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EXAMINING CORRELATES OF METHAMPHETAMINE AND OTHER DRUG USE IN PREGNANT AMERICAN INDIAN ADOLESCENTS

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Abstract: American Indian and Alaska Native (AI/AN) adolescents have high rates of pregnancy, as well as alcohol, marijuana, cocaine, and, increasingly, methamphetamine (meth) use. The progression of adolescent drug use to meth use could have devastating impacts on AI communities, particularly when youth are simultaneously at risk for teen childbearing. In order to inform future prevention efforts, this study explores correlates of meth use in a sample of pregnant AI teens, with a focus on sociodemographic, familial, and cultural factors and use of other drugs.

INTRODUCTION

Increasing use of methamphetamine (meth) among adolescents in the U.S. is a serious public health problem, with long-lasting medical, psychosocial, and societal consequences. Meth is a highly addictive drug that causes sustained structural changes in the brain, and cognitive and emotional problems in chronic users. It is also associated with a constellation of other unsafe behaviors and with the spread and progression of HIV and other infectious diseases, such as Hepatitis B and C (National Institute on Drug Abuse, 2009). Nationally, an estimated 4.3% of people aged 12 years and older (Substance Abuse and Mental Health Services Administration, 2006) and 4.5% of high school seniors (Johnston, O'Malley, Bachman, & Schulenberg, 2006) have used meth at least once. Use of meth among adolescents has been found to follow use of alcohol, marijuana, and other illicit drugs (Novins, Beals, & Mitchell, 2001). American Indian/Alaska Native (AI/AN) adolescents, in general, report higher lifetime and past year use of illicit drugs than any other racial or ethnic group (Substance Abuse and Mental Health Services Administration, 2008). Between 2006-2008, approximately 3 times more AI/ANs aged 12 years and older vs. U.S. All Races (1.4% vs. 0.54%) reported using meth in the past year (National Institute on Drug Abuse, 2006).

Considering nearly 2 times as many AI/AN females begin childbearing in adolescence, and bear twice as many children while teenagers as the general U.S. population (Indian Health Service & Department of Health and Human Services, 2001), increasing use of meth among AI/AN adolescents poses significant lifetime risks for young AI/AN mothers and their children, families, and communities. Prenatal meth exposure has been linked to fetal growth restriction, cardiac anomalies, clefting, and neurocognitive defects (Plessinger, 1998; Smith et al., 2003; Chang et al., 2004; Smith et al., 2006). Early childhood exposure to parental meth use is associated with exposure to environmental toxins and dangers, neglect, abuse, and insufficient bonding and nurturing (Haight et al., 2005). More generally, adolescent childbearing has been linked with both drug use and negative parenting practices that predict higher drug use in offspring (Ashery, Roberston, & Kumpfer, 1998). Thus, the intertwining risks of teen pregnancy and drug use among AI/AN adolescent girls may be a critical contributor to multigenerational drug dependence and related behavioral health disparities among AI/AN populations (Howard et al., 1999; Barlow et al., 2006; Walkup et al., 2009). This situation begs further understanding of population-specific risks and potential prevention strategies.

Recent studies have identified risk and protective factors for meth use among youth in the general U.S. population. Risks include: fewer years of education; homosexuality and bisexuality; history of psychiatric disorder; family history of drug use; use of alcohol, cigarettes, marijuana, and heroin/opiates; and peer pressure and the presence of drug-using friends (Russell et al., 2008; Shillington et al., 2005; Sattah et al., 2002). Reservation-based AI adolescents face additional environmental risks that may contribute to higher rates of drug and meth use, including a history of cultural and political oppression, high unemployment and school dropout rates, geographic isolation, underresourced law enforcement agencies, and lower access to services to prevent and treat drug use (Barlow et al., 2006; Walkup et al., 2009; Barlow & Walkup, 1998; Barlow & Walkup, 2008; Office of Technology Assessment, 1990). AI/AN communities also have unique protective factors against drug use, including traditions that support strong linkages to family and clan networks, as well as cultural beliefs and practices that promote alcohol and drug abstinence and maintenance of pure body and mind during pregnancy (Barlow & Walkup, 1998; American Indian Families Project, 2004; Rogers, 2001; Szlemko, Wood, & Thurman, 2006).

As a step toward prevention in AI reservation settings, the goal of this study was to explore demographic, familial, and cultural correlates of meth and other drug use among 322 expectant AI adolescents enrolled in a trial of a home-visiting intervention called Family Spirit (Barlow et al., 2006; Walkup et al., 2009). Family Spirit is designed for delivery by local Native paraprofessionals in their reservation communities, and aims to reduce maternal and child risks for lifetime drug use. The theoretical model underpinning the Family Spirit intervention is based on G.R. Patterson's

theory of how children develop behavior problems (see Patterson, DeBaryshe, & Ramsey, 1989). Patterson's model posits that ineffective parenting mediates a variety of poor child behavior outcomes; conversely, positive parenting protects against the onset of negative behaviors through early, middle, and later childhood.

Consistent with the theoretical model and the behavioral target of the intervention, the primary aim of the baseline analysis conducted for this study was to investigate relationships between drug use and expectant mothers' family of origin functioning. We hypothesized that mothers who reported higher drug use would report lower family functioning. Further, we hypothesized that stronger affinity with traditional values would correlate with both more positive family functioning and lower drug use. In keeping with Patterson's model, we hypothesized that negative demographic factors could exacerbate poor family functioning and ultimately affect mothers' capacity for positive parenting if not addressed. To explore the spectrum of drug use severity, we viewed lifetime and pregnancy meth use and pregnancy use of any drugs as the strongest indicators of drug use risk. We also looked at relationships of meth use to other drug use, to understand the patterns of drug progression in this sample.

METHODS

Data Collection

Data were collected at the baseline assessment of the intervention trial, prior to the participants being randomized. The sample included 322 expectant females, aged 12-19 years at the time of conception, from four rural reservation communities in the Southwest (referred to as Sites 1-4). Baseline data were collected from expectant teens between 14 and 35 weeks' gestation (median = 25 weeks) during the period June 2006 to May 2008.

The baseline assessment included a semi-structured interview that elicited sociodemographic and cultural identity information, and standardized self-report questionnaires on drug use and family functioning. AI study personnel administered assessments in participants' homes, or another confidential setting (e.g., vehicle or site office) if requested by the participant.

Measures

Semi-structured Interview. Sociodemographic information, including participants' age at conception, parity, marital and educational status, current use of food stamps, number of homes lived in during previous year, and drug use since the time of conception, was collected via a semi-

structured interview. The interview was compiled primarily from the Voices of Indian Teens instrument (Moran, Fleming, Somervell, & Manson, 1999) and a demographic survey that had been developed by the investigators, via an iterative process with Native paraprofessionals, for this and two previous studies (Barlow et al., 2006; Walkup et al., 2009).

Voices of Indian Teens (Moran, Fleming, Somervell, & Manson, 1999). The VOICES survey is the product of a rigorous formative and instrument development project conducted with two AI communities that has been found to have acceptable reliability and validity (Mitchell, Beals, & Whitesell, 2008). Selected components of the survey used in this study included questions on cultural identity and family history of suicide. Parental alcohol abuse was measured using a VOICES question that asked participants to indicate whether their birth mother or birth father currently has or in the past had a "serious drinking problem." VOICES questions about drugs were also used, including a 13-item self-report questionnaire measuring lifetime use, use in past 30 days, and age at first use of alcohol, marijuana, crack/cocaine, meth, barbiturates, and inhalants.

Problem Oriented Screening Instrument for Teenagers (POSIT), Family Relations (range 0-11, Cronbach's alpha 0.75; Rahdert, 1991). The POSIT is widely used to assess a broad range of functional areas among teens. The instrument has 139 self-report items encompassing 10 functional subscales. The subscale measuring family functioning was included in this study. This subscale is derived from individuals' responses to 11 yes/no questions, with approximately half of the items being reverse-scored. For clinical and research purposes, the family functioning subscale is typically dichotomized into two categories (low and high risk), based on whether the subscale score exceeds a given cutoff value (i.e., 0-3 indicates low risk; $\geq$4 indicates high risk). The POSIT is designed to flag functional problem areas, but is considered conservative in that a 'high' risk score is suggestive, but not definitive, of potential underlying problems (Rahdert). Psychometric data on the POSIT indicate high reliability and validity of the instrument (Gruenewald & Klitzner, 1991), and the instrument has been found to be an effective screening tool for maladaptive family functioning among African-American and Latino adolescent drug users (Santisteban, Tejeda, Dominicis, & Szapocznik, 1999).

ANALYSIS

Given the rapid rise of meth in many AI/AN communities, as well as the serious public health and societal consequences associated with its use, our analysis focused primarily on meth use. Two time periods for meth use were created for analyses of correlates. Lifetime meth use was defined as positive when participants noted "ever having tried" meth on the self-report questionnaire. Pregnancy meth use was defined as positive when participants reported (a) using meth since conception during the semi-structured interview, or (b) using meth in past 30 days on the self-report questionnaire.

Due to the increased risks associated with young age (≤15 years) at first drug use (Kumpfer, Alexander, McDonald, & Olds, 1998), variables representing ages of participants were dichotomized into two age groups: 12-15 and 16-19 years. Due to limited variation in the distribution of cultural identity items, the 4-point Likert measures were collapsed into two groups (i.e., "Not at all/Not much" versus "Some/A lot"). In interpreting outcomes, the dichotomized groupings of cultural identity were used to differentiate positive or negative affinity with traditional cultural beliefs and practices. (However, the authors recognize that cultural affinity is, in practice, a dynamic and continuous variable, and therefore, the collapsing of positive and negative cultural affinity scores presents a limitation in this study.) Binary variables for alcohol, marijuana, or crack/cocaine use during pregnancy were based on drug use since conception or in past 30 days. Barbiturate and inhalant use during pregnancy were too infrequent (n = ~1-2) for analysis. The POSIT family functioning scale was dichotomized into low (0-3) and high (≥ 4) risk scores, according to the manual instructions regarding clinical cutoff scores (Rahdert, 1991; Santisteban et al., 1999).

Factors associated ($p < 0.05$) with meth use in bivariate analyses were included in multivariate models. Because our sample contained only 17 individuals who had used meth during pregnancy, we expanded the multivariate analysis to include a model of any drug use during pregnancy (i.e., meth, marijuana, crack/cocaine, inhalants, barbiturates, or alcohol). Examination of other drug use during pregnancy is of special interest in understanding intervention needs because of its potential to signal drug use severity, progression, and dependence.

Relative risks (RR) for meth or any drug use were calculated by using modified Poisson regression with robust variance estimation, considered the optimal approach for cross-sectional analysis of relatively frequent outcomes (Barros & Hirakata, 2003; Zou, 2004). RR, a commonly used measure in statistics and epidemiology, is a ratio of the probability of an event or outcome (in this case, drug use) occurring in an exposed versus an unexposed group (i.e., high-risk family functioning versus low-risk family functioning group). While RR is similar to the odds ratio in terms of measuring associations of risk between two variables, it is considered more accurate and appropriate in measuring associations with outcomes that are relatively frequent. Because drug use in this sample was relatively frequent, RR was determined to be the more appropriate measure for this analysis.

Variance inflation factors (VIF) were calculated to test for multicollinearity between covariates. Given high correlation levels (VIF > 5; O'Brien, 2007) between lifetime and pregnancy use of substances, multivariate models of pregnancy use excluded lifetime use. Ages at first use for different substances were not included in multivariate models due to reduction in sample size if those variables were used. Exploratory chi-squared analysis was conducted to compare meth and other drug use patterns across individual POSIT family functioning items.

All analyses were conducted using Stata 9.2. Missing data were minimal (< 1% of values). The study protocol was approved by the Johns Hopkins Bloomberg School of Public Health IRB, Indian Health Service (IHS) IRB, and appropriate tribal IRBs and health boards. The manuscript was approved by all relevant tribal and IHS IRBs.

RESULTS

Sociodemographic, Family, and Cultural Characteristics and Drug Use History

This sample of expectant AI women was young (mean age = 17.6 years), unmarried (97%, n = 311), out of school (59%, n = 191), and highly mobile (51%, or n = 163, lived in 2 or more homes in the previous year). Nearly one quarter (23%, n = 75) had more than one child (See Table 1). Over one third (37%, n = 119) had a family functioning score above or equal to the clinical cutoff indicating high risk for problems in family functioning. More than half (58%, n = 188) reported having at least one parent with a serious drinking problem according to the VOICES self-report item. Approximately 5% (n = 14) had lost an immediate family member to suicide. In terms of cultural identity, 47.5% reported living a traditional way of life vs. 52.5% who said they did not. One third (33.9%) ascribed high importance to having traditional Indian values vs. 66.1% who said living traditionally was less important.

Drug Use History

More than one quarter of participants (26%, n = 83) reported using meth at least once in their lifetimes (Table 1). Reported lifetime meth use was one third of reported alcohol (78%, n = 250) or marijuana (75%, n = 241) use, nearly the same as lifetime crack/cocaine use (23%, n = 75), and approximately 5 times higher than barbiturate or inhalant use (5-6%, n = 17 and n = 21, respectively). Almost half (48%, n = 155) of the sample said they had ever used cigarettes, and 19% (n = 62) reported using cigarettes at least once during pregnancy. Of these 19%, the majority (n = 54; 87%) said they smoked cigarettes occasionally, but not every day, while the remaining 8 respondents (13%) reported smoking 1-10 cigarettes per day.

Approximately 1 in 20 (5.3%, n = 17) reported meth use during pregnancy prior to study enrollment (mean gestational age, 25 weeks). Substances used most during pregnancy were alcohol (14%, n = 45) and marijuana (13%, n = 43).

Initiation of meth use occurred at older ages than for all other substances (mean = 15.7 years). Inhalants were initiated earliest (mean = 13.6 years), followed by marijuana (mean = 14.0 years), tobacco (mean = 14.2 years), then alcohol (mean = 14.6 years).

Table 1
Participants' Drug Use History (N = 322)

Drug Use Characteristics	Lifetime Drug Use n (%)	Pregnancy Drug Use n (%)	Age at First Use Mean (SD)
Alcohol	250 (77.6)	45 (14.0)	14.6 (1.8)
Marijuana	241 (74.8)	43 (13.4)	14.0 (2.1)
Methamphetamines	83 (25.8)	17 (5.3)	15.7 (1.7)
Crack/cocaine	75 (23.3)	6 (1.9)	15.4 (1.7)
Barbiturates	21 (6.5)	3 (1.0)	15.3 (2.0)
Inhalants	17 (5.3)	1 (0.3)	13.6 (2.1)
Any of above drugs	276 (85.7)	81 (25.2)	NA
Never used any drugs	46 (14.3)	241 (74.8)	NA

Factors Associated with Lifetime and Pregnancy Meth Use Risk

Bivariate test results examining factors associated with increased or decreased likelihood of lifetime or pregnancy meth use are shown in Table 2. Factors most strongly associated with increased lifetime meth use included southern or central geographic locations; high residential mobility; poor family functioning; parental history of alcohol problems; family history of suicide; and lifetime and pregnancy use of alcohol, marijuana, crack/cocaine, barbiturates, and inhalants. Currently attending school, living by traditional way, greater importance ascribed to traditional Indian values, and older ages of initiation of alcohol and marijuana were all associated with decreased lifetime meth use. Although not shown in this table, similar geographical patterns were seen for lifetime and pregnancy use of alcohol, marijuana, and crack/cocaine, with the southern and central locations having the highest levels of use.

Table 2
Factors Associated with Lifetime and Pregnancy Meth use, with Bivariate Analysis Results

	Total Number (%) (N=322)	Number (%) who Used Meth in Lifetime (n = 83)	RR	95% CI	Number (%) who Used Meth in Pregnancy (n=17)	RR	95% CI
Sociodemographic Factors							
Geographic location							
Northeast AZ (Site 1)	83 (25.8)	11 (13.3)	1.00		1 (1.2)	1.00	
Southern AZ (Site 2)	65 (20.2)	28 (43.1)	3.25***	1.75, 6.03	8 (12.3)	10.2*	1.3, 79.6
North-central AZ (Site 3)	69 (21.4)	7 (10.1)	0.77	0.31, 1.87	0 (0)	N/A	N/A
Central AZ (Site 4)	105 (32.6)	37 (35.2)	2.66***	1.45, 4.89	8 (7.6)	6.32	0.81, 49.6
Age at time of conception							
12-15 years		6 (18.2)	1.00		1 (3.0)	1.00	
16-20 years		77 (26.6)	1.46	0.69, 3.10	16 (5.5)	1.82	0.25, 13.34
Parity							
0		60 (24.3)	1.00		11 (4.4)	1.00	
$\geq$ 1		23 (30.7)	1.26	0.84, 1.89	6 (8.0)	1.80	0.69, 4.69
Marital status							
Married		2 (18.8)	1.00		0 (0)		
Unmarried		81 (26.1)	1.43	0.40, 5.09	17 (5.5)	N/A	N/A
Current school status							
Not attending school		59 (30.9)	1.00		14 (7.3)	1.00	
Attending school		24 (18.3)	0.59*	0.39, 0.90	3 (2.3)	0.31	0.09, 1.07
Currently use food stamps							
No		36 (21.3)	1.00		5 (3.0)	1.00	
Yes		47 (30.7)	1.44	0.99, 2.10	12 (7.8)	2.65	0.96, 7.35
Number of homes lived in during past year							
1 home		40 (25.2)	1.00		9 (5.7)	1.00	
2-3 homes		37 (24.5)	0.97	0.66, 1.43	6 (4.0)	0.70	0.26, 1.92
$\geq$ 4 homes		6 (50.0)	1.99*	1.06, 3.72	2 (16.7)	2.94	0.72, 12.1

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Table 2, Continued
Factors Associated with Lifetime and Pregnancy Meth use, with Bivariate Analysis Results

	Number (%) (N=322)	Lifetime Meth Use (n = 83) Number (%)	RR	95% CI	Meth Use in Pregnancy (n=17) Number (%)	RR	95% CI
Family Factors							
Family functioning (POSIT)							
Low risk: 0-3 score	203 (63.0)	37 (18.2)	1.00		6 (3.0)	1.00	
High risk: ≥ 4 score	119 (37.0)	46 (38.7)	2.12***	1.47, 3.07	11 (9.2)	3.13*	1.19, 8.24
Mother or father has had serious drinking problem							
No	134 (41.6)	22 (16.4)	1.00		4 (3.0)	1.00	
Yes	188 (58.4)	61 (32.4)	1.98***	1.28, 3.05	13 (6.9)	2.32	0.77, 6.95
Family member has committed suicide							
No	308 (95.6)	76 (24.7)	1.00		14 (4.6)	1.00	
Yes	14 (4.4)	7 (50.0)	2.03*	1.16, 3.54	3 (21.4)	4.71**	1.53, 14.54
Cultural Factors							
Degree to which live by traditional way							
Not at all/Not much	169 (52.5)	53 (31.4)	1.00		12 (7.1)	1.00	
Some/A lot	153 (47.5)	30 (19.6)	0.63*	0.42, 0.92	5 (3.3)	0.46	0.16, 1.28
Importance of having traditional Indian values							
Not/somewhat important	213 (66.2)	64 (30.1)	1.00		16 (7.5)	1.00	
Very important	109 (33.9)	19 (17.4)	0.58*	0.37, 0.92	1 (1.0)	0.12*	0.02, 0.91

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Table 2, Continued
Factors Associated with Lifetime and Pregnancy Meth use, with Bivariate Analysis Results

	Number (%) (N=322)	Lifetime Meth Use (n = 83) Number (%)	RR	95% CI	Meth Use in Pregnancy (n=17) Number (%)	RR	95% CI
Substance Use Factors							
Ever had a drink of alcohol							
No	72 (22.4)	5 (6.9)	1.00		3 (4.2)	1.00	
Yes	250 (77.6)	78 (31.2)	4.49***	1.89, 10.67	14 (5.6)	1.34	0.40, 4.55
Alcohol use during pregnancy							
No	277 (86.0)	60 (21.7)	1.00		10 (3.6)	1.00	
Yes	45 (14.0)	23 (51.1)	2.36***	1.64, 3.39	7 (15.6)	4.31***	1.73, 10.74
Age at first alcohol use (of those who used)							
≤ 15 years	166 (68.6)	62 (37.4)	1.00		13 (7.8)	1.00	
16-19 years	76 (31.4)	11 (14.5)	0.39***	0.22, 0.69	1 (1.3)	0.17	0.02, 1.26
Ever tried marijuana							
No	81 (25.2)	2 (2.5)	1.00		2 (2.5)	1.00	
Yes	241 (74.8)	81 (33.6)	13.6***	3.42, 54.11	15 (6.2)	2.52	0.59, 10.79
Marijuana use during pregnancy							
No	279 (86.7)	62 (22.2)	1.00		9 (3.2)	1.00	
Yes	43 (13.3)	21 (48.8)	2.20***	1.51, 3.20	8 (18.6)	5.77***	2.35, 14.14
Age at first marijuana use (of those who used)							
≤ 15 years	179 (74.6)	69 (38.6)	1.00		14 (7.8)	1.00	
16-19 years	61 (25.4)	12 (19.7)	0.51*	0.30, 0.87	1 (1.6)	0.21	0.03, 1.56

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Table 2, Continued
Factors Associated with Lifetime and Pregnancy Meth use, with Bivariate Analysis Results

	Number (%) (N=322)	Lifetime Meth Use (n = 83) Number (%)	RR	95% CI	Meth Use in Pregnancy (n=17) Number (%)	RR	95% CI
Substance Use Factors							
Ever tried crack/cocaine							
No	247 (76.7)	28 (11.3)	1.00		7 (2.8)	1.00	
Yes	75 (23.3)	55 (73.3)	6.47***	4.49, 9.41	10 (13.3)	4.70***	1.86, 11.93
Crack/cocaine use during pregnancy							
No	316 (98.1)	78 (24.7)	1.00		14 (4.4)	1.00	
Yes	6 (1.9)	5 (83.3)	3.38***	2.25, 5.07	3 (50.0)	1.29***	4.36, 29.18
Age at first crack/cocaine use (of those who used)							
≤ 15 years	33 (44.6)	24 (72.7)	1.00	0.76, 1.33	7 (21.2)	1.00	
16-19 years	41 (55.4)	30 (73.2)	1.01	0.76, 1.33	3 (7.3)	0.34	0.10, 1.23
Ever tried barbiturates							
No	301 (93.5)	74 (24.6)	1.00		16 (5.3)	1.00	
Yes	21 (6.5)	9 (42.9)	1.74*	1.02, 2.97	1 (4.8)	0.90	0.12, 6.43
Ever tried inhalants							
No	305 (94.7)	68 (22.3)	1.00		12 (3.9)	1.00	
Yes	17 (5.3)	15 (88.2)	3.96***	3.01, 5.20	5 (29.4)	7.48***	2.97, 18.79

*p < 0.05
**p < 0.01
*** p <0.005

Correlates of Risk

Lifetime Meth Use

Geographic location, family functioning, parental alcohol abuse, and lifetime use of marijuana, crack/cocaine, and inhalants were all independently associated with increased risk of lifetime meth use (Table 3). After controlling for covariates, participants at Site 2 were more likely to report lifetime meth use (RR = 2.53, $p < 0.005$). Regardless of study site, those with higher family dysfunction were 1.44 times ($p < 0.05$) more likely to use meth, compared to those with lower family dysfunction. Findings also suggest that participants who reported having a parent with a serious drinking problem were 1.36 times ($p < 0.1$) more likely to use meth. Controlling for

lifetime use of all other substances, participants who had ever used marijuana were more than 5 times more likely to have ever used meth than non-marijuana users (RR = 5.23, $p < 0.05$); crack/cocaine users were approximately 4 times (RR = 3.96, $p < 0.005$) more likely; and, inhalant users, 1.5 times more likely (RR = 1.51, $p < 0.05$).

Table 3
Multivariate Analysis of Correlates of Lifetime Meth Use and Use of Meth and Other Drugs During Pregnancy

	Model 1 *Lifetime Meth Use*+		Model 2 *Use of Any Drugs During Pregnancy*		Model 3 *Use of Meth During Pregnancy*	
Determinant	Adjusted RR	95% CI	Adjusted RR	95% CI	Adjusted RR	95% CI
Sociodemographic						
Geographic location						
Northeast Arizona (Site 1)	1 (ref)		1 (ref)		1 (ref)	
Southern Arizona (Site 2)	2.53	1.38, 4.62***	1.26	0.76, 2.11	5.83	0.55, 62.2
North-central Arizona (Site 3)	0.94	0.46, 1.92	0.25	0.10, 0.62***	0.04	0.01, 0.05***
Central Arizona (Site 4)	1.70	1.00, 2.90	0.84	0.51, 1.41	3.43	0.33, 35.5
Current School Status						
Not attending school	1 (ref)		1 (ref)		1 (ref)	
Attending school	0.77	0.54, 1.12	0.96	0.65, 1.42	0.40	0.13, 1.20
# of homes lived in past year						
1 home	1 (ref)		1 (ref)		1 (ref)	
2-3 homes	0.74	0.54, 1.02	1.16	0.80, 1.67	0.55	0.23, 1.32
≥ 4 homes	0.92	0.54, 1.58	1.98	1.15, 3.39**	0.94	0.13, 6.62
Family						
Family functioning (POSIT) score						
Low risk: 0-3	1 (ref)		1 (ref)		1 (ref)	
High risk: ≥ 4	1.44	1.02, 2.04**	1.15	0.79, 1.69	1.84	0.78, 4.34
Parent w/serious drinking problem						
No	1 (ref)		1 (ref)		1 (ref)	
Yes	1.36	0.94, 1.97*	1.76	1.12, 2.75**	1.34	0.42, 4.23
Family member committed suicide						
No	1 (ref)		1 (ref)		1 (ref)	
Yes	1.07	0.58, 1.99	2.22	1.23, 3.98**	4.25	1.25, 14.47**

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Table 3, Continued
Multivariate Analysis of Correlates of Lifetime Meth Use and Use of Meth and Other Drugs During Pregnancy

	Model 1 *Lifetime Meth Use*†		Model 2 *Use of Any Drugs During Pregnancy*		Model 3 *Use of Meth During Pregnancy*	
Determinant	Adjusted RR	95% CI	Adjusted RR	95% CI	Adjusted RR	95% CI
Cultural						
Degree to which live by traditional way						
Not at all/Not much	1 (ref)		1 (ref)		1 (ref)	
Some/A lot	1.06	0.70, 1.61	1.01	0.64, 1.58	1.94	0.61, 6.21
Importance of having traditional values						
Not/somewhat important	1 (ref)		1 (ref)		1 (ref)	
Very important	1.02	0.64, 1.63	0.42	0.23, 0.76***	0.17	0.03, 1.20*

† Model 1 also adjusted for lifetime use of alcohol, marijuana, crack/cocaine, barbiturates, and inhalants
* $p < 0.1$
** $p < 0.05$
*** $p < 0.005$

Exploratory Analysis of Pregnancy Meth and Other Drug Use

Two independent models of substance use during pregnancy were created: one for any substance use (including meth, alcohol, marijuana, crack/cocaine, barbiturates, or inhalants), and one specifically for meth use. Participants at Site 3 were significantly less likely to use meth (RR = 0.04, $p < 0.005$) or any substances during pregnancy (RR = 0.25, $p < 0.005$) than participants at Site 1. Participants who had lived in four or more homes vs. one home in the previous year were twice as likely to use any substances during pregnancy (RR = 1.98, $p < 0.05$). Participants who reported parent abuse of alcohol were 1.76 times more likely to report substance use during pregnancy ($p < 0.05$). Having an immediate family member who had committed suicide quadrupled participants' risk of meth use and doubled risk of any substance use during pregnancy (RR = 4.25 [$p < 0.05$] and RR = 2.22 [$p < 0.05$], respectively). Individuals who ascribed greater importance to practicing traditional Indian values were less likely to report meth or any substance use during pregnancy (RR = 0.17 [$p < 0.1$] and RR = 0.42 [$p < 0.005$], respectively).

Exploratory Analysis of Family Functioning and Meth and Other Drug Use

Table 4 reports chi-squared results for associations between POSIT family functioning scale items, lifetime meth use, and use of meth or any other drugs during pregnancy. Lifetime meth use was consistently associated with higher family dysfunction scores. Individuals with high vs. low family dysfunction POSIT scores also began alcohol and marijuana use at younger ages (14.1 vs.

14.9 years for alcohol, $p < 0.001$; 13.7 vs. 14.3 years for marijuana, $p < 0.05$), and earlier initiation of drug use correlated with meth use. For every POSIT item, there was a greater proportion of women who had "ever used" meth in the higher family dysfunction category, with 7 of 11 items reaching significance at the $p < 0.05$ level and 3 of 11 at the $p < 0.1$ level. Similar POSIT patterns were found for use of meth or any drugs during pregnancy. POSIT items most strongly associated with lifetime and pregnancy drug use included, "Do your parents/guardians argue a lot?" and "Do you and your parents/guardians have frequent arguments which involve yelling or screaming?" Items negatively correlated with drug use included, "Do your parents/guardians and you do lots of things together?" and "Do your parents/guardians have a pretty good idea of your interests?"

Table 4
Association between POSIT Items and Lifetime and Pregnancy Methamphetamine use and Other Drug use, With Chi-Squared Test Results

	Lifetime Meth Use		Pregnancy Drug Use		Pregnancy Meth Use	
POSIT Family Functioning Items	% used meth in lifetime	*p* value	% used any drug in pregnancy	*p* value	% used meth in pregnancy	*p* value
Do your parents or guardians argue a lot?						
No	22.1		21.3		3.2	
Yes	37.9	0.009	39.4	0.003	12.1	0.003
Do your parents or guardians refuse to talk with you when they are mad at you?						
No	22.4		22.9		4.0	
Yes	31.1	0.085	28.6	0.256	6.7	0.277
Do your parents or guardians usually know where you are and what you are doing?						
No	39.7		33.3		6.4	
Yes	22.2	0.004	23.0	0.088	4.7	0.583
Do your parents or guardians and you do lots of things together?						
No	35.7		35.7		8.7	
Yes	20.2	0.002	19.2	0.001	3.0	0.024
Do your parents or guardians pay attention when you talk to them?						
No	38.9		33.3		8.3	
Yes	24.0	0.055	23.7	0.206	4.6	0.333
Do your parents or guardians have rules about what you can and cannot do?						
No	31.4		28.0		6.8	
Yes	22.4	0.077	23.4	0.362	4.0	0.269

continued on next page

Table 4, Continued
Association between POSIT Items and Lifetime and Pregnancy Methamphetamine use and Other Drug use, With Chi-Squared Test Results

	Lifetime Meth Use		Pregnancy Drug Use		Pregnancy Meth Use	
POSIT Family Functioning Items	% used meth in lifetime	*p* value	% used any drug in pregnancy	*p* value	% used meth in pregnancy	*p* value
Do your parents or guardians know what you really think or feel?						
No	29.7		27.1		5.5	
Yes	19.0	0.035	21.5	0.258	4.1	0.579
Do you and your parents or guardians have frequent arguments which involve yelling or screaming?						
No	21.3		21.7		2.7	
Yes	45.5	0.000	41.8	0.002	16.4	0.000
Do your parents or guardians like talking with you and being with you?						
No	35.7		38.1		9.5	
Yes	24.2	0.111	23.1	0.037	4.3	0.151
Do your parents or guardians have a pretty good idea of your interests?						
No	40.2		34.1		11.0	
Yes	20.6	0.000	21.9	0.027	2.9	0.004
Do your parents or guardians usually agree about how to handle you?						
No	36.0		29.8		5.3	
Yes	19.9	0.002	22.3	0.138	4.8	0.872

Positive family functioning, as measured by the POSIT, was also associated with traditional cultural affinity. For example, 71% of those who said they lived a traditional way of life had positive family functioning vs. 56% who did not believe living a traditional way of life was important ($p < 0.01$). Similarly, 72% of respondents who felt it was more important to have traditional Indian values had positive family functioning, versus 58% of respondents who reported it was less important to have traditional Indian values ($p < 0.05$; data not shown).

DISCUSSION

Drug Use

Lifetime meth use in this sample of pregnant AI teens was up to 3 times higher than among previous national samples of AI/AN adolescents (Oetting et al., 2000) and approximately 5 times higher than U.S. All Races adolescents (Springer, Peters, Shegog, White, & Kelder, 2007; Johnston et al., 2006). Past-month use of meth (2.5%) was double past-month use in comparable samples of U.S. All Races youth (Iritani, Hallfors, & Bauer, 2007). Reported meth use during pregnancy (5.3%) was approximately 5 times higher than recent national samples of pregnant women (National Institute on Drug Abuse, 2006).

Mean age at first meth use (15.7 years) was considerably lower than among the general U.S. population (22.1 years in 2004; Substance Abuse and Mental Health Services Administration, 2006). Generally consistent with gateway theory (Kandel, 1975), exposure to meth in this sample occurred later than exposure to other legally available substances (alcohol and inhalants) and marijuana and crack/cocaine. However, in contrast with gateway theory findings in other U.S. adolescent populations (Willner, 2001), participants were more likely to initiate marijuana use prior to alcohol use and had equal exposure to alcohol and marijuana (77.6% vs. 74.8%). Meth use was more highly correlated with marijuana use than with use of alcohol, cocaine, or any other drug. This finding is consistent with another large prospective study of western AI adolescents, which showed that initiation of marijuana use prior to alcohol use increased the risk of substance use progression (Novins & Barón, 2004). Further study is needed to determine if teen pregnancy and early initiation of marijuana use are linked risk factors for substance use progression. Early marijuana use should be an indicator for intervention in the AI communities participating in this study, and potentially in other similar AI/AN communities.

Correlates of Drug Use Risk

Sociodemographic Factors

We found no differences in meth use related to education or marital status, age at conception, parity, or use of food stamps, which may be a function of the limited variability in socioeconomic status among the participating communities. However, we found that geographic location was strongly correlated with meth use risk. The four participating communities vary somewhat in population (ranging from approximately 13,000 to 27,000) and are located on three different reservation lands that differ in topography and proximity to urban areas. Site 2, which had the highest lifetime and pregnancy meth use rates, is the southernmost site and is closest (1-2 hours)

to two large urban population centers. Site 3, which had the lowest rates, is the northernmost and the most geographically distant (> 4 hours) from urban centers. Sites 1 and 4 are in between with respect to geographic isolation and drug use risk. Differences in levels of drug trafficking from southern urban centers may influence adolescents' exposure and use. For example, drug traffickers from Mexico, which controls 70-90% of meth production and distribution to the U.S., may exploit the southernmost AI reservations, which generally have fewer law enforcement resources and face complications in applying legal consequences to outsiders (Brouwer et al., 2006). However, the fact that other drug use was also higher in the sites with high meth use complicates the picture, but may mean that other drug exposure is necessary and facilitates the uptake of meth.

After adjusting for site in multivariate models, family dysfunction and residential instability remained significant risks, and traditional cultural affinity remained significantly protective. High residential mobility in this sample was also correlated with greater family dysfunction (42% of those who had lived in ≥ 2 homes in the previous year had high family dysfunction scores, as compared to 31% of those who had lived in only one home, $p < 0.05$).

Family factors

Family factors correlated with meth use in this sample hold clues for prevention. Teen mothers who reported growing up in families with poor functioning and high conflict (e.g., parents who frequently argued, yelled), as measured by the POSIT, were at greatest risk for lifetime meth and pregnancy drug use. In contrast, teens who felt understood by their parents/guardians (e.g., parents/guardians have "good idea of my interests") had lower drug use. These findings are consistent with child development theories indicating that ineffective parenting leads to a variety of poor child behavior outcomes (Patterson et al., 1989), including drug use, and predict drug use will be perpetuated across generations in the absence of family-based intervention.

Our exploration of correlations of severe drug use with other indicators of family dysfunction yields several directions for future research. Parental history of alcohol problems and family history of suicide were correlated with the most severe drug use risk, including pregnancy use of meth and other drugs. We hypothesize that these mothers' serious drug use may be correlated with a more severe history of family dysfunction. The role of family history of psychiatric disorders is unknown in this sample, and is an important piece of the puzzle in understanding the constellation of family-based risks for drug use. Further research is needed to target reduction of children's *in utero* exposure to drugs and the perpetuation of negative mental health outcomes across generations in Native and other similarly challenged communities.

While a growing body of studies has demonstrated that positive parenting interventions are preventive for lifetime child behavior risks (Kumpfer & Alvarado, 2003; Etz, Robertson, & Ashery, 1998), rigorous trials with AI/AN reservation communities have been scarce (see Novins, 2009). Baseline data from the current trial regarding family-based risks that affect drug use among teen mothers, and ultimately the ability of the Family Spirit intervention to reduce drug use in AI teen mothers and their offspring, holds high public health significance for Indian communities.

Cultural factors

Participants who ascribed importance to having strong traditional Indian values were less likely to use meth and other substances during pregnancy, and were also more likely to have positive scores (i.e., low risk of problems) for family functioning. Strong cultural identification has been shown to be protective against substance use among other populations, as well as AIs (Castro et al., 2007; Szlemko et al., 2006). AIs have unique traditions that view pregnancy and childbearing as spiritually sacred (Cesario, 2001). The participating tribes have special cultural practices during pregnancy to honor and protect the growing child spirit, such as avoiding negative thoughts or foreign foods or smells. Engagement in unique traditional Native customs and beliefs has potential to strengthen drug prevention efforts among pregnant AI/AN women. Further, the fact that the majority (80%) of females who used meth in their lifetime did *not* use meth during pregnancy may indicate that pregnancy presents a distinct opportunity for behavioral redirection.

Limitations

There are several limitations to this study. Given the cross-sectional nature of the analyses, we are unable to make assumptions regarding causality of the identified associations. The small sample size and relatively small numbers of teens who used meth (n = 17) or any drugs (n = 81) during pregnancy limited our ability to draw definitive conclusions. The generalizability of our findings is also limited by potential sampling bias, as we only included AI adolescents who agreed to participate in the Family Spirit intervention study. We suspect that the expectant teens who enrolled in the trial may have had lower meth use risk than their communities' pregnant teen populations at large. Further, substance use, especially illicit drug use, is historically susceptible to underreporting among youth. Our sample may have viewed reporting sensitive information about drug use during and prior to pregnancy as socially undesirable, potentially yielding lower estimates. Family history of drug use is also susceptible to underreporting by adolescent populations.

Meth use estimates during pregnancy were also potentially problematic. In an effort to provide the most statistically robust estimates, the variable for pregnancy meth use was created by combining two questions (use of substance since time of conception, when participants may

not have known they were pregnant yet, and use of substance during past 30 days of pregnancy, when participants knew they were pregnant). Upon running the same multivariate models for the individual questions, similar trends were seen, but with diminished statistical significance. Further, the pregnancy usage captured only the time from conception to study enrollment (mean gestational age 25 weeks) and not use during the third trimester, once again potentially resulting in underestimates of pregnancy use. Finally, dichotomizing groups related to the cultural identity scales potentially oversimplifies the interpretation of participants' cultural affinity.

CONCLUSIONS

High reported rates of meth and other drug use among this sample of expectant teens support disparities found among other AI/AN populations and increase the urgency for determining effective substance abuse prevention strategies among AI/AN adolescents, especially those at risk for pregnancy. The strong association of family and traditional cultural factors with meth and other substance use within this sample suggests that further research on the utility of culturally driven family strengthening approaches to prevent children's drug use is warranted within AI/AN populations. While expectant AI/AN teens are exposed to multiple environmental risks, pregnancy and early childbearing may provide a pivotal developmental time point for effecting lasting behavior change in ways that tap local cultural strengths. Because a large proportion of AI/AN women begin childbearing as teenagers, the success of such interventions has important public health significance to breaking multigenerational cycles of drug abuse.

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ASSESSING HEALTH-RELATED QUALITY OF LIFE IN NORTHERN PLAINS AMERICAN INDIANS: PROMINENCE OF PHYSICAL ACTIVITY AS A HEALTH BEHAVIOR

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Abstract: Associations of behavioral health risks and healthy behaviors with self-reported health-related quality of life measures were investigated in a Northern Plains American Indian sample. Participants were surveyed in person using the Behavioral Risk Factor Surveillance Survey. The results showed that regular physical activity was significantly associated with better self-reported overall health, fewer mentally unhealthy and activity limitation days in the past 30 days, and with a greater number of good health days.

INTRODUCTION

Health disparities among various ethnic groups in the U.S. between 1997 and 2000 were particularly prominent among American Indians and Alaska Natives (AI/ANs), who were more likely to report higher obesity rates (BMI $\geq$ 30) than were members of other racial/ethnic groups (23.9% vs. 18.7%). They were also more likely to suffer from diabetes (9.7% vs. 5.7%), and to show higher rates of cigarette smoking (32.2% vs. 22.3%), greater lack of leisure-time physical activity (32.5% vs. 27.5%), and slightly greater rates of binge drinking (23.9% vs. 22.0% for men; 8.8% vs. 7.4% for women; (Zahran et al., 2005). The deleterious effects of these physical and behavioral factors on morbidity and mortality are well established (Blair & Brodney, 1999; Centers for Disease Control and Prevention [CDC], 1994; Koop & Luoto, 2006; Sher, Grekin, & Williams, 2005). There is also a growing body of evidence linking the above risk factors to health-related quality of life (HR-QOL) measures.

HR-QOL measures have been developed by the Centers for Disease Control and Prevention (CDC) for use in surveys and have been reaffirmed in Healthy People 2010 as a valuable tool for reaching the goals of increasing quality and years of healthy life and eliminating health disparities

(U.S. Department of Health and Human Services, 2000). HR-QOL measures have been included in the annual Behavioral Risk Factor Surveillance Survey (BRFSS) survey to assess four domains: participants' self-rated overall health, recent activity limitations, recent physical health, and recent mental health.

This four-pronged approach to health assessment has been further validated by Idler and Angel (1990), who found that, while a majority of respondents used physical health criteria in evaluating their health, many also perceived their health in terms of physical functioning, social role activities they were not capable of, and emotional or spiritual well-being. Additionally, according to a review by Idler and Benyamini (1997) self-ratings of physical and mental health consistently predicted survival beyond other health indicators of mortality risk (e.g. blood pressure, serum cholesterol level, body mass index, prescription medication use, chronic conditions). These findings suggest that subjective health ratings may be fairly accurate and useful indicators of health status.

According to the CDC BRFSS report evaluating HR-QOL between 1993 and 2001, AI/ANs reported poorer overall health and a greater number of physically and mentally unhealthy days than many other ethnic groups, as well as the highest number of activity limitation days of any ethnic group (Zahran et al., 2005). Similar findings were reported by Gilliland and Davis (1998) in a study of AIs in rural New Mexico. The investigators observed the lowest self-reported ratings on HR-QOL measures in AIs compared to the overall New Mexico and U.S. populations.

Behavioral health risks and healthy behaviors have also been found to influence HR-QOL measures. For example, Stranges et al. (2006) found that unhealthy alcohol consumption (i.e., experiencing at least one episode of intoxication in the past 30 days) was associated with poorer reported mental health in women and poorer physical health in men. Laaksonen, Rahkonen, Martikainen, Karvonen and Lahelma (2006) reported that smokers consistently gave lower ratings to their general, physical, and mental health than non-smokers, while Croghan et al. (2005) found that smokers abstaining from cigarette smoking for a year following a cessation program reported better overall health, as well as better physical and mental health, than those who continued to smoke. Recently, Kostka and Bogus (2007) reported significantly lower overall health scores for elderly (over 65 years old) overweight (BMI 25 to <30) and obese (BMI $\geq$ 30) community-dwelling adults compared to an age-matched normal-BMI (20 to <25) group. The researchers also observed a significant negative relationship between reported levels of moderate physical activity and overall health. Similarly, other authors have reported an inverse relationship between physical activity levels and poor HR-QOL outcomes regardless of the BMI category, age group, sex, health care coverage, education, income, or ethnicity (e.g., Phillips & Blanton, 2005; Kruger, Jones, Ainsworth, & Kohl, 2007; Abu-Omar & Robine, 2004).

In AI/AN samples, a positive association has been found between physical activity and overall health (Coble & Rhodes, 2006). Furthermore, a number of studies in AI communities have shown a negative association between physical activity and BMI (e.g. Whitt, DuBose, Ainsworth, & Tudor-Locke 2004; Esparza et al., 2000). Whitmer, Hensel, Holck, Ammerman, and Will (2004) have also reported that a 12-week physical activity program significantly reduced cardiovascular risk in AN women. Additionally, research evidence suggests that physical activity in AI/ANs is strongly influenced by social support. Specifically, Thompson, Wolfe, Wilson, Pardilla, and Perez (2003) reported that those AI participants who knew people who exercised were 5 times more likely to engage in some form of physical activity than those who did not. Conversely, lack of social support has been perceived by AI women to be the greatest barrier to the increase in physical activity levels (Heesch, Brown, & Blanton, 2000).

These findings suggest multiple relationships between physical activity, HR-QOL measures, and behavioral health risks (i.e. cigarette smoking, excess alcohol consumption, high BMI). Yet comprehensive multivariate modeling of such relationships in AI/AN populations is not routinely found in research literature. Investigation of such associations in AI/AN populations can help direct public health initiatives in respective communities by focusing efforts on attenuation of specific risks and promotion of specific health behaviors. The purpose of the present study was, thus, to explore these relationships in an AI sample using personal interviews as a method of data collection. Most previous studies on health disparities in AI populations relied on combined responses from several years of BRFSS administration over the phone (e.g., Denny & Holtzman, 1999; Denny, Holtzman, & Cobb, 2003). Telephone-based survey procedures may underestimate behavioral risk factors and health problems because of selection bias, especially in ethnic minority samples residing in ethnic communities and tribal/reservation areas (Pearson, Cheadle, Wagner, Tonsberg, & Psaty 1994; Giulino et al., 1998; Donovan, Holman, Corti, & Jalleh, 1997). Additionally, the great cultural diversity of the U.S AI/AN population (there are 562 federally recognized tribes and numerous tribes not recognized by the U.S. government) can lead to inaccuracies when health data are reported in aggregate for AI/ANs from different regions.

METHOD

Participants and Sampling Procedures

A convenience sample, consisting of members of four AI tribal communities located on the Northern Plains of the U.S. (mostly North Dakota territory), participated in the present study. The study was approved by the Institutional Review Board of the University of North Dakota and the governing councils of the participating tribes. Each tribe retained ownership of its data; however, the researchers were allowed to use the data in aggregate format for report and publication purposes.

The estimated adult population of the area surveyed was 13,061 (North Dakota Indian Affairs Commission, 2005; U.S. Census Bureau, 2000). Thus, to obtain a representative sample sensitive to effect sizes of small-to-medium magnitude with the minimal power of .80, a 95% confidence level and a 5% error rate, we needed to recruit 400 participants (see the Statistical Analyses section for more information). Housing officials from each participating tribal group provided lists of tribal members' addresses within their respective geographical areas (i.e., reservations or, in one case, an Indian Health Service Area). These lists are constantly updated and maintained by tribal governments to provide information that is as accurate as possible regarding current residences of tribal members. Stratified random sampling was used to select 125 household addresses from each of the four tribal communities. Only one adult (18 years or older) in each household was eligible for inclusion in this study, so in households with more than one adult, the adult with the most recent birthday was invited to participate. Members from each of the four participating tribal communities were trained as interviewers by the project senior researchers on the premises of the School of Medicine and Health Sciences at the University of North Dakota, and interviewing was completed between February and December 2004.

Interviewers administered a computer-assisted personal interview to survey participants, who volunteered to participate and signed a corresponding consent form. Upon completion of the survey, all participating households were given $30 gift cards. All interviews were conducted one-on-one in English in the participants' homes. To the knowledge of the researchers none of the participants reported English language proficiency problems. A total of 404 participants completed the interview in its entirety. There were no incomplete interviews. Ten participants declined to participate and 86 households were considered unresponsive after three attempts to contact their members. Using the conservative method recommended by the Council of American Survey Research Organizations (American Association for Public Opinion Research, 2008), the response rate was 80.8%.

Instrument

The current study used the 2003 version of the BRFSS survey, administered in its entirety with all core sections and optional modules, and without any modifications to either the question language or question order (CDC, 2007). Questionnaire Programming Language (QPL) software version 4.1 (Dooley, 1999) was used to format the BRFSS survey as a computer-assisted personal interview, which was then installed on laptop computers used by the interviewers.

Criterion measures

Consistent with CDC recommendations (1994) five criterion variables based on four BRFSS questions related to HR-QOL were used in the study:

- *Overall health* ratings (excellent, very good, good, fair, and poor). This variable was based on the question "Would you say that in general your health is excellent, very good, good, fair, or poor?"
- *Unhealthy physical days* (number of days in the past month on which the participants' physical health was not good). This variable was based on the question "Now thinking about your physical health, which includes physical illness and injury, for how many days during the past 30 days was your physical health not good?"
- *Unhealthy mental days* (number of days in the past month on which the respondents' mental health was not good). This variable was based on the question "Now thinking about your mental health, which includes stress, depression, and problems with emotions, for how many days during the past 30 days was your mental health not good?"
- *Activity limitation days* (number of days in the past month on which the participants' poor physical or mental health interfered with their regular daily activities). This variable was based on the question "During the past 30 days, for about how many days did your poor physical or mental health keep you from doing your usual activities such as self-care, work, or recreation?"

- *Good health days* (GHD: number of days in the past month on which the respondents' overall health was good). This last variable is derived by subtracting the sum of "not good" physical health days and "not good" mental health days from 30 days, with the restriction that the number of GHDs cannot be less than zero (CDC, 1994). The BRFSS findings showed that the GHD index can identify differences in reported good health among population subgroups and in relation to key factors (e.g., annual household income, education).

Predictor Measures

Behavioral Health Risks

For the purposes of the present study, behavioral health risks were defined as behaviors and conditions that are linked with the leading causes of death—heart disease, cancer, stroke, diabetes, and injury—and with other important health issues. Cigarette smoking, as a behavioral health risk, included the following categories: *current smokers* (those who reported having smoked at least 100 cigarettes in their lifetime and now smoke either every day or some days), *never-smokers* (those who reported they had not smoked 100 cigarettes in their lifetime) and *former smokers* (those who reported having smoked at least 100 cigarettes in their lifetime and currently do not smoke).

Alcohol consumption categories included *unhealthy use* (those either at risk for binge drinking, defined as 5 or more drinks on at least one occasion in the past 30 days, or heavy alcohol use, defined as 3 or more drinks per day for men and 2 or more drinks per day for women in the past 30 days), *abstinence* (those who did not have an alcoholic beverage within the 30-day period preceding the interview), and *healthy use* (those whose alcohol consumption during the 30 days preceding the interview was within healthy limits, defined as 1-2 drinks per day for men and 1 drink per day for women).

Body Mass Index (BMI) was used in the analysis as a continuous predictor variable with raw BMI values listed for each participant.

Disease conditions

Presence of a disease condition included the following categories: *those who had one disease condition* (arthritis, diabetes, asthma, coronary heart disease, previous heart attack or stroke), *those who had two or more of the above disease conditions; those who were at risk for a disease* (reported elevated blood cholesterol or blood pressure)*;* or *those reporting no disease condition or risk*.

Healthy behaviors

In this study, healthy behaviors were defined as behaviors associated with reduced risk for many diseases, including the three leading causes of death: heart disease, cancer, and stroke. Physical activity, as a healthy behavior, included the following two categories: those who *met recommendations from the CDC and American College of Sports Medicine (AMCSM) for either moderate* (150 minutes per week: at least 30 minutes 5 times per week) *or vigorous physical activity* (60 minutes per week: at least 20 minutes 3 times per week), and *those who did not fulfill recommendations for either type of physical activity* (Pate et al., 1995). The physical activity questions used in the 2003 version of the BRFSS survey targeted daily moderate physical activity lasting for at least 10 minutes (e.g., brisk walking, bicycling, vacuuming, gardening) and vigorous physical activity lasting for at least 10 minutes (e.g., running, aerobics, heavy yard work). These types of activities are done primarily during leisure time.. To avoid potential misclassification, later that year the CDC recommended adding routine daily activities (which may include those performed at work) into the determination of whether moderate physical activity requirements have been met (Whitt, Levin, Ainsworth, & Dubose, 2003). Thus, the physical activity module was extended to include a question about activities most commonly performed at work. For example, in this study, 25.6% of the employed participants reported "mostly walking" as part of their job. Therefore, participants who did not meet the recommended criteria for either moderate or vigorous physical activity, but reported mostly walking at work, were assigned to the category of those who met physical activity requirements. Such assignment was based on the assumption that even 1 hour of walking per day at work 5 times per week would result in 300 minutes of moderate physical activity per week, which is well above the recommended minimum of 150 minutes per week.

Fruit and vegetable consumption included 2 categories: *those who consumed five or more servings of fruits and vegetables per day*, and *those who did not*. Calculation of daily servings was based on 6 questions referring to either daily, weekly, monthly, or yearly consumption of particular types of fruits and vegetables. Within each frequency category (e.g., daily, weekly), the reported number of servings was summed across all 6 questions and divided by a corresponding denominator (e.g., weekly servings were divided by 7). Cumulative daily servings for each frequency category then were summed to obtain the total number of daily servings of fruits and vegetables.

Demographic Variables

Other predictors included in the analyses were demographic variables such as *sex, age, marital status* (non-single, i.e., married or living with a partner, or single, i.e., never married, widowed, divorced, or separated), *education level, annual household income*, and *having a personal doctor/health care provider.*

Statistical Analyses

A series of linear multiple regressions using SPSS 15.0 (SPSS, 2006) was conducted to determine individual relationships of health risk factors, healthy behaviors, and BMI, as well as demographic variables, with each of the five HR-QOL measures. Using GPOWER 3.7 (Faul, Erdfelder, Lang, & Buchner, 2007) we determined that with 12 predictor variables, 404 participants, power of .80 and alpha level of 0.05, an omnibus R^2 test on each dependent measure was sensitive to effect sizes of small-to-medium magnitude ($f^2 = 0.05$).

RESULTS

All demographic, physical, and behavioral characteristics of the sample are presented in Table 1. Approximately 46% of the participants reported suffering from at least one of the surveyed disease conditions, approximately 55% reported being current smokers, 27% consumed alcohol in unhealthy amounts, 52% reported having a personal doctor/health care provider, 48% did not meet recommendations for either moderate or vigorous physical activity, and approximately 82% reported consuming fewer than five servings of fruits and vegetables daily.

Table 1
Descriptive Statistics for Demographic, Health Status, Behavioral, and Health Outcome Variables for American Indian Participants from the Northern Plains of the U.S. (N=404)[1]

Predictor	Percent (n)/ Mean[2]	Standard Error (%)	95% Confidence Interval	
			Lower	Upper
Sex				
Male	36.4 (147)	2.4	31.8	41.2
Female	63.6 (257)	2.4	58.8	68.2
Age	40.38	.80	38.81	41.96
Marital status				
Single	56.1 (226)	2.5	51.2	60.9
Non-single	43.9 (177)	2.5	39.1	48.8
Education				
Less than high school	25.1 (101)	2.2	21.1	29.5
High school graduate/ GED	35.0 (141)	2.4	30.5	39.8
Some college	29.5 (119)	2.3	25.3	34.2
College graduate or higher	10.4 (42)	1.5	7.8	13.8

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Table 1, Continued
Descriptive Statistics for Demographic, Health Status, Behavioral, and Health Outcome Variables for American Indian Participants from the Northern Plains of the U.S. (N=404)[1]

Predictor	Percent (n)/ Mean[2]	Standard Error (%)	95% Confidence Interval	
			Lower	Upper
Annual household income				
Under $15,000	57.7 (226)	2.5	52.7	62.5
$15,000 - $24,999	19.1 (75)	2.0	15.5	23.3
$25,000 - $34,999	7.9 (31)	1.4	5.6	11.0
$35,000 - $49,999	9.7 (38)	1.5	7.1	13.1
Over $50,000	5.6 (22)	1.2	3.7	8.4
BMI	29.98	.31	29.37	30.59
Health status				
No risk or disease	46.0 (186)	2.5	41.2	50.9
High BP or cholesterol	8.4 (34)	1.2	6.1	11.6
One disease condition present	27.5 (111)	2.2	23.3	32.1
Two or more disease conditions present	18.1 (73)	1.9	14.6	22.1
Smoking status				
Never smoker	26.4 (106)	2.2	22.3	30.9
Former smoker	18.9 (76)	2.0	15.4	23.1
Current smoker	54.7 (220)	2.5	49.8	59.6
Personal doctor	52.0 (209)	2.5	47.1	56.9
Alcohol use				
No alcohol in past 30 days	52.4 (206)	2.5	47.5	57.3
Healthy alcohol use in past 30 days	20.6 (81)	2.0	16.9	24.9
Unhealthy alcohol use in past 30 days	27.0 (106)	2.2	22.8	31.6
Physical activity				
Physically active	52.0 (210)	2.5	47.1	56.8
Sedentary	48.0 (194)	2.5	43.2	52.9
Fruits and vegetables				
Does not meet 5+ requirement	81.5 (327)	1.9	77.4	85.1
Meets 5+ requirement	18.5 (74)	1.9	14.9	22.6
Overall health rating	2.93	.06	2.82	3.03
Physically unhealthy days	4.70	.44	3.83	5.57
Mentally unhealthy days	4.92	.47	4.00	5.84
Activity limitation days	3.66	.41	2.86	4.46
Good health days	22.06	.57	20.95	23.17

[1] On some questions data were not available for all 404 participants
[2] Means are reported for continuous variables: age; BMI; overall health rating; and number of physically unhealthy days, mentally unhealthy days, activity limitation days, and good health days.

In general, the sample was composed of middle-aged (mean age = 40), obese individuals (mean BMI = 30) whose health was, on average, "good," who reported approximately 5 days in the 30 days preceding the interview on which their physical health was not good, and an equal number of mentally unhealthy days. On approximately 4 of the preceding 30 days their poor physical and/or mental health imposed limitations on their daily activities, but on approximately 22 days the participants enjoyed good health (see Table 1).

Multiple regression analyses revealed that a model with all 12 predictors accounted for a significant amount of variance on all dependent measures ($p < 0.01$), with multiple correlation coefficients ranging from .29 for mentally unhealthy days (9% of variance explained) to .55 for overall health (30% of variance explained). Collinearity diagnostics did not reveal any apparent multiple collinearity problems, with tolerance values ranging from .65 to .98 and variance inflation factors being close to 1.

Overall Health

The largest portion of variance in the criterion explained by the model was observed for overall health (31% of the total variance explained). Women, older respondents, and those with less education and household income, as well as those with higher BMI and presence of a disease condition, were significantly more likely to report poorer overall health. Physical activity was the only behavioral variable to reach statistical significance ($p = .007$). Those who met the recommendations for weekly moderate or vigorous physical activity were significantly more likely to report better overall health than those who did not. While controlling for other variables, physical activity accounted for approximately 2% of the variance in the overall health measure (partial $r = -.146$; see Table 2 for details).

Table 2
Regression Analysis Summary for Demographic, Health, and Behavioral Variables Predicting Overall Health Ratings[1]

Predictor	Bivariate Correlation	Partial Correlation	Standardized β
Sex	.101	.123	.108*
Age	.343	.155	.161*
Marital status	-.025	.103	.093
Education level	-.264	-.198	-.180*
Annual income	-.227	-.149	-.143*
Health status	.395	.244	.259*

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Table 2
Regression Analysis Summary for Demographic, Health, and Behavioral Variables Predicting Overall Health Ratings[1]

Predictor	Bivariate Correlation	Partial Correlation	Standardized β
Body Mass Index	.234	.174	.153*
Smoking status	.054	.043	.037
Personal doctor	.086	-.019	-.017
Alcohol use	-.072	.027	.025
Physical activity	-.199	-.146	-.127*
Fruits and vegetables	.007	-.005	-.004

[1] $R^2 = .31$ ($p < .01$)
* $p < .05$

Physically Unhealthy Days

The full model accounted for 15% of the variance in the physically unhealthy days variable. Those indicating presence of a disease condition or a health risk and those who reported having a personal doctor/health care provider were significantly more likely to report a greater number of days in the 30 days preceding the interview when their health was not good. None of the other demographic or behavioral variables in the model were significant (see Table 3).

Table 3
Regression Analysis Summary for Demographic, Health, and Behavioral Variables Predicting Number of Physically Unhealthy Days in Past 30 Days[1]

Predictor	Bivariate Correlation	Partial Correlation	Standardized β
Sex	.003	-.032	-.031
Age	.241	.073	.083
Marital status	-.086	-.024	-.024
Education level	-.143	-.097	-.096
Annual income	-.130	-.068	-.071
Health status	.275	.131	.151*
Body Mass Index	.149	.082	.079
Smoking status	.033	.049	.047
Personal doctor	.220	.164	.166*
Alcohol use	-.108	-.022	-.023
Physical activity	-.119	-.077	-.074
Fruits and vegetables	.077	.050	.047

[1] $R^2 = .15$ ($p < .01$)
* $p < .05$

Mentally Unhealthy Days

Approximately 9% of the variance in the mentally unhealthy days variable was explained by the predictors included in the model. Female respondents, and respondents having a personal physician/health care provider, were significantly more likely to report a greater number of mentally unhealthy days during the 30-day period preceding the interview. Greater income, on the other hand, was associated with significantly better perceived mental health. Regular physical activity was the only behavioral variable associated with significantly fewer days on which the respondents thought that their mental health was not good. It accounted for approximately 2.5% of the variance in the dependent variable, providing the largest contribution to the prediction equation (see Table 4 for details).

Table 4
Regression Analysis Summary for Demographic, Health, and Behavioral Variables Predicting Number of Mentally Unhealthy Days in Past 30 Days[1]

Predictor	Bivariate Correlation	Partial Correlation	Standardized β
Sex	.142	.111	.112*
Age	.069	.003	.003
Marital status	-.053	.014	.015
Education level	-.062	-.008	-.008
Annual income	-.166	-.120	-.131*
Health status	.093	.030	.036
Body Mass Index	.077	.058	.058
Smoking status	.021	-.010	-.010
Personal doctor	.139	.110	.114
Alcohol use	-.035	.025	.027
Physical activity	-.163	-.158	-.158*
Fruits and vegetables	.016	.014	.014

[1] $R^2 = .09$ ($p < .01$)
* $p < .05$

Activity Limitation Days

A greater number of days on which poor physical or mental health interfered with the respondents' daily activities were predicted by the presence of a disease condition/health risk, lower annual household income, and presence of a personal doctor/health care provider. Nevertheless, if participants met the recommendations for either moderate or vigorous physical activity, they were

significantly more likely to report fewer days of activity limitation in the 30-day period preceding the interview. Physical activity again provided the greatest contribution to the explanation of the variance in the criterion, accounting for 3.6% of the variance, compared with 15% of the variance explained by the entire model (see Table 5).

Table 5
Regression Analysis Summary for Demographic, Health, and Behavioral Variables Predicting Number of Activity Limitation Days in Past 30 Days[1]

Predictor	Bivariate Correlation	Partial Correlation	Standardized β
Sex	.032	-.008	-.007
Age	.142	-.001	-.001
Marital status	-.063	.006	.006
Education level	-.106	-.048	-.047
Annual income	-.164	-.109	-.115*
Health status	.207	.111	.128
Body Mass Index	.144	.093	.090
Smoking status	.082	.060	.058
Personal doctor	.216	.195	.198*
Alcohol use	-.044	.021	.022
Physical activity	-.212	-.192	-.186
Fruits and vegetables	-.002	-.018	-.017

[1] $R^2 = .15$ ($p < .01$)

* $p < .05$

Good Health Days

The overall model was effective in explaining approximately 13% of the variance in the variable associated with days on which the participants were considered to be in good health. Presence of a personal doctor/health care provider, higher BMI, and lower annual household income were associated with significantly fewer good health days. Those participants who did meet the recommendations for either moderate or vigorous physical activity were, again, significantly more likely to enjoy a greater number of good health days than those who did not. Physical activity accounted for approximately 1.4% of the overall variance in the dependent variable (see Table 6).

Table 6
Regression Analysis Summary for Demographic, Health, and Behavioral Variables Predicting Number of Good Health Days in Past 30 Days

Predictor	Bivariate Correlation	Partial Correlation	Standardized β
Sex	-.103	-.068	-.067
Age	-.151	-.024	-.028
Marital status	.073	-.002	-.002
Education level	.105	.047	.047
Annual income	.183	.124	.133
Health status	-.202	-.094	-.110
Body Mass Index	-.159	-.114	-.112*
Smoking status	-.050	-.042	-.041
Personal doctor	-.192	-.142	-.144*
Alcohol use	.073	.000	.000
Physical activity	.142	.117	.113*
Fruits and vegetables	-.036	-.023	-.022

[1] $R^2 = .13$ ($p < .01$)

* $p < .05$

DISCUSSION

The findings of poorer outcomes on HR-QOL measures associated with sex, annual household income, age, and BMI are not unexpected and are consistent with previously reported findings from the CDC (CDC, 1994; Zahran et al., 2005). Several findings warrant further discussion, including the absence of significant self-reported HR-QOL deterioration associated with either unhealthy alcohol or tobacco use, poorer HR-QOL outcomes in persons having a personal doctor/health care provider, and the apparent prominence of physical activity in contributing to perceived good health.

The lack of significant associations between smoking status and any of the HR-QOL measures could be explained, in part, by the absence of questions in the 2003 BRFSS version that assess smoking intensity. A previous CDC report indicated that a significant negative relationship between good health days and smoking status was observed only for persons who reported smoking 20 or more cigarettes per day (CDC, 1994). Similarly, Laaksonen et al. (2006) found that heavy smokers (defined as those smoking 20 or more cigarettes per day) reported poorer overall, physical, and mental health than either non-smokers or moderate smokers. Studies of mortality have likewise shown a dose-response relationship with the amount of smoking (Doll, Peto, Boreham, & Sutherland, 2004). Nevertheless, in 2001 the CDC shortened the BRFSS Tobacco Use module by excluding (among others) questions that addressed the number of cigarettes smoked per day, and subsequent versions of the instrument no longer contained such questions (CDC, 2008). While this modification may be

warranted by an observed downward trend in cigarette smoking in the general population (CDC, 2005), questions assessing daily quantities of smoked cigarettes may be informative for researchers targeting subpopulations with higher prevalence of tobacco use (e.g., some AI/AN communities).

Furthermore, Hodge and Struthers (2006) reported tolerant attitudes toward and low perceived risk from cigarette smoking, as well as partiality and ritualistic behaviors associated with tobacco use among Northern Plains AIs. In combination, these factors may contribute to low perceived harmful effects of tobacco use on HR-QOL measures in our AI sample.

When assessing alcohol consumption, it may be important to distinguish between lifetime abstinence and non-current alcohol use, as the latter has been linked to the poorest self-reported physical and mental health, possibly due to prior unhealthy alcohol history (Stranges et al., 2006). In this study, we were unable to distinguish between the two groups, as the BRFSS questions addressing alcohol intake only referred to the 30 days preceding the interview. Independent sample *t*-tests between abstainers ($n = 206$) and problem drinkers ($n = 106$) in our sample revealed that problem drinkers reported better perceived health on virtually all HR-QOL measures. These differences reached statistical significance (alpha = 0.05) for measures of physical health and good health days. Consistent with the findings of Stranges et al., it is thus possible that the majority of the 30-day abstainers in this study were not lifetime abstainers.

Consumption of five or more servings of fruits and vegetables per day in the 30 days preceding the interview also did not have any apparent association with any of the HR-QOL variables. However, it is highly unlikely that compliance with the minimum recommended daily intake of fruits and vegetables in the preceding month could result in significant short-term benefits on self-reported measures of health. Thus, a more extended period of surveillance, covered by an appropriate question in the survey, may be necessary to detect any significant self-reported changes on these measures.

In this study, presence of a personal doctor/health care provider was associated with a significantly greater number of physically and mentally unhealthy days and activity limitation days, as well as fewer good health days. These results contradict the findings of Zahran et al. (2005), who reported poorer HR-QOL outcomes in the general population for those without health insurance and/or a personal doctor/health care provider. All respondents in the present study had free access to Indian Health Service (IHS) care, which generally addresses more acute and emergent conditions. Zuckerman, Haley, Roubideaux, and Lillie-Blanton (2004) reported that AI/ANs with only IHS coverage were significantly less likely than insured Whites to have had preventive services. AI/ANs in Zuckerman et al.'s study were also less likely than Whites to use basic medical care, including health professional/doctor visits, and were significantly more likely to visit an emergency room. Thus, those AI/ANs in Zuckerman et al.'s study who reported having a personal doctor/health care

provider may have been more likely to suffer from a chronic physical or mental condition than those who did not. Consistent with this assumption, in our sample those participants who reported having a personal doctor/health care provider were significantly more likely to have one or more chronic medical conditions or health risks ($\chi = 9.85$, $p < .01$).

The only behavioral variable to reach statistical significance in predicting HR-QOL was sufficient weekly physical activity. This finding is particularly robust in view of the fact that, in our model, we controlled for underlying reported chronic illness and BMI, the two factors that have been found to predict a decline in physical activity levels in AIs (Fischer, Bialek, Homan, Livingston, & McMahon, 1999).

The results are consistent with the findings of Kruger et al. (2007) who showed an inverse relationship between physical activity levels and poor HR-QOL outcomes regardless of BMI and age group. Additionally, Phillips and Blanton (2005) found that after controlling for age, sex, health care coverage, education, income, ethnicity, BMI, diabetes, and arthritis, those individuals who did not report any type of leisure-time physical activity in the 2003 BRFSS data set for Texas were twice as likely to report fair or poor overall health than those who reported exercising in their leisure time. Similar findings were observed in national samples of countries within the European Union that were surveyed using the International Physical Activity Questionnaire (Abu-Omar & Robine, 2004). The results indicated a positive relationship between physical activity and self-rated overall health.

The positive effect of physical activity on HR-QOL measures may be of particular significance considering that the participants in this study reported a higher prevalence of obesity (49.4%), diabetes (13.8%), and coronary heart disease (6.6%) than were observed in the general population in North Dakota in 2004 and 2005 (24.6%, 5.9%, and 4.3%, respectively; Holm, Vogeltanz-Holm, Poltavski, & McDonald, 2010). Since the benefits of physical activity for the above conditions have been well established both in the general population and in AI populations (Imperatore, Cheng, Williams, Fulton, & Gregg, 2006; Irwin et al. 2000; Whitt et al., 2003; Yurgalevitch et al., 1998), promotion of physical activity in AI communities should become an important and urgent public health initiative. Moreover, according to the U.S. Department of Health and Human Services (2000), 46% of AIs report no leisure time physical activity, compared to 38% of their non-minority counterparts; similarly, in our sample, 48% of the respondents were classified as sedentary despite the inclusion of walking at work in the activity definition (see Table 1). This disparity mandates further emphasis on promotion of physical activity in this minority group.

However, research evidence suggests that there are multiple barriers to increasing regular physical activity in AI communities, some of which may be environmental or culture-specific. For instance, in one survey, Lakota adults residing on reservations in South Dakota identified fear of

traffic while walking, lack of childcare facilities while exercising, and safety concerns associated with snake and dog attacks during outdoor physical activities, as well as social stigma (e.g., being teased by others for exercising), as some of the barriers preventing them from engaging in physical activity. In addition, they also identified more general barriers, such as lack of time, lack of willpower or motivation, and inclement weather (Harnack, Story, & Rock, 1999). Negative social stigma associated with physical activity in some AI communities may be related to perceptions of exercise as something done during leisure time outside of one's home and family responsibilities—something that was found to be incompatible with the lives of many AI women in a study by Tudor-Locke et al. (2003).

Thus, health promotion initiatives targeting physical activity for AIs should be community and culture-specific and should address both educational aspects of activity promotion (which may be necessary to counteract possible negative perceptions of exercise) and environmental limitations (e.g., opening of community centers, creation of outdoor walking trails, and either development of family-oriented physical activity programs or provision of child care for adults who are willing to exercise). Additionally, evaluation of physical activity should not necessarily be restricted to leisure-time activity only, and the very word 'leisure' could either be avoided altogether or be replaced by a more culturally acceptable term or phrase.

LIMITATIONS

These results must be considered in the context of certain limitations. First, our entire model was able to explain only a small portion of the variance on all HR-QOL measures, with physical activity accounting for only 3% of the variance at best. Other factors that were not included in the model may potentially be better predictors of HR-QOL outcomes than physical activity. For example, despite the fact that we administered the 2003 version of the BRFSS survey in its entirety, including optional modules, the survey contains questions about a limited number of physical conditions (e.g., diabetes, hypertension, hyperlipidemia, asthma, arthritis, cardiovascular disease, heart attack and stroke, HIV/AIDs). Other disease conditions not mentioned in the survey—including psychiatric disorders—may also affect HR-QOL measures. For instance, chronic liver disease, chronic kidney disease, certain types of cancer, substance abuse, sleep disorders, and depression significantly contribute to morbidity and mortality in AI/AN populations (Fischer et al., 2009; Jolly et al. 2008; Weir, Jim, Marrett, & Fairley, 2008; CDC 2008; Froese et al., 2008), and may thus affect scores on HR-QOL measures. Yet, the instrument did not contain specific questions pertaining to these conditions, and the authors did not screen participants for any psychiatric or cognitive disorders.

Second, the purpose of this study was to address health disparities faced by AIs residing in rural Northern Plains tribal communities; as such, the results do not address health disparities among AI/ANs living in non-reservation communities or other parts of the U.S. For example, the prevalence of cigarette smoking in southwest tribes has been reported to be less than half the prevalence found in northern plains tribes (Denny et al., 2003).

Finally, self-reported information can reflect various recall biases and a tendency toward socially acceptable/favorable answers; however, some studies have found self-report to be a reliable means of gathering data about the prevalence of some health concerns and behavioral risk factors assessed in this study, i.e., cardiovascular diseases, diabetes, hypertension, and cigarette smoking (Jackson, Jatulis, & Fortmann, 1992; Kehoe, Wu, Leske, & Chylack, 1994; Martin, Leff, Calonge, Garrett, & Nelson, 2000). In addition, the degree of error in assessing one's health based on self-reports may be influenced by cultural differences. Garroutte, Sarkisian, Arguelles, Goldberg, and Buchwald (2006) reported that older AI respondents perceived their overall health to be worse than their health providers did in 40% of cases, whereas in the general population the trend seems to be reversed, with older patients perceiving their health to be better than their providers do. The researchers further noted that the discrepancy was significantly related to the degree of majority-culture acculturation, with higher acculturation scores corresponding to less discordant overall health ratings.

Nevertheless, gathering self-report information using face-to-face interviewing, as was done in this study, has been shown to be a more effective method than telephone interviewing for rural, socioeconomically deprived participants and/or ethnic minorities; it results in a higher response rate and, perhaps, a greater willingness to reveal negative information (Donovan et al., 1997; Nebot et al., 1994; Aquilino, 1992). Furthermore, Letiecq and Bailey (2004) reported that members of many AI/AN cultures prefer face-to-face interviews to any other form of data collection, including letters, telephone calls, or e-mails.

Research evaluating health behaviors in AI/ANs is nascent at best. More studies are needed to investigate relationships of various health behaviors (including physical activity and nutrition), health risks, and demographic characteristics to health outcomes and HR-QOL measures. Administration of standardized surveys such as the BRFSS or the National Health and Nutrition Examination Survey to AI/ANs may be informative, but these instruments may require some modification to be more culturally appropriate and more sensitive to a particular research topic.

CONCLUSION

Overall, the study showed that, even in the presence of adverse socio-demographic (e.g., low income, low education level, older age), physical (e.g., high BMI, presence of one or more disease conditions) and behavioral (e.g., cigarette smoking, alcohol consumption, poor nutrition) factors, regular physical activity may still exert a positive influence on most HR-QOL measures. Northern Plains AIs may significantly improve their quality of life by increasing their participation in any type of physical activity to at least the level currently recommended by the CDC and the American College of Sports Medicine (Pate et al., 1995).

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URBAN INDIAN VOICES: A COMMUNITY-BASED PARTICIPATORY RESEARCH HEALTH AND NEEDS ASSESSMENT

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Abstract: This community-based participatory research (CBPR) project utilized a mixed-methods survey design to identify urban (Tulsa, OK) American Indian (AI) strengths and needs. Six hundred fifty AIs (550 adults and 100 youth) were surveyed regarding their attitudes and beliefs about their community. These results were used in conjunction with other community research efforts to inform program development, support proposals for external funding, and develop a comprehensive service system model to be implemented in the community.

INTRODUCTION

As a result of social inequalities, high poverty and unemployment rates, disparities in healthcare access and utilization, and cultural/historical trauma, urban American Indians (AIs), who make up 45% to 67% of the total AI population (Grant & Brown, 2003; Urban Indian Health Institute, 2007), face a host of physical and mental health concerns (Urban Indian Health Institute, 2004). More AIs experience serious mental illness, commit suicide, and report mental distress than do members of any other racial group, and they do so at twice the rate of the general population (Harvard Project on American Indian Economic Development, 2004; Grant & Brown). A multitude of challenges threaten AI youth in particular. According to the Harvard Project on American Indian Economic Development, Native youth are 60% more likely than their non-Native peers to get into fights at school. They also are more likely to drink heavily, abuse drugs, and attempt suicide. They have disproportionate arrest rates, as well as a teen birth rate 50% higher than that of non-Native youth (Harvard Project on American Indian Economic Development).

AI communities frequently use needs assessments to evaluate current health, mental health, and community needs and to gain empirical data for program development and external funding support to address these needs. A special issue of *American Indian and Alaska Native Mental Health Research* presented several examples of needs assessments from Native communities around the country (Manson, 1999). The community needs assessment discussed here, which represents findings from one site funded through the Circles of Care Initiative (Manson, 2004), complements this earlier work. We hope that this project might serve as a model for other AI community needs assessments and research partnerships, particularly in urban settings.

ORGANIZATIONAL OVERVIEW

Active for over 30 years, Indian Health Care Resource Center of Tulsa, Inc. (IHCRC) is a 501(c)(3) nonprofit, comprehensive health care facility, governed by a local volunteer Board of Trustees, the majority of whom are AI. IHCRC strives to promote quality health care by providing comprehensive culturally appropriate access to comprehensive medical and mental health care. Medical, health education, dental, optometry, behavioral health, chemical dependency, HIV/AIDS prevention, and pharmacy services are provided directly to the Tulsa AI community. Members of any federally recognized tribe and their children under age 18 are eligible to receive care.

IHCRC's service area consists of Tulsa County and contiguous regions—a blend of urban areas and rural communities, substantial portions of which are impoverished as well as medically and socially underserved. According to the 2000 U.S. Census, the AI population within IHCRC's service area numbers 55,722, 41.9% of whom are under age 22 (U.S. Census Bureau, 2002). Most reside within 30 miles of Tulsa. Overall, Tulsa is home to one of the largest urban AI populations in the U.S., with 86,118 AIs living in the metro area, comprising 10.7% of the total population (U.S. Census Bureau). Many AIs in this area live close to affluent communities, but remain functionally isolated from mainstream society because of cultural, economic, social, and educational barriers. They make up a community within a community, a culture within a culture.

The clinic's history highlights its importance as the necessary cultural foundation that would organize and mobilize the Tulsa AI community for decades to come. Prior to the 1950s, most AIs and Alaska Native peoples lived on reservations, in rural towns, or in tribal jurisdictional areas (Fixico, 2000). In the 1950s and 1960s, Congress passed legislation focused on assimilating Indian people into mainstream society. This legislation resulted in the Bureau of Indian Affairs (BIA) Relocation/Employment Assistance Programs, which promised incentives to Native people for leaving impoverished rural areas and moving to cities for jobs and education. Urban Indian leaders soon began to emerge in relocation cities throughout the United States, including Tulsa. These

leaders began organizing to address the issues facing relocated Native people, many of whom found themselves culturally disconnected from their homes, isolated, lonely, and suffering from the effects of city poverty.

The advocacy of these urban Indian leaders resulted in Congressional appropriation of funds for a 1966 pilot project in Rapid City; by the 1970s, Congress had passed the Indian Health Care Improvement Act, leading to the establishment of Urban Indian Health Centers in relocation cities all over the country. IHCRC was founded to address the real need for culturally based health and wellness services for the Tulsa AI community. The clinic has served as more than just a house of physical healing: IHCRC has provided the infrastructure necessary for inter-tribal community connections, community education about health and wellness, and 30 years of advocacy that has built up the spirits, hearts, and minds of the community.

AI Mental Health in Oklahoma

There is a severe lack of culturally sensitive mental health services for AIs in Oklahoma, particularly for youth. IHCRC strives to achieve organizational cultural competence; it is an ongoing developmental process that requires reflection, evaluation, and the ability to change. Cultural competence is particularly challenging because more than 150 different tribes are represented in the Tulsa area, each with different customs, beliefs, languages, and traditional healing practices. However, there are some common factors that tie AI people together, including belief in the Creator and the use of holistic healing processes. The culturally based services at IHCRC reflect this common thread of holistic care for AI people. In addition to comprehensive health and behavioral health services, IHCRC provides community-based cultural programs and services, including Indian youth leadership development; after-school programs about traditional foods, music, dance, and arts; connections to spiritual healing resources for adults suffering from substance addiction; and incorporation of cultural elements into treatment plans for young people suffering from mental illness.

Unfortunately, the state's Department of Mental Health and Substance Abuse has suffered severe funding cuts over the past several years. As a result, mental health and substance abuse services across Oklahoma have been greatly reduced, and service provision is often fragmented and ad hoc. Families, legal authorities, providers, educators, public officials, and community leaders often lack knowledge regarding the problems facing AIs, as well as appropriate treatments, which further limits behavioral health services. Additionally, the social stigma associated with mental health and substance abuse treatment in AI communities negatively affects both referrals

for care and intervention. Other variables known to limit AIs' access to care include cost, lack of transportation, and lack of trust in an often transient and marginally qualified cadre of service providers (Cunningham & Cornelius, 1995).

Circles of Care Program

In September 2005, the Substance Abuse & Mental Health Services Administration (SAMHSA), Center for Mental Health Services Circles of Care program funded the *Strengthening Our Children* project at IHCRC in September 2005; the needs assessment discussed here was a component of this project. The purpose of the *Strengthening Our Children* project was to develop a culturally appropriate service system model for treating children, youth, and their families who are struggling with serious emotional difficulties. In other words, the goal was to expand the provision of mental health services and to create a comprehensive mental health treatment delivery system to fully accommodate the complex, multiple, and ever-changing needs of AI youth and their families. The Circles of Care program supports the overall SAMHSA agenda for transformation of mental health systems through a focus on infrastructure development and service capacity expansion.

IHCRC staff forged a number of partnerships with community agencies and stakeholders to accomplish this goal. To assess the strengths and needs of the Tulsa AI community, IHCRC staff joined with the University of Oklahoma-Tulsa to survey a community sample of adults and youth. This paper presents the results of this community health and needs assessment.

PURPOSE

This paper consists of two parts. First, we describe the results of the community health and needs assessment of AI youth and adults in the greater Tulsa area. The aims of this project were to provide the leadership at IHCRC with important health and community data to inform the development of a comprehensive service system model, enhance the quality of services provided, and support applications for external funding. To achieve these aims, the following community-developed research questions guided the project: (1) What do community members perceive as the greatest social/health problems facing AIs in Tulsa? (2) What wellness and social programs are desired? (3) How connected and safe do AIs feel in the Tulsa community? (4) What strengths does the Tulsa AI community possess? and (5) How do adults and youth differ in their perceptions of problems and needs?

Second, this paper briefly evaluates the process of conducting community-based participatory research (CBPR), including the relationship between the university research partners and the Tulsa AI community. CBPR is a culturally sensitive, collaborative, multi-method research approach

that seeks to include the target community as an equal partner in every phase of the research and to directly translate the findings into interventions and policies (Israel, Schulz, Parker, & Becker, 1998; Viswanathan et al., 2004). This commitment covers the spectrum including research design, implementation, data collection, analysis, and dissemination of results. CBPR was chosen as the research framework for a variety of reasons. For example, all involved felt that it was important to conduct a collaborative, strengths-focused assessment. We aimed to improve the ability of IHCRC and the Tulsa AI community to conduct independent research and evaluation, and to implement interventions based on this research.

METHOD

CBPR

Consistent with the principles of CBPR, IHCRC staff assembled a community advisory board to review and provide input on the research purpose, design, methodology, instrument development, and results. This community advisory board consisted of tribal elders and leaders, parents, youth, IHCRC staff and board members, and other people and local organizations interested in developing programs to support the Tulsa AI community (e.g., police, teachers, social/youth services workers, religious leaders). The community advisory board met monthly and was open to the public. Meetings usually consisted of 15-35 attendees. Public announcements were sent through IHCRC e-mail lists, newsletters, and other AI publications. The meeting were coordinated and facilitated by a community coordinator (funded through the Circles of Care grant) and the IHCRC project director/staff psychologist.

The research for this project followed APA ethical standards (APA, 2002) and was approved by the University of Oklahoma's IRB.

Measures

The community advisory board, IHCRC staff, and the university research partners worked together to develop a telephone script and two surveys—one for adults and one for youth ages 14-19. (Fearing that a long survey would decrease youth participation rates, the community advisory board chose not to ask youth all of the questions that were asked of adult participants.) The team reviewed existing surveys and needs assessments and constructed original items as proposed by community members (e.g., items related to community problems, youth concerns, participation in cultural activities, and feelings of community connection, as well as most of the open-ended items). The surveys went through a number of revisions until all partners agreed on the content.

After data were collected early in the interview process, the community advisory board suggested further revisions to improve the survey, and other questions and response options were added (e.g., "gambling" was added to the section on community problems list, and questions concerning parental involvement were added to the youth survey). Because they were added later, these items were not asked of all respondents and, thus, sample sizes for them were smaller; however, the overall analyses were not significantly affected.

The surveys included information about physical health, behavioral health, wellness, demographics, and community services and supports. Because the youth survey was intentionally kept shorter and several items asked of adults were not asked of youth, we could not compare the two groups on these items. The surveys contained both Likert and open-ended questions, resulting in both quantitative and qualitative data.

Procedure

Participants were recruited in a variety of ways, including letters mailed out to parents through Tulsa Indian Education (a community program providing academic support, resources, and cultural programming for AI public school students and their families), ads placed in AI and tribal newspapers, flyers passed out at area churches and community events, in-person requests at area pow-wows, and in-person requests in the IHCRC waiting room and at the reception desk. We attempted to obtain a representative sample from different regions (by zip code) in the Tulsa area. (In one instance, recruitment letters were inadvertently sent to the incorrect school districts, which probably resulted in low representation from those areas.) As an incentive, participants were offered a $20 gift card to Wal-Mart. Surveys were conducted in an interview format, either via telephone or in person, and took approximately 25 minutes each. A total of 550 adult interviews were conducted: 200 at IHCRC, 78 at area pow-wows, and 272 via telephone. We conducted a total of 100 youth interviews: 15 at area pow-wows and 85 via telephone.

Research from the U.S. Department of Commerce (1999a, b) has shown that AI households fall far below national averages in telephone service and computer/internet access. Thus, although we utilized telephone interviews, we initially recruited participants using the various in-person strategies mentioned above. It has also been noted that, given issues with trust and privacy, AIs tend to prefer in-person contact to the impersonal nature of telephone interviews (Christopher, 2005; Sobeck, 2003). Many participants who completed the survey via telephone were recruited in person at community and cultural events.

RESULTS

Results were presented and discussed at several community advisory board meetings. Comments from these meetings are included in the following discussion.

Demographics and Personal Information

The community advisory board selected several demographic variables to investigate, including age, gender, family indicators (e.g., number of children in home, marital status), income, tribal affiliation, volunteerism, religious indicators (e.g., type of church attended and how frequently), transportation, and telephone access. These variables were chosen because the board believed that this information would provide the most meaningful categories for comparison and for evaluating the representativeness of the sample. The median age of the adult participants was 38.0 years (mean = 40.2; range = 18-83 years), and most had lived in the Tulsa area for quite some time (average = 25.05 years). The mean age of the youth participants was 15.9 years (range = 14-19 years). Of the 100 youth that participated in the survey, 43% were male and 57% were female. A disproportionate number of women were represented in the adult sample (74.2% women vs. 25.8% men). According to the U.S. Census Bureau (2002), the AI population in Tulsa County is composed of 52.1% women and 47.9% men. Community members hypothesized that women are more likely to (a) go to IHCRC, (b) bring their children for medical appointments, and (c) participate in surveys. They also indicated that men may not be able to take time off from work as easily as women because of gender role expectations. (However, members did note a growing impression that AI men are more frequently becoming primary caretakers for their children.)

Of the 350 adult participants not interviewed at IHCRC, 58.5% indicated that they had received care at IHCRC. Overall, 72% of the adults surveyed were familiar with and/or had received services at IHCRC.

Family

Marriage and family status were similar to general 2000 U.S. Census data for Tulsa County (U.S. Census Bureau, 2000). Approximately 53.8% of the sample reported being in a marriage or cohabitating relationship, compared with 52% overall in Tulsa County. A large majority of the participants (85.3%) reported having at least one child, with an average of 2.43 children under age 19. Tulsa County census data (U.S. Census Bureau, 2000) showed that 49.5% of families had children less than 18 years old. (Although the 2000 U.S. Census considered children to be less than 18 years old, the community advisory board selected 19 years of age as the cutoff for youth because its members felt there were a significant number of youth this age still living at home and dependent on their parents or families.) The sample averaged 3.63 total children per family, compared with

3.03 children per family in the general Tulsa County population. This information suggests that the AI households in this sample contained more children (and total people), on average, than Tulsa County households in general. Household members may be extended family such as nephews, nieces, or other community children living in the home.

Tribes

We asked respondents to select a primary tribal affiliation and also to indicate whether they identified with other tribes. In terms of primary tribal affiliation, more than 40 tribes were represented in the adult sample. The majority of the respondents were Creek (30.5%), Cherokee (28.7%), Choctaw (6.9%), and Osage (5.3%)—consistent with the general AI population in Tulsa. Of those responding, 46.4% stated that their ancestry included other tribes. Ninety-two percent of youth respondents were members of a federally recognized tribe; 16 tribes were represented, with Cherokee (33%) and Creek (23%) named by the most respondents. Regarding AI blood, the majority (62.7%) of participants were one half to full-blooded AI, and 44.9% were three quarters to full-blooded AI. This finding suggests that most respondents had a high degree of AI lineage.

Income

Concerning household income, 45.7% of respondents indicated that they earned less than $20,000 per year; 32.5%, between $20,000 and $35,000; and the remaining 21.8%, more than $35,000. U.S. Census (2000) data revealed that the median household income for AIs in Tulsa County was $32,367, and that 703 out of 8,987 total families with children under 18, both Native and non-Native, were below the poverty line in the city of Tulsa.

Telephone and Transportation

When questioned about having a telephone and transportation, 94.9% of the adult respondents reported having a telephone and 87.4%, access to dependable transportation. The number of respondents having a telephone was higher than expected for AI households, and there was no difference in telephone access among those interviewed in person and those interviewed by telephone. Regarding transportation, 13% of the respondents reported they did not have access to dependable transportation. Furthermore, on open-ended questions, many respondents indicated that lack of transportation was a primary obstacle to obtaining health care.

Church attendance

Regarding church attendance, 30.9% responded that they attended frequently; 35.9%, sometimes; and 23.2%, rarely. Only 9.9% responded that they never attended church. Almost half (46.3%) of church attendees stated that they attended an Indian church.

Volunteerism

Among adult respondents, 36.8% stated that they recently performed volunteer work. They mentioned a wide range of volunteer activities, including work with community service agencies, AI activities (e.g., pow-wows, stomp dances), church activities, school programs, providing assistance to elders, and providing general assistance to others. Survey respondents appear to have a relatively high rate of volunteerism, as national surveys indicate that, in general, an average of 26.2% adults volunteer (Corporation for National and Community Service, 2008).

Health, Interest in Wellness Programs, and Youth Issues

This section of the survey inquired about self-reported health status, types of wellness and health programming community members might participate in, and youth perspectives on common activities and parental involvement.

Health

Regarding general health, 61.1% of adults reported being in good to excellent health, while 38.9% indicated poor to fair health (to keep the youth survey short, youth were not asked about health). The community advisory board found this to be a high number of adults reporting poor to fair health, and believe that these results are consistent with the high levels of health problems found among AIs. As is often reported, AIs have higher levels of diabetes, obesity, and cardiovascular disease than the general population (Urban Indian Health Institute, 2004). Fewer than half of survey respondents indicated having medical insurance coverage for themselves (43.6%) or their children (35.3%, although 50.1% reported having Medicaid or Sooner Care for their children).

Wellness programs

Table 1 summarizes the adult respondents' interest in participating in (or making available) a variety of health and wellness programs (to keep the youth survey short, youth were not surveyed about this topic). Respondents were most interested in the following wellness programs: traditional Indian games and activities, Indian youth and family clubs, youth sports teams, and weight management classes.

Table 1
Interest in Wellness Programs[1]

	Type of Program	Mean	SD
1.	Traditional Indian Games & Activities	3.69	0.62
2.	Indian Youth & Family Clubs	3.58	0.72
3.	Youth Sports Teams	3.55	0.76
4.	Weight Managemnt Classes	3.46	0.84
5.	Walking Club	3.35	0.87
6.	Healthy Cooking Classes	3.34	0.88
7.	Aerobic Exercise Classes	3.31	0.87
8.	Nutrition Classes	3.20	0.91
9.	Stretching Classes	3.14	0.92

[1]A rating scale of 1-4 was used, with 1 = *Don't know*, 2 = *No*, 3 = *Maybe*, and 4= *Yes*

Youth issues

Almost half (49%) of youth respondents indicated that they played in school or youth sports leagues. Activities included softball, basketball, volleyball, baseball, track, soccer, football, cheerleading, tennis, boxing, and golf. A majority of youth (55%) indicated that they would like to participate in youth sports leagues outside of school. Many youth (61%) indicated that they would be interested in participating in an Indian youth club or council. Participants also identified Indian dancing, language classes, bead working, ribbon working, and learning more about Indian heritage as activities they wished were available.

Youth were also surveyed about perceived parental involvement; 56.9% reported being satisfied with their parents' level of involvement in their lives, while 10.3% were at least somewhat dissatisfied. Similarly, 57.8% reported wished their parents were at least somewhat more involved with their lives, contrasted with 42.2% who wished their parents were at least somewhat less involved.

AI Strengths

The community advisory board and university research partners desired to assess strengths as well as needs and limitations in the community; therefore, adult and youth participants were asked the following open-ended question: "What are the greatest strengths of American Indians?" Overwhelmingly, community members emphasized Indigenous AI culture, including "Native

rituals," "heritage," "ceremonies," and "tribal ways" as primary strengths. In addition, participants recognized family—"strong family values" and the importance of "closeness among family members." Participants viewed spirituality and religion as important strengths—traditional tribal practices and beliefs as well as Christian ones. Community members noted unity among AIs as a source of pride and resilience. They expressed a sense of "unity," "togetherness," and "solidarity." Finally, the ability to persevere in the face of adversity (e.g., "stubborn," "determined," "willpower") and the pride shown in Native traditions and culture were seen as vital strengths.

Statistical Analyses

The community advisory board wanted to examine the differing views of adults and youth. Therefore, both surveys included the same questions regarding several topics, allowing comparison of responses using a one-way Analysis of Variance (ANOVA). These topics included: attending traditional events, importance of learning culture, likelihood of attending cultural events, life satisfaction, stigma of mental health, safety of neighborhood, connection to Tulsa AI community, and connection to tribal community. Results are provided in Table 2. We also compared adults and youth on their ratings of several social and health issues: poverty, unemployment, public transportation, racism, teen pregnancy, gangs, youth suicide, adult suicide, depression, anxiety, stress, obesity, alcohol abuse, drug abuse, youth tobacco use, diabetes, child abuse or neglect, domestic violence, school dropout rate, bullying at school, learning difficulties, availability of health care, and religious or spiritual problems. Results are provided in Table 3. We computed effect sizes for the adult vs. youth comparisons. The partial eta-squared (η^2) is an effect size index that reflects the proportion of effect and error variance that is attributable to the effect. Another type of effect size is Cohen's d-statistic (Cohen, 1992), which is, essentially, a difference between standardized means.

AI Heritage

We surveyed participants regarding their identification with and participation in traditional or cultural American Indian activities and events; 69.8% of adults and 56.5% of youth indicated that they attended such events at least sometimes. Only about 11.1% of adults and 14.1% of youth reported never attending these events. Seventy-two percent of adults reported that it was very important for their children to learn about traditional AI culture; in contrast, only 52% of youth stated it was very important to them. In another discrepancy between adults and youth, 52% of adults—but merely 28.6% of youth—reported that they would frequently attend intertribal community social activities if they were offered on a regular basis (only 0.9% of adults and 3.1% of youth said they would never attend). Results (see Table 2 for complete statistics) indicated that adults were more likely to support and participate in traditional events, $F(1, 646) = 8.38$, $p = .004$; partial $\eta^2 = .013$. Likewise, adults

responded more positively than youth to questions about the importance of learning traditions, F (1, 632) = 16.53, p = .0001; partial η^2 = .025. Adults also reported higher likelihood of supporting and attending intertribal events than youth, F (1, 638) = 17.18, p = .00004; partial η^2 = .026.

Table 2
Descriptive Statistics: Means, Standard Deviations, Skewness, and Kurtosis

	Overall					Youth			Adult				
	n	Mean	SD	Skewness	Kurtosis	n	Mean	SD	n	Mean	SD	F	d
Attend traditional events	648	2.92	1.01	-0.51	-0.87	99	2.65	0.98	549	2.96	1.01	8.38	0.31
Important to learn traditions	634	3.60	0.66	-1.62	1.99	100	3.36	0.75	534	3.65	0.64	16.53	0.44
Intertribal events	640	3.38	0.69	-0.89	0.42	98	3.11	0.72	542	3.42	0.69	17.18	0.45
Satisfied with life	647	3.26	0.75	-0.78	0.13	100	3.50	0.64	547	3.22	0.77	11.91	0.39
Stigma to mental health	646	1.93	0.87	0.58	-0.52	100	2.18	0.69	546	1.88	0.89	10.21	0.35
Safety of neighborhood	643	2.75	0.91	-0.33	-0.67	100	2.97	0.78	543	2.71	0.93	7.18	0.31
Connected to community	637	2.58	0.89	-0.41	-0.62	98	2.55	0.79	539	2.59	0.91	0.16	ns
Connected to tribe	641	2.74	0.98	-0.52	-0.71	98	2.74	0.78	543	2.74	1.02	0.0001	ns

Table 3
Identified Community Problems[1]

Adult Sample	Mean	SD	Youth Sample	Mean	SD
1. Alcohol Abuse	4.42	0.86	1. Alcohol Abuse	3.79	1.18
2. Diabetes	4.35	0.95	2. Drug Abuse	3.62	1.25
3. Obesity/Overweight	4.24	0.97	3. Youth Tobacco Use	3.61	1.21
4. Drug Abuse	4.22	1.04	4. Obesity	3.51	1.09
5. Youth Tobacco Abuse	4.12	1.02	5. Stress	3.46	1.16
6. Stress	4.04	1.06	6. Gangs	3.34	1.30
7. Depression	3.95	1.07	7. Diabetes	3.31	1.34
8. Gambling	3.86	1.10	8. Depression	3.30	1.12
9. Teen Pregnancy	3.84	1.07	9. Teen Pregnancy	3.28	1.30
10. Unemployment	3.80	1.03	10. School Dropout Rate	3.20	1.31

[1]A rating scale of 1-5 was used, with 1 = *Not a problem* and 5 = *A severe problem*

Connection to Community

When asked about their feeling of community connection, 62.2% of adults and 61.2% of youth reported feeling at least somewhat connected to the Tulsa AI community, while 37.8% and 38.7% indicated feeling at least somewhat not connected, respectively. Thirteen percent of adults and 6.1% of youth felt very connected; in contrast, 16.3% of adults and 12.2% of youth felt that they were not connected at all. Moreover, 67.8% of adults and 74.5% of youth felt at least somewhat connected to their specific tribes, while 32.2% and 25.5% reported feeling at least somewhat not connected, respectively. A noteworthy percentage of adults (17.7%) felt that they were not connected at all to their tribe, compared to 10.2% of youth. For each comparison, the more rigorous $\alpha = .025$ criterion for level of statistical significance resulted in the same set of conclusions as the conventional .05 criterion. However, none of these comparisons were statistically different; i.e., adults and youth did not differ statistically in their reported feelings of connection with the greater AI community or their specific tribe.

Adult participants listed a number of important qualities when asked the open-ended question (youth were not asked): "What do you think a caring community should look like?" First, respondents said a caring community should be "cohesive and collaborative." Members should "work and play well together" and "support one another." Second, a caring community should "take great care of its environment including parks, streets, and neighborhoods," which should be "clean and attractive to residents and guests alike." Third, this community should be "welcoming, warm, respectful, and promote happiness among its members." Fourth, a caring community should have plentiful programs and services for children, families, and those in need. These include outreach programs, recreational facilities, counseling, after-school programs, adequate and accessible health care, elder care, and money for things like funerals. Fifth, a caring community would reflect a high level of AI cultural awareness, respect differences, and provide equal opportunities for everyone. Finally, respondents stated that a caring community should be safe and relatively free from violence, drugs, and violations of property and person.

Safety and Well-being

We surveyed participants as to their perceptions of community safety and their levels of life satisfaction. Participants were asked to rate the perceived safety of their neighborhoods. Most adults (62.2%) rated their neighborhood safety as good to excellent, while 12.2% perceived it as poor. In contrast, 74.4% of youth perceived their neighborhood as safe, and only 3% thought the level of safety was poor. Scores on questions about neighborhood safety were higher among youth than among adults, $F(1, 641) = 7.18$, $p = .008$; partial $\eta^2 = .011$. In other words, youth perceived greater levels of safety and security in their neighborhoods than adults did.

In terms of life satisfaction, 40.2% of adults and 57% of youth reported being very satisfied with their lives right now. Conversely, 2.4% and 1% reported being very dissatisfied with their lives, respectively. Higher scores were recorded from youth than from adults on questions pertaining to life satisfaction, $F(1, 645) = 11.91$, $p = .001$; partial $\eta^2 = .018$.

Perspectives on Mental Health

Regarding mental health, 41.8% of adults indicated that there is stigma attached to seeking mental health care (33.5% said there was no such stigma, and 24.7% were unsure). In contrast, only 12% of youth reported perceiving such a stigma (62% did not, and 26% were unsure). Overall, youth reported less stigma regarding mental health than adults, $F(1, 644) = 10.21$, $p = .001$; partial $\eta^2 = .016$. When asked why the stigma exists, adults reported concerns about being labeled or stigmatized, being thought crazy or weak, and being ashamed of their problems; they also mentioned cultural reasons (e.g., taboo, belief that AIs are private people). Youth thought that the stigma exists because of the "shame" involved and "people's pride." Perceived causes of mental health problems included, for adults, "substance abuse," "stress/coping issues, "family background," poverty/unemployment, and health issues (e.g., "awareness of shorter life span," "problems with weight and diabetes"), and, for youth, "substance abuse," "parents," and "health issues."

Identified Community Problems and Needs

Interviewers queried AI adult and youth participants regarding their ratings of 24 possible problems. Table 3 lists the top ten problems identified by the participants in rank order by the mean rating (1 = *not a problem* to 5 = *a severe problem*). Statistically significant differences between youth and adult responses were noted on all social issues except racism, gangs, and religious or spiritual problems. Adults reported higher scores on all issues; that is, adults were more likely than youth to view each of the issues as a problem.

Participants were also asked, in open-ended question format, "What do you think are the biggest problems faced by AIs who live in the Tulsa area?" The results were similar to the ranked list above. Adults and youth reported the following categories, ranked in order of descending frequency: Substance Use/Abuse (e.g., "Alcohol is still our biggest problem"), Lack of Tribal Services/Resources (e.g., "There is no regional office for my tribe in Tulsa," "We need more activities for kids and food for families"), Unemployment/Poverty (e.g., "It is very difficult to find a job, especially if you are Native"), Health Issues (e.g., "We need more clinics and better clinics," "Diabetes and obesity are major problems"), Lack of Education (e.g., "Poor education for Indian folks"), Lack of Indian Culture/Education (e.g., "Lack of Native language," "Kids don't have enough educational places to learn about their heritage"), Lack of Community Involvement and Leadership (e.g., "Indians

don't communicate," "Lack of connectedness among tribes"), and Racism/Prejudice/Discrimination (e.g., "People think we're drunks and we steal," "They think that we're savages," "I've been called a squaw").

DISCUSSION

One of the primary purposes of the study was to identify community health and well-being needs that could then be addressed through program and community development. The following sections highlight the most pertinent areas for program development and intervention according to the participants surveyed.

Substance Abuse

Participants consistently listed drug and alcohol abuse as the most serious problem (see Table 3). Some community members noted that this perception may be the result of a perpetual stereotype, as AIs and non-AIs alike continue to perpetuate the myth that AIs have a higher prevalence of drinking than the general population (May, 1994). According to May, however, the evidence shows a different picture: Prevalence of drinking varies widely among tribes and communities. The research evidence suggests there are higher rates of binge drinking among AIs who drink, but not a higher prevalence of drinking overall (May). The fact remains, however, that participants viewed substance abuse as a major threat to community and individual health. Participants reported that substance abuse treatment and counseling was one of the most needed community services.

Health issues

Diabetes and obesity were reported as the most problematic health issues for AIs (see Table 3), and it appears that programs targeting prevention and treatment of these issues are warranted. Of course, access to health care must also be addressed. A number of respondents noted that there was a lack of health care services and insurance in the Tulsa area, and that increased health services and improved health care were the highest priorities for the community.

Mental health issues

Although the adult community sample was divided on whether there is stigma attached to seeking mental health care, participants agreed that stress and depression were serious problems in the community (see Table 3). Programs designed to address these issues, especially preventive measures, appear to be needed. Indeed, prevention, education, and treatment were noted as highly needed health services in Tulsa. It is unclear why youth and adults had different views on the stigma

attached to mental health care. It may be that youth have not yet developed such a stigma, or their views may represent a change in attitude toward mental health services. This finding could also be an example of "rose-colored glasses" among youth—who, although aware of problems among their peers, may maintain hope that things are not that bad and will improve.

Similarly, we do not know why adults and youth differed on ratings of safety and well-being. It might be that youth have experienced less discrimination and frustration with life than adults have, or youth may differ in their perception of the world, influenced by the so-called "optimism of youth" and the feeling of invulnerability that is common to youth. Perhaps their lives appear improved compared with those of the adults around them, although current rates of poverty, unemployment, and mental health issues cast this idea in doubt.

Socioeconomic issues

Given the high incidence of poverty in the sample and community (almost half earned less than $20,000 per year), and the large number of households with children, it is clear that socioeconomic issues are of paramount importance. Poverty and unemployment were reported as major problems, and many other issues noted by respondents have strong connections with poverty (e.g., depression, lack of transportation, gangs, stress– see Results section and Table 3). For example, many respondents reported that they lacked transportation. Although some community members felt that the severity of this issue might be exaggerated, it is nonetheless a cause for concern. Even those with dependable transportation may not necessarily have had *convenient* transportation (e.g., many had access to a car, but did not have money for travel expenses such as gas, repairs, and inspections). Programs aimed at eliminating poverty and providing assistance for those in poverty are greatly needed.

Cultural issues

The respondents appeared to highly value AI culture and activities focused on promoting it. However, youth demonstrated significantly less participation and interest in traditional Native activities than adults. Community members were concerned about this finding, and believed that programs focused on developing this interest and nurturing the ethnic identity of AI youth were needed. It is encouraging that almost 30% of youth indicated interest in frequently attending intertribal community events, as such activities are the reality of urban Indian communities. Involving youth in planning community activities and integrating traditional events into the framework of youth culture are recommended.

Youth Issues

Community members stressed that they were concerned about several youth issues, including tobacco use, teen pregnancy, and educating youth about Native traditions and culture (see Results section and Table 3). Youth themselves were primarily concerned about drug and alcohol problems among their peers and community.

LIMITATIONS

There are a few notable limitations to this project. First, although we had hoped to achieve a representative sample of AIs from the Tulsa area, there were far more female than male participants. Thus, the findings may not represent the views of AI men. As with most social science and applied research, we were not able to obtain a statistically random sample of participants. We utilized purposive, snowball sampling to recruit participants and offered an incentive for participation. Therefore, our confidence in generalizing the results from this study to all AIs, even in the Tulsa area, is limited. Recruiting this sample took considerable effort on the parts of both the community and university research partners, and we believe it provides meaningful data about community needs and issues. Finally, administration of the survey items was not counterbalanced; thus, the possibility exists that prior items influenced responses to later items. For example, respondents ranked a series of problems first; they then responded to open-ended questions about perceived problems. It is impossible to know whether their rankings influenced their answers to the open-ended questions.

An important component of CBPR is increasing the research capacity of the community. In this vein, project staff adapted a research-training curriculum developed by the Los Angeles urban AI community (directed by Carrie Johnson, PhD) to train AI community members as researchers for the Circles of Care project. The training curriculum included the following modules: History of Research in Indian Country, Institutional Review Boards (Protection of Human Participants Rights), CBPR, Conducting Key Informant Interviews, and Conducting Focus Groups. These community researchers, who were involved in collecting data with project staff, received a total of 8 hours of training: 4 hours in the fall of 2006 and 4 in the spring of 2007. A total of 20 community members (including 7 students from the university and 1 teenager) were trained to conduct research activities. A full-time community coordinator and administrative assistant were also funded through the SAMSHA grant. The community coordinator co-facilitated community advisory board meetings, developed and facilitated community/research events, and served as primary liaison between IHCRC and the Tulsa AI community. The administrative assistant recruited community participants, managed administrative duties, and kept and disseminated records and project information.

THE UNIVERSITY AND TULSA AI COMMUNITY PARTNERSHIP

Both IHCRC staff and the university research partners were eager to work together on the project for several reasons. First, both saw the benefit of combining resources to address health, economic, social, and mental health needs of AIs in Oklahoma. Second, IHCRC staff recognized the benefit of expanding research and evaluation capacity through collaborating with and receiving training from the university research partners. Third, the university research partners realized that developing a collaborative working relationship with IHCRC might increase scholarly understanding of AI issues, build a trusting relationship that could lead to ongoing research and community service projects, and improve recruitment and retention of AI faculty and students.

However, issues soon arose that exposed the challenges of CBPR. First, IHCRC staff asked a non-Native university researcher to assist in conducting the needs assessment. Although the researcher had received training in multicultural theory and social justice, he had only a passing familiarity with CBPR, and first assumed that he should independently develop a survey instrument and utilize university resources (e.g., graduate assistants, students) to collect the data with minimal collaboration with the community—bringing Eurocentric and imperialistic assumptions and practices to the research endeavor. When he learned that IHCRC staff wanted the research to be co-designed and approved by community members, these assumptions caused him some initial frustration, mostly due to his lack of familiarity with CBPR, the increased amount of time needed for completion of the project, and perceived lack of control. However, after the initial misunderstanding, he recognized the automatic, culturally encapsulated assumptions guiding his reactions, actively sought training and education in CBPR and research among AIs, and fully embraced its underlying principles and goals. This change of perspective became helpful when the university legal counsel had some concern regarding intellectual property rights.

As is standard practice, when the university research partners entered into a contractual agreement with IHCRC, the university legal counsel drafted a memorandum of understanding. This initial document awarded all intellectual property rights to the university and its principal investigator (a non-Native researcher). Although universities often use this practice to protect data and publication rights, it directly contradicts the core principles of CBPR (Israel, Schulz, Parker, & Becker, 1998; Viswanathan et al., 2004), which state that the research and its data belong to the community and its members. The university research partners and IHCRC staff agreed that the community and its representatives should have full intellectual property rights and discussed the situation with legal representatives for both parties for 2-3 months, educating the university about CBPR and research with Indigenous populations. It helped that they presented a consolidated

front; in the end, the university legal counsel made provisions in the contract so that the researcher could publish material from the project, in partnership (and with the approval of) IHCRC and the community.

Community-based participatory research projects represent a valuable opportunity for both communities and universities. This project demonstrated a successful partnership that benefitted IHCRC, the university research partners, and the Tulsa AI community in a variety of ways:

University faculty and staff learned about CBPR and community members learned about the research process. Many community members received research training and collaborated in the implementation of the research project. They—and the community advisory board—gained a greater appreciation for research and its usefulness for improving community conditions. They also experienced empowerment (e.g., they negotiated intellectual property rights with the university and claimed ownership of the data), and increased their capacity for evaluating, designing, and implementing research projects for themselves—an important principle of CBPR.

The project provided meaningful information that was disseminated to the community, and increased capacity for an Urban Indian Health Center. In accordance with CBPR principles, the results from this study have been disseminated to the community and beyond. For example, the university research partners and IHCRC project director have presented the results of the project and the CBPR process at national conferences. Also, the university research partners and the community advisory board provided technical reports to community members, posted the results on the IHCRC Web site, and presented the results at community meetings. One community leader expressed the importance of "looking at our data" to improve conditions for the Tulsa AI community. The study results also helped IHCRC prioritize its goals and allocate resources to those areas most needed (e.g., development of substance abuse treatment and prevention and health promotion programs). In addition, important strengths and needs were identified and included as part of a larger research project to develop a comprehensive service system model. This model has been refined and presented to IHCRC and the community, and is currently being implemented and evaluated.

The project served to assist IHCRC with developing an improved system of care and additional programs. For example, IHCRC has successfully obtained three youth/family grants for the next 3-5 years to address cultural traditions, food, physical activity, community gardening, community building, and family/community empowerment (from the Centers for Disease Control, the U.S. Department of Agriculture, and the new Oklahoma Tobacco Settlement Endowment Trust). These programs are designed to teach healthy nutrition and sustainable food production, and involve community members in gardening and communing together. They also include cultural components and activities to emphasize Native beliefs and values.

Additionally, the partnership forged through this study has led to other collaborative research and service projects. For example, IHCRC and university research partners have submitted a proposal to the National Institute of Mental Health to develop a community-based prevention program focused on strengthening cultural identity to prevent substance abuse and mental illness and to promote school functioning and youth assets. Moreover, work is underway to submit a grant proposal the National Institutes of Health to address organ/tissue donation among AIs and to develop a social marketing campaign.

We hope this project will serve other Urban Indian Health Centers in developing and implementing community health research with university partners.

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