Major depressive episode§, LT		0.230		0.854
No	Referent		Referent	
Yes	1.60 (0.74 – 3.47)		0.90 (0.29 – 2.80)	
Any mental health treatment, PY		0.867		0.112
No	Referent		Referent	
Yes	1.07 (0.48 – 2.40)		2.03 (0.84 – 4.86)	
HL Wald F (*p*-value)	0.790 (*p*=0.627)		2.009 (*p*=0.054)	

* PM, past month; PY, past year; LT, lifetime

† Large metropolitan: CBSA with ≥ 1 million residents; Small metropolitan: CBSA with >10,000 but < 1 million residents; Non-metropolitan: rural area with < 10,000 residents

‡ Includes hallucinogens, heroin, cocaine, and inhalants

** Measured among adults only; K6 indicator score ≥ 13, based on a 6-question series assessing the frequency that respondents experienced symptoms of psychological distress during the one month in the past year when they were at their worst emotionally

DISCUSSION

This study provides population-based prevalence estimates and correlates of the use of two classes of drugs of current concern in Indian country, drawn from a nationally representative sample of American Indians and Alaska Natives. Twelve percent of AIANs in the National Survey on Drug Use and Health (NSDUH) sample reported using methamphetamine at least once in their lives, and two percent had used it within the past year. Report of nonmedical prescription analgesic use was even more common at 18% ever use and 8% within the past year. Additionally, AIANs with a history of methamphetamine and/or nonmedical prescription pain reliever use were likely to have experienced mental health problems. The prevalence of reported drug abuse was found to differ by the population size of the county of residence, suggesting that patterns of drug use behavior and availability in urban versus rural areas differ and may be important determinants of risk for abuse in AIAN populations.

Comparison with the Literature

Prevalence Estimates

To date, nationally representative survey data on drug use in the U.S. have come primarily from two sources: the NSDUH and the Monitoring the Future (MTF) survey, which collects data from adolescents in the 8th, 10th, and 12th grades. Drug use data are also available from the National Longitudinal Study on Adolescent Health (Add Health), a prospective study which has followed a nationally representative sample of adolescents into young adulthood (Iritani, Hallfors, & Bauer, 2007). However, since NSDUH is the only annual survey sampling adults as well as youth, comparisons based on different

sources aren't readily available, and national figures for AIANs are even less frequently reported.

General population estimates of methamphetamine use from the NSDUH place prevalence of lifetime use at approximately 5.2% (Gettig et al., 2006) and past year use between 0.5 and 0.7% (NSDUH, 2007). Lifetime MA estimates from 2005 MTF are slightly lower, at 4% for 12th graders (MTF, 2005), while past-year MA use was substantially higher (approximately 3%) among young adult Add Health participants (Iritani et al., 2007). We found that 11.7% of AIANs had used MA at least once in their lifetime, and 2.1% had used it in the past year (Table 5), estimates which are expectedly higher than general population figures. These figures differ from past-year estimates presented by Iritani and colleagues (2007) based on 2001-2002 Add Health; in this sample, 12.8% of AIANs aged 18-26 reported past-year use of crystal MA. Whitesell and colleagues (2006) reported lifetime stimulant use among Southwest and Northern Plains AI samples at 6% and 15%, respectively, based on 1997 AI-SUPERPFP data. The observed discrepancies are likely due to differing survey periods, the presence of secular trends in MA use, use of different age groups, and, in the latter study, the assessment of stimulants as a class rather than restriction to MA only.

NSDUH figures for lifetime and past-year prescription pain reliever misuse in the general population have been estimated at 12.6% (NSDUH, 2004) and 5% (Tetrault et al., 2007), respectively. Past-year abuse of prescription narcotics was reported by 9% of high school seniors in the 2005 MTF (NIDA, 2006). In data derived from the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC) in 2001-2002, lifetime prevalence of opioid misuse among Native American adults was 9.1% (Huang,

2006). This NESARC estimate is substantially lower than the 18.2% observed in the present study for AIANs ages 12 and older (Table 5); differences in the definitions of nonmedical use between the two surveys may account for some of the variation, in addition to the surveys utilizing slightly different drug categorizations (all prescription pain relievers vs. opioid drugs only). Interestingly, our past-year estimate of 7.9%, using 2005-2006 NSDUH data, is also considerably higher than combined 2002-2005 NSDUH estimates, in which 5.4% of AIANs reported past-year nonmedical pain reliever use (NSDUH 2007b). This suggests an increasing trend of pain reliever misuse in this population in recent years which would have been obscured by the combination of four years of data. This observation agrees with increasing trends of prescription opioid abuse reported in the general population over time (Compton & Volkow, 2005; Zacny et al., 2003).

Co-occurring mental health conditions among AIAN drug users was common in this study. Lifetime major depressive episode was reported by nearly 28% of lifetime MA users, and over 37% of adult MA users had experienced serious psychological distress in the past year. The prevalence of MDE among nonmedical prescription analgesic users was slightly lower, but psychological distress was even more common, approaching half of all adult users of these drugs (Tables 6 and 7). Although comparative estimates from other data sources are not readily available in the literature, these findings are consistent with many studies which have documented correlations between drug abuse and mental health symptomology (e.g., Booth et al., 2006; Isaacson et al., 2005). In a study of AI adolescents in substance abuse treatment, lifetime traumatic events, posttraumatic stress disorder (PTSD), and major depressive disorder were common

(Deters et al., 2006). Federman and colleagues (1997) documented higher rates of anxiety, depression, behavioral disorders, and emotional disorders among substance-using AI youth relative to non-substance users in the Great Smoky Mountains Study. In the general population, past-year use of any illicit drug has been found to be more common both among adults with past-year SPD (27.2% vs. 12.3%) and MDE (27.7% vs. 12.9%) (SAMHSA, 2007).

Correlates: Methamphetamine

The results of this study are consistent with much of the literature that has investigated risk factors for illicit drug use among AIANs and other populations, but important differences were also observed. Rural areas had the highest burden of both lifetime and past-year MA use relative to small and large urban areas, a finding which agrees with most MA research (e.g., Gettig et al., 2006; Denehy, 2006). Multi-year NSDUH reports describe the highest prevalence of past-year MA use in non-metropolitan counties and in the Western U.S. (followed by the Midwest, South, and Northeast), regardless of gender or race (NSDUH, 2007). Unfortunately, the public use files used in our analysis do not include a geographic variable, which precluded from examining regional variations.

The most important correlates of lifetime MA use in this AIAN sample include residence in a rural county, lifetime use of marijuana and other illicit drugs, having sold illegal drugs in the past year, having been recently approached by someone selling illegal drugs, and history of arrest (see Tables 9 and 10). Additionally, major depressive episode was marginally associated with MA use, and females had slightly increased odds of use relative to males. These observed risk factors are in agreement with much of the general

population literature. Several studies have described significant associations between MA use and other substance use (Wu et al., 2007; Herman-Stahl et al., 2007; Iritani et al., 2007), history of arrest (Wu et al., 2006; Wu et al., 2007; Herman-Stahl et al., 2007), and selling drugs (Herman-Stahl et al., 2007). Gender differences in MA use have been inconsistently observed in the literature, with some researchers reporting higher prevalence of use in males (Iritani et al., 2007; Wu et al., 2007), and others, as we have, among females (Herman-Stahl et al., 2007; Wu et al., 2006). Interestingly, no significant difference in lifetime use was observed between age groups in this study, though young adults are generally reported to be at the highest risk in the general population (Wu et al., 2007; Herman-Stahl et al., 2006). Additionally, measures of low socioeconomic status have been identified as risk factors in other studies (Iritani et al., 2007; Booth et al., 2006), but neither educational attainment nor employment status were significantly correlated with MA use among AIANs in our adjusted analyses.

Correlates: Nonmedical Prescription Pain Reliever Use

Several important correlates of nonmedical use of prescription pain relievers among AIANs were identified in this study, including age, recent heavy alcohol use, lifetime use of illicit drugs other than marijuana, history of arrest, serious psychological distress, and past year mental health treatment. No gender differences were observed, and, similar to the MA analyses, socioeconomic measures were not associated with the outcome (see Tables 11 and 12). These results are largely consistent with the literature, in which prescription analgesic misuse has been associated with young adults (Simoni-Wastila et al., 2004; Dowling et al., 2006; Tetrault et al., 2008), abuse of alcohol and other illicit drugs (Dowling et al., 2006; Huang et al., 2006; Tetrault et al., 2008), and

mental health morbidities (Dowling et al., 2006; Huang et al., 2006). Both depressive and psychological symptoms have been described among pain reliever abusers, but at least two studies identified a stronger association with psychological distress than major depressive episode (Dowling et al., 2006; Huang et al., 2006), a finding which is in agreement with our results. Sociodemographic factors such as low educational attainment and low income have been identified as correlates of prescription analgesic misuse in the general population (Dowling et al., 2006; Tetrault et al., 2008), but were not significant correlates in our analysis.

Insights into Substance Use Behavior among American Indians and Alaska Natives

The results of this analysis reveal a complex set of factors associated with methamphetamine use and nonmedical use of prescription pain relievers in AIANs. Several associations differed by county type, particularly in the model describing lifetime MA use, suggesting that differing social and behavioral factors influence urban vs. rural AIANs' odds of using MA. The finding that females had higher odds of use only held in large metro areas (OR = 4.62 relative to males), while males and females were at equal risk in the smaller two county types. Prior studies suggest that females may initiate MA use to suppress appetite (Gettig et al., 2006), reflecting a social pressure that may differentially affect urban AIAN women. Additionally, urban AIANs who had been approached a seller of illegal drugs in the month prior to being interviewed had 13.0 times the odds of having used MA, while this association was non-significant in the other two county types. Although the discrepant timeframes of the measures warrant cautious interpretation, this finding suggests differing availability and accessibility of drugs in urban and rural areas. MA may be more widely available in rural and small metro areas,

such that users don't need to obtain it through street drug dealers. This theory is consistent with what we know about rural home production and the more recent trafficking of MA from 'super lab' organizations through Indian reservations. Urban AIANs with a history of MA use were also substantially more likely to have a history of lifetime marijuana use and lifetime other illicit drug use than their counterparts in less populated counties, although these estimates were imprecise and not included in the final model. AIANs living in large cities may follow a more traditional pathway of progression from alcohol to marijuana use to other hard drugs including MA (Federman et al., 1997), whereas those living on Indian lands may be more likely to try MA earlier due to its relative ease of availability. These differences may be explained, in part, by the lack of economic opportunity of rural areas (see Table 8), as well as differences in cultural orientation between reservation-dwelling AIANs and those who have moved to cities and adopted a lifestyle more akin to the dominant culture (Herman-Stahl et al., 2003).

The association between MA use and major depressive episode, but not serious psychological distress, presents an interesting observation. MA is a strong stimulant offering a powerful and lasting euphoric 'high', which may make it an attractive drug to those with depressive symptoms. This hypothesized initiation pathway has been described in qualitative research (Barr et al., 2006), but the drug is more often associated with psychological distress and psychotic symptoms resulting from physiologic changes in the brain (Barr et al., 2006; Chen et al., 2003; Grant et al., 2007). While AIANs may be drawn to MA to escape feelings of depression, our analysis does not suggest that many users progress to the deleterious psychological outcomes that have been demonstrated in

other populations (Chen et al., 2003; Gettig et al., 2006). On the other hand, prolonged exposure to MA alters the functional ability of dopamine receptors in the brain and may chronically decrease dopamine transporters and serotonin production, making an individual more susceptible to major depression as an outcome (Gettig et al., 2006). These physiologic changes may render individuals more susceptible to environmental stress (Barr et al., 2006), an outcome which is particularly concerning among AIANs, who already experience racial, cultural, and historical conflict from the dominant society (Herman-Stahl et al., 2003).

The examination of factors related to nonmedical use of prescription pain relievers also revealed some interesting insights. One would expect older individuals to have the highest prevalence of lifetime use due to their longer period of risk; however, this analysis revealed that each of the younger age groups had significantly increased odds of lifetime pain reliever misuse – up to 4 times higher – than those aged 35 years and older (see Table 12). This finding gives us cause for concern, particularly in light of findings that early onset of nonmedical prescription drug use is associated with incrementally increasing risk of lifetime prescription drug abuse and dependence (McCabe et al., 2007). Additionally, those who initiate use of cigarettes, alcohol, and other substances at young ages are much more likely to progress to drug-related problems and drug-use disorders (Tetrault et al., 2007; McCabe et al., 2007).

Adolescents and young adults are more likely to obtain prescription drugs from friends or relatives than legitimately through the health care system (NSDUH, 2006), and anecdotal accounts suggest that theft of medications from older family members is an increasing problem on some reservations (AP, 2007). This phenomenon may be

exacerbated by the fact that budget constraints on the Indian Health Service (IHS) system, through which most AIANs receive health care, result in long waiting lists for surgery; pain relievers are widely prescribed as a short-term solution (AP, 2007). Additionally, limited access to clinics among rural residents may result in the prescription of larger quantities of medications at a time, perhaps rendering these patients vulnerable to theft by younger tribal members searching for these drugs. In the present study, both stealing/attempted stealing and use of physical violence were marginally associated with nonmedical use of prescription pain relievers (Table 11), lending support to this hypothesis. It is unclear whether respondents would consistently recognize prescription medications as being "something worth more than $50," so if young AIANs were indeed stealing to obtain these drugs, this association may have been underreported.

Older individuals may be more likely to obtain abusable prescription drugs legitimately through the medical system (i.e., abuse their own prescriptions). This supposition that is somewhat supported by our observation that older AIANs with a recent history of mental health treatment were much more likely to have abused prescription pain relievers than those with no mental health treatment, whereas the difference was negligible in the three younger age groups. The explanation for this observation, however, could simply be that older AIANs have higher involvement with the health care system in general, and are more likely to recognize the need for, seek, and/or obtain mental health treatment than younger individuals. The incongruity of the timeframes of these measures further adds to the difficulty of interpretation, which is why this interaction was excluded from the final model. Use of other illicit drugs was highly correlated with prescription analgesic misuse regardless of age, suggesting that many

users likely obtain them through similar illegal routes, rather than through the medical system.

Despite AIAN males and females exhibiting equal odds of pain reliever misuse, we observed an important difference between genders in the effect of heavy alcohol use on the outcome. Female heavy drinkers were over 10 times more likely to have misused prescription analgesics than females who hadn't consumed alcohol heavily in the past month; among males, this association was null. The cross-sectional data make this association difficult to interpret, but it may suggest a gender difference in the importance of alcohol abuse as an initiator of other illicit drug use. Another possible explanation is that females are more likely than males to persist in the use of drugs that are relatively accessible and socially acceptable, such as alcohol and prescription medications. Women are nearly 50% more likely than men to be prescribed abusable medications (Isaacson et al., 2005), and research has shown that they also tend to progress more rapidly from initiation of a substance to abuse and dependence (Tetrault et al., 2007). This finding, therefore, has implications for female AIANs who abuse alcohol. Several other gender differences have been described in the general population, including higher rates of drug dependence and comorbid mental health conditions among women (Tetrault et al., 2007), an association that was also noted in the present study in the interaction between gender and SPD (though this became non-significant in adjusted analysis).

After adjustment for other covariates, nonmedical use of prescription analgesics was significantly associated with serious psychological distress but not major depressive episode, an opposite result than what was observed in the methamphetamine model. Although causal associations based on these cross-sectional data cannot be inferred,

hypotheses from the literature suggest that psychological symptoms usually precede prescription pain reliever misuse (Kandel et al., 2001; Federman et al., 1997), while substance abuse may exacerbate mental health problems in complex ways (Kessler et al., 1996). Relative to occasional and former drug users, adults dependent on any illicit drug have exhibited higher rates of psychiatric morbidity (Kandel et al., 2001), and comorbid addictive and mental disorders are associated with increased odds of seeking treatment (Kessler et al., 1996). Although the present study's focus was on lifetime use rather than abuse or dependence, it is possible that we captured a high prevalence of AIANs dependent on prescription analgesics, evidenced by the observed associations between SPD and mental health treatment and this outcome. Additionally, AIANs may be more likely to recognize and/or seek mental health treatment for SPD than for symptoms of depression. According to many traditional AI conceptualizations, one's mental, physical, social, and spiritual conditions are not necessarily distinct; rather each exists in balance with the other aspects of the self (Nelson & Manson, 2000). Traditional AIANs may therefore recognize and respond to symptoms of mental distress differently than those of Western orientation, so conjectures about causal associations between addiction and psychological distress can be difficult to support and generalize.

Although comparing correlates of the two outcomes was not a primary objective of this study, the comparative models presented in Table 13 lend some potentially important insights into mechanisms related to the use of these two drugs. As previously discussed, younger AIANs appear to be at increased risk of misusing prescription pain relievers, while no difference between ages was observed for MA use. Additionally, MA use differed by county type and gender, but nonmedical analgesic use did not. Relative

to those who had misused prescription pain relievers, AIANs who had used MA had much higher odds of also using marijuana and other illicit drugs, selling illegal drugs themselves, and having been approached by someone selling illegal drugs; users of the two drugs were approximately equally likely to have a history of arrest. Both drug outcomes were significantly associated with mental health symptomology, but these differed by type and likelihood of obtaining treatment.

A high degree of religiosity appeared to be marginally protective against nonmedical prescription analgesic use (unadjusted OR = 0.69, 95% CI: 0.47 – 1.03), while this factor was not significantly related to MA use (unadjusted OR = 0.76, 95% CI: 0.44 – 1.31). It is unclear how AIANs may have interpreted this survey item since it was designed for the general population, but judging from the high response (82% reported a 'high' degree of religiosity), most respondents likely applied it to traditional Indian spirituality. However, when stratified by county type, rural AIANs appeared to be less highly religious than large urban dwellers (75% vs. 86%, respectively). This observation disagrees with the generally-held idea that assimilation into the dominant society is associated with separation from traditional activities, transition to less "Indian-oriented" acculturation, and increased risk of multiple types of substance abuse (Herman-Stahl et al., 2003). While these results are not readily explained, they do support previous findings that cultural orientation can affect drug use susceptibility among AIANs in complex ways, and associations with abuse of MA and prescription pain relievers warrant further examination.

Limitations and Strengths

This study has several inherent limitations, perhaps the biggest of which is the necessary treatment of American Indians and Alaska Natives as a homogeneous ethnic group. There are over 500 federally recognized tribal governments in the U.S., representing a diverse array of cultural histories and practices (BIA, 2008), but NSDUH, along with most federal data sources, does not distinguish tribal affiliation or reservation dwelling when surveying AIANs. Several studies have examined drug use cross-tribally and have noted important differences between culturally distinct tribal groups (e.g., Whitesell et al., 2007; Whitesell et al., 2006), and between AIANs with differing degrees of acculturation or cultural orientation (Herman-Stahl et al., 2003; Spear et al., 2007). Unfortunately, we were precluded from examining such variation in this study. We had planned to examine geographic differences by region of the country, but this variable was not provided in the public-use dataset.

A potential for selection bias exists in NSDUH's racial designation that may affect the generalizability of our results. Our analysis was restricted to single-race AIANs; those who identified as AIAN in addition to another race were grouped into the "two or more races" category, resulting in our analysis likely excluding many multi-race AIAN respondents. This likely resulted in an underestimation of the outcomes, since the "two or more races" group frequently reported higher prevalence of drug use than other racial categories (Colliver, 2007).

Non-metropolitan county type was used as a rough proxy for reservation dwelling. Most reservations and tribal lands are located in sparsely populated areas, so we made the assumption that most AIAN respondents from rural counties lived on or

near a reservation. According the 2000 U.S. Census, 36% of AIANs lived in designated American Indian areas or Alaska Native villages (Ogunwole 2006), a similar proportion to rural-dwelling AIANs in this study (29%). Additionally, large reservations that have populations over 10,000 (e.g., Navajo Nation) would fall into the small metropolitan county designation, which represented the majority of AIANs in the current study.

Another major limitation is the cross-sectional nature of the data, combined with the evaluation of lifetime instead of more recent measures of drug use. Because of the limited sample size of AIANs in the dataset, lifetime measures assured an adequate number of respondents, but temporal relationships between drug use and correlates cannot be determined. Additionally, demographic characteristics measured at the time of the interview may have differed from the time of drug use, particularly if individuals hadn't used recently.

Although NSDUH protocol includes measures to ensure privacy and guarantee confidentiality, some respondents may have been untruthful in some of their answers, considering the sensitive nature of much of the interview. Additionally, some subjects may have had difficulty accurately recalling past events; those with a history of drug abuse and/or mental health problems may be affected differentially by this type of bias. Field interviewers were recruited from local areas, but were not matched to respondents by race. AIANs may have been less inclined to participate or report honest answers with non-Native interviewers. Overall response rates have been presented in NSDUH documentation (see Table 1), but were not stratified by race/ethnicity, so it is unknown if AIANs participated at different rates than the general population. Weighting procedures did account for non-participation and item non-response, but if differential recall among

AIANs occurred, it would likely result in under-reporting of drug use behaviors. These adjustments would also fail to capture AIANs who were incarcerated or institutionalized, possibly for reasons related to the factors under study, since these populations were not sampled.

Methamphetamine users in this study were identified from both core and non-core items, asked in separate parts of the survey, whereas most other published NSDUH figures report only core item MA use. The addition of the non-core item in the 2005 survey increased MA estimates by 15-25% and is believed to be more accurate (Colliver, 2007), but this item is still being evaluated by SAMHSA. Because it is the only drug that is asked about twice, there is concern at SAMHSA that MA estimates may be artificially inflated relative to other drug use estimates; consistency checks were implemented in the 2006 survey and should help resolve this issue in future years (OAS, 2008). Therefore, the results from this analysis should not be compared to those from past years to evaluate trend.

Finally, the assessment of mental health measures, including major depressive episode and serious psychological distress, was based on self-report. Although these survey items were derived from DSM-IV diagnostic criteria, NSDUH can only ascertain probable, rather than clinically diagnosable, mental disorders.

This study also has several strengths. Very few studies have examined correlates of drug use among AIANs nationally, using a within-race comparison group. Much of the AIAN substance abuse literature has focused on adolescents and young adults, but this analysis broadened the scope to describe patterns of drug use in the population ages 12 and older. We examined factors related to the use of two drugs which are particularly

concerning to many AIAN communities at present: methamphetamine and nonmedical use of prescription pain relievers. Additionally, while associations between mental health problems and substance use have long been recognized by community leaders and providers, we examined the co-occurrence of depressive and psychological symptomology among AIAN users of these two drugs.

Most of the correlates identified in this study are consistent with the literature, but some differ, adding insight into processes specific to AIANs. A novel facet of this study was that we were able to examine and identify several interactions occurring among AIAN drug users that warrant further investigation. As expected, many associations differed by county type, suggesting that AIANs living on or near reservations are subject to different substance use influences than their urban counterparts.

Public Health Implications and Future Research

The abuse of methamphetamine and prescription pain relievers represents two concerning public health issues facing AIAN communities today. Since AIANs in the U.S. represent a wide range of cultural traditions and are confronted with differing public health needs, tribal health leaders will need to interpret these results in the context of their communities' specific situations. However, a few generalizations based on this national sample can be made.

Culturally appropriate prevention and intervention programs should be advanced on both Indian lands and in cities with AIAN populations. In contrast to other populations, measures of socioeconomic status are not highly correlated with illicit drug use among AIANs, indicating that abuse of these drugs is truly a community-wide problem. This study has highlighted the associations between mental health morbidities

and drug use among AIANs. Clinicians and counselors working in both fields must be made aware of the susceptibility of mental health patients to substance abuse, and substance users to poor mental health outcomes. Because depression and psychological distress are highly treatable conditions, efforts should be taken to improve recognition and treatment of these disorders in the context of traditional AIAN views of health. Longitudinal studies to examine the temporal relationships of these co-occurring disorders among AIANs will be helpful.

Additional research is needed to identify how AIANs obtain these two drugs, and whether these routes differ by age and place of residence. The high odds of nonmedical use of prescription analgesics among young AIANs is particularly concerning, because it may be associated with increased risk of subsequent drug dependence in this group. Therefore, ways by which youth are accessing these drugs, and motivations for initiation must be better understood. In addition, cultural identity may play an important role in AIANs' initiation of substance use, but the secondary nature of this analysis made us ill-equipped to examine these factors. Future research among and between smaller tribal groups, in which a higher degree of cultural homogeneity can be assumed, could clarify risk and protective factors such as cultural identity and spirituality, examine local routes of drug access, and better assess the roles of reservation vs. urban dwelling. A better understanding of these factors would help identify those at highest risk and inform culturally-specific prevention and intervention strategies.

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APPENDIX A: NSDUH documents

DEPARTMENT OF HEALTH & HUMAN SERVICES

U.S. Public Health Service
Office of Applied Studies
Rockville, MD 20857

_____, 2006

Dear Resident:

To better serve all people across the nation, the United States Public Health Service (USPHS) is conducting a national study on health-related issues. Your address was randomly chosen along with more than 200,000 others. Research Triangle Institute (RTI) is under contract to carry out this study for the USPHS. Soon, an RTI interviewer will be in your neighborhood to give you more information.

When the interviewer arrives, please ask to see his or her personal identification card. An example of the ID card is shown below. The interviewer will ask you a few questions, and then may ask one or two members of your household to complete an interview. It is possible that no one from your household will be chosen to be interviewed. You may choose not to take part in this study, but no one else can take your place. **Every person who is chosen and completes the interview will receive $30 in cash**.

All the information collected is confidential and will be used only for research purposes. This is guaranteed by federal law. This letter is addressed to "Resident" because your address was selected, and we do not know your name. Feel free to ask the interviewer any questions you have about the study.

Your help is very important to this study's success. Thank you for your cooperation.

Sincerely,

Assistant Project Officer, USPHS

National Field Director, RTI
(800) 848-4079

_____
Assigned Field Interviewer

Confidentiality protected by the Confidential Information Protection and Statistical Efficiency Act of 2002 (PL 107-347)
Authorized by Section 505 of the Public Health Service Act (42 USC 290aa4)
Approved by Office of Management and Budget (OMB Approval No. 0930-0110)

Public Health Service
Office of Applied Studies

Study Description

Your address is one of several in this area randomly chosen for the 2006 National Survey on Drug Use and Health. This study, sponsored by the United States Public Health Service, collects information for research and program planning by asking about:

- tobacco, alcohol, and drug use or non-use,
- knowledge and attitudes about drugs,
- mental health, and
- other health issues.

You cannot be identified through any information you give us. Your name and address will never be connected to your answers. Also, federal law requires us to keep all of your answers confidential, and to use your answers only for research purposes (the *Confidential Information Protection and Statistical Efficiency Act of 2002*).

The screening questions take just a few minutes. If anyone is chosen, the interview will take about an hour. You can refuse to answer any questions, and you can quit at any time. **Each person who is chosen and completes the interview will receive $30 in cash.**

If you have questions about the study, call , the Project Representative, at . If you have questions about your rights as a study participant, call , the representative for RTI's Office of Research Protection, at (a toll-free number). You can also visit our project Website: http://nsduhweb.rti.org/ for more information.

Thank you for your cooperation and time.

Office of Applied Studies
Substance Abuse and Mental Health Services Administration (SAMHSA)
U.S. Public Health Service
Department of Health and Human Services

INTRODUCTION AND INFORMED CONSENT FOR INTERVIEW RESPONDENTS AGE 18+

IF INTERVIEW RESPONDENT IS NOT SCREENING RESPONDENT, INTRODUCE YOURSELF AND STUDY AS NECESSARY: Hello, I'm _____, and I'm working on a nationwide study sponsored by the U.S. Public Health Service. You should have received a letter about this study. (SHOW LEAD LETTER, IF NECESSARY.)

READ THE BOXED INFORMATION BELOW
BEFORE STARTING EVERY INTERVIEW

This year, we are interviewing about 70,000 people across the nation. You have been randomly chosen to take part. You will represent over 3,000 other people who are similar to you. You may choose not to take part in this study, but no one else can take your place. We will pay you $30 when you finish the interview.

GIVE STUDY DESCRIPTION TO R IF YOU HAVE NOT ALREADY DONE SO.

This study asks about tobacco, alcohol, and drug use or non-use, knowledge and attitudes about drugs, mental health, and other health issues. It takes about an hour. You will answer most of the questions on the computer, so I will not see your answers. We are only interested in the combined responses from all 70,000 people, not just one person's answers. This is why we do not ask for your name and we keep your answers separate from your address. RTI may contact you by phone or mail to ask a few questions about the quality of my work. This is why we ask for your phone number and mailing address at the end of the interview.

While the interview has some personal questions, federal law keeps your answers private. We hope that protecting your privacy will help you to give accurate answers. You can quit the interview at any time and you can refuse to answer any questions.

If it is all right with you, let's get started.

(Can we find a private place to complete the interview?)

INTRODUCTION AND INFORMED CONSENT FOR INTERVIEW RESPONDENTS AGE 12-17

FIRST, OBTAIN PERMISSION FROM THE PARENT AND READ THE BOXED INFORMATION BELOW

Your (AGE) year-old child has been selected to be in this study. Your child's participation is voluntary. This interview asks about tobacco, alcohol, and drug use or non-use, knowledge and attitudes about drugs, mental health, and other health related issues. All of your child's answers will be confidential and used only for research purposes. Since your child will answer most of the questions on the computer, I will never see the answers, and you are not allowed to see them either. If it is all right with you, we'll get started.

(Can we find a private place to complete the interview?)

THEN, READ THE BOXED INFORMATION BELOW BEFORE STARTING EVERY INTERVIEW WITH A 12-17 YEAR OLD

This year, we are interviewing about 70,000 people across the nation. You have been randomly chosen to take part. You will represent over 1,000 young people in this country who are similar to you. You may choose not to take part in this study, but no one else can take your place. We will pay you $30 when you finish the interview.

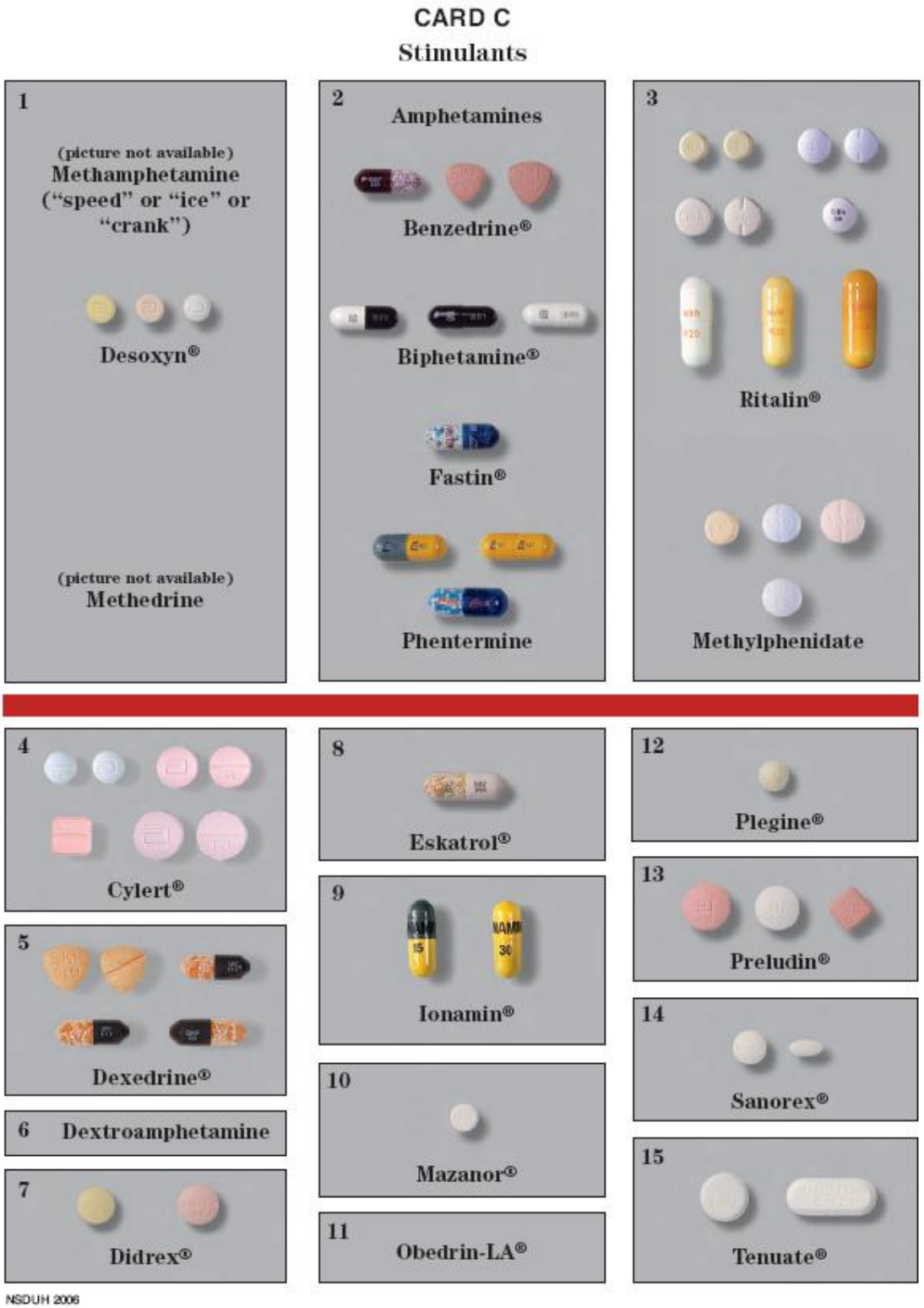
GIVE STUDY DESCRIPTION TO R IF YOU HAVE NOT ALREADY DONE SO.

This study asks about tobacco, alcohol, and drug use or non-use, knowledge and attitudes about drugs, mental health, and other health issues. It takes about one hour. You will answer most of the questions on the computer, so I will not see your answers. Your answers will never be seen by either your parents or your school. We are only interested in the combined responses from all 70,000 people, not just one person's answers. This is why we do not ask for your name and we keep your answers separate from your address. RTI may contact you by phone or mail to ask a few questions about the quality of my work. This is why we ask for your phone number and mailing address at the end of the interview.

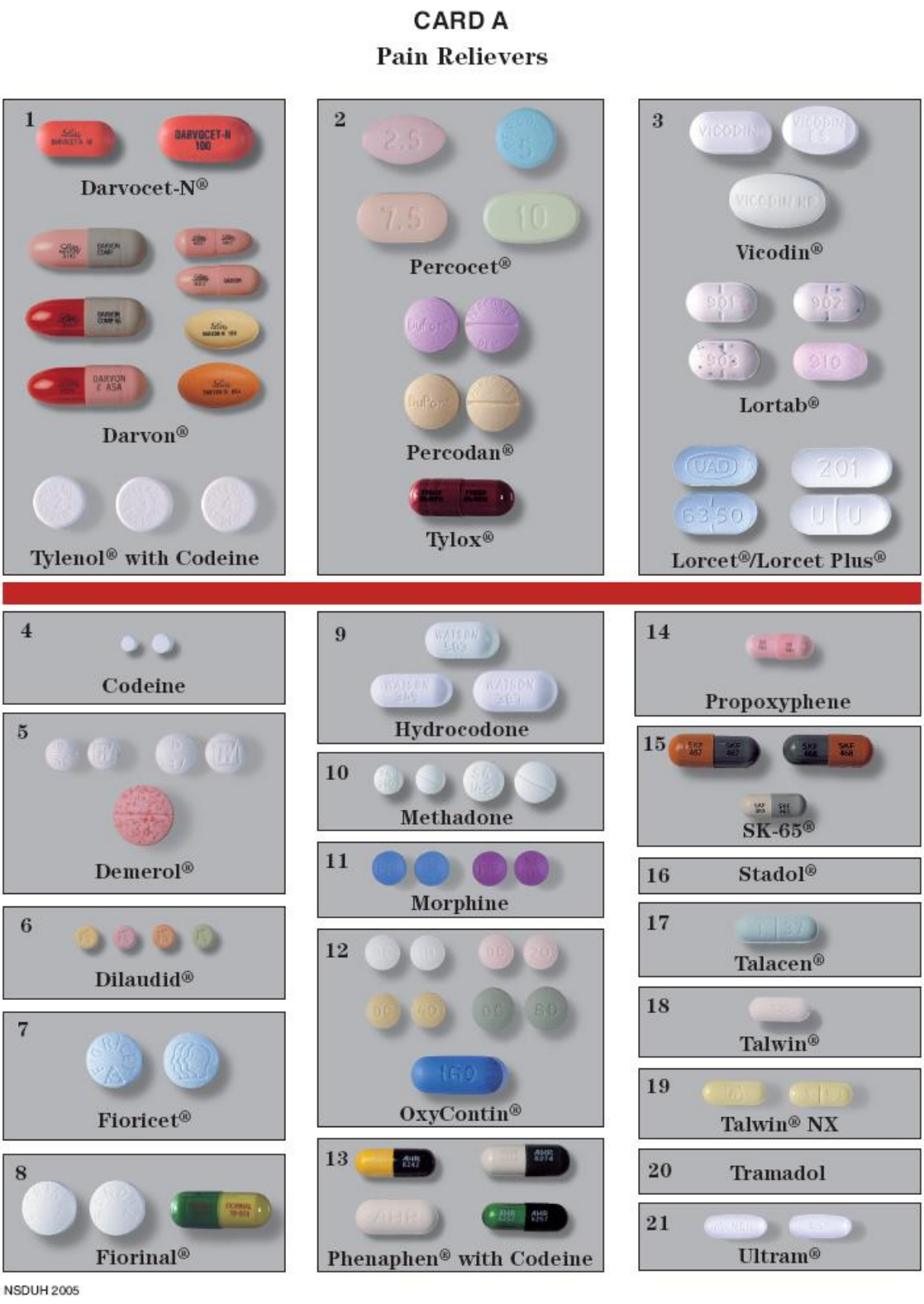
While the interview has some personal questions, federal law keeps your answers private. We hope that protecting your privacy will help you to give accurate answers. You can quit the interview at any time and you can refuse to answer any questions.

If it is all right with you, let's get started.

APPENDIX B: NSDUH stimulants showcard



APPENDIX C: NSDUH pain relievers showcard



APPENDIX D: Correlates of lifetime methamphetamine use by county type: Results of main effects models constructed separately by county type

Table 14. Multivariable logistic regression modeling results for lifetime methamphetamine use by county type, AIAN respondents, NSDUH, 2005-2006*

	Large Metropolitan		*Small Metropolitan*		*Non-metropolitan*	
Variable	**OR (95% CI)**	***p*-value**	**OR (95% CI)**	***p*-value**	**OR (95% CI)**	***p*-value**
Gender		0.014		0.682		0.717
Male	Referent		Referent		Referent	
Female	11.44 (1.68-78.1)		1.18 (0.53-2.59)		1.17 (0.49-2.79)	
Age		0.103		0.251		0.262
12-17	0.20 (0.02-1.94)		0.37 (0.12-1.16)		0.85 (0.3-2.44)	
18-25	1.93 (0.36-10.46)		1.04 (0.40-2.75)		1.65 (0.59-4.57)	
26-34	0.13 (0.01-1.94)		1.51 (0.39-5.74)		2.18 (0.68-6.95)	
35+	Referent		Referent		Referent	
Education		0.012				
Less than HS	2.97 (0.62-14.17)					
HS grad	0.01 (0.0-0.44)					
Post-high-school	Referent					
School aged	1.0 (1.0-1.0)					
Family income		0.013				
<$20,000	0.09 (0.01-0.9)					
$20,000-$49,999	0.04 (0.0-0.33)					
≥$50,000	Referent					
Employment status						0.097
Full time					Referent	
Part time					2.41 (0.45-12.8)	
Unemployed					2.35 (0.59-9.34)	
Other					0.70 (0.18-2.67)	
School aged					1.0 (1.0-1.0)	
Current cigarette smoking status						0.012
No					Referent	
Yes					4.10 (1.37-12.24)	
Marijuana use, LT				0.004		<0.001
No			Referent		Referent	
Yes			11.94 (2.28-62.59)		139.42 (15.07-1290)	
Other illicit drug use†, LT		0.012		0.008		<0.001
No	Referent		Referent		Referent	
Yes	10.02 (1.69-59.6)		6.85 (1.7-27.58)		22.47 (8.27-61.09)	
Sold illegal drugs, PY				0.005		<0.001
No			Referent			
Yes			6.53 (1.78-23.97)			
Approached by seller, PM		0.002				
No	Referent					
Yes	7.98 (2.28-27.9)					
Arrested & booked, LT		0.028		0.008		
No	Referent		Referent			
Yes	8.48 (1.26-56.9)		3.24 (1.38-7.64)			
Use of physical violence, PY		0.039				
No	Referent					
Yes	12.13 (1.14-129.1)					

Continued, next page

Table 14. *continued*

	Large Metropolitan		*Small Metropolitan*		*Non-metropolitan*	
Variable	**OR (95% CI)**	***p*-value**	**OR (95% CI)**	***p*-value**	**OR (95% CI)**	***p*-value**
Major depressive episode‡, LT						
No						
Yes						
Any mental health treatment, PY		0.095				0.054
No	Referent				Referent	
Yes	3.89 (0.79-19.23)				3.34 (0.98-11.38)	
HL Wald F (p-value)	2.632 (p=.0100)		0.528 (p=.849)		0.792 (p=.625)	

*PM, past month; PY, past year; LT, lifetime

† Includes hallucinogens, heroin, cocaine, and inhalants

‡ Based on self-report of 9 DSM-IV criteria used to define MDE