

American Indian and Alaska Native Mental Health Research



Volume 20, Issue 2, 2013



**Centers for American Indian
and Alaska Native Health**

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ISSN 1533-7731
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USEFULNESS OF A SURVEY ON UNDERAGE DRINKING IN A RURAL AMERICAN INDIAN COMMUNITY HEALTH CLINIC

David A. Gilder, MD, Juan A. Luna, BS, Jennifer Roberts, BS, RN, Daniel Calac, MD, Joel W. Grube, PhD, Roland S. Moore, PhD, and Cindy L. Ehlers, PhD

Abstract: This study examined the usefulness of a survey on underage drinking in a rural American Indian community health clinic. One hundred ninety-seven youth (90 male, 107 female; age range 8-20 years) were recruited from clinic waiting rooms and through community outreach. The study revealed that the usefulness of the survey was twofold: Survey results could be used by clinic staff to screen for underage drinking and associated problems in youth served by the clinic, and the process of organizing, evaluating, and implementing the survey results accomplished several important goals of community-based participatory research.

INTRODUCTION

In the general U.S. population, underage drinking is associated with significant morbidity and mortality in childhood and adolescence (Hingson, 2009; Hingson, Edwards, Heeren & Rosenbloom, 2009; National Institute on Alcohol Abuse and Alcoholism [NIAAA], 2005). American Indian/Alaska Native (AI/AN) adolescents are at higher risk than other U.S. ethnic minority adolescents for underage drinking and its associated morbidity and mortality (Bachman et al., 1991; Beals et al., 1997; Beauvais, Jumper-Thurman, & Burnside, 2008; Beauvais, Jumper-Thurman, Helm, Plested, & Burnside, 2004; Blum, Harmon, Harris, Bergeinsen, & Resnick, 1992; NIAAA, 2009; Miller, Beauvais, Burnside, & Jumper-Thurman, 2008; Substance Abuse and Mental Health Services Administration [SAMHSA], 2008; Indian Health Service, 2009; Wallace et al., 2003). Furthermore, adolescents living in rural areas may be at higher risk for underage drinking than suburban or urban youth (SAMHSA, 2004). Thus, AI/AN youth living in rural areas may be at higher risk for underage drinking and its associated problems than other U.S. youth.

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INTRODUCTION

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In addition, in the general U.S. population, earlier ages of first use of and intoxication with alcohol have been associated with higher rates of problems in adulthood, including alcohol use disorders and alcohol-related risk behaviors (Grant & Dawson, 1997; Grant, Stinson, & Harford, 2001; Hingson, 2009; Hingson & Zha, 2009; Hingson, Heeren, & Winter, 2006a, 2006b; Hingson, Heeren, & Edwards, 2008). One study of an AI community sample from the same population from which the current study participants were drawn (Ehlers, Slutske, Gilder, Lau, & Wilhelmsen, 2006) showed that earlier ages of first alcohol intoxication were associated with higher rates of alcohol use disorders in adulthood. These findings raise the important question of whether earlier ages of first alcohol intoxication are associated with higher rates alcohol-related problems in youth themselves (prior to reaching adulthood), especially in AI and other high-risk youth. If earlier ages of first intoxication are related to higher risk for alcohol-related problems, then delaying age of first intoxication holds promise for decreasing alcohol-related harm in youth and rates of alcohol use disorders in adulthood.

Given these circumstances, finding ways to assess and intervene against underage drinking in rural AI settings is an important goal. Although primary care clinic screening for youth with psychiatric problems has shortcomings as currently practiced (Kelleher & Gardner, 2009; Ozer et al., 2009), such clinics continue to offer an important venue for information collection and screening, particularly in rural and high-risk minority communities where they may be the only source of medical treatment and health information. Thus, screening in the rural primary care setting is important because this setting offers a point of contact with youth where underage drinking and its associated risk behaviors and problems can be identified and appropriate intervention initiated.

Additionally, screening of adolescent health status in a primary care setting has the potential to build the human and infrastructure capacity of the clinic to promote positive health outcomes effectively in the community at large. Because it generates statistics on specific health issues and risk behaviors in the community served by the clinic, screening establishes a quantitative measure of a health problem that can be used by the community and its health care institutions to assess the importance of the problem, disseminate health information by education and outreach, evaluate alternative interventions against the problem, and measure the efficacy of those interventions. In addition, screening undertaken as part of a research process can promote an entity within the clinic dedicated to ongoing research on the health needs of the community and the translation of findings on those needs to interventions.

In this sense, primary care clinic screening of adolescent health issues can serve as a vehicle for implementing many goals of community-based participatory research (CBPR) for health. To paraphrase Israel and colleagues (2003), CBPR is an approach to health research which equitably involves community members, health care institutions, and researchers in a project to understand

health problems in the unique context of the community and to use that knowledge to improve the health of community members. CBPR emphasizes the importance of local factors in health problems and in health solutions; facilitates collaborative, equitable partnerships in the research process; promotes co-learning and capacity building among all partners; aims to translate research to health intervention/prevention in the community; builds the capacity of the community to engage in further health care research and translation through a cyclical, iterative process in which the partners pursue new research questions and interventions based on their evolving understanding of the health dynamics in the community; disseminates findings to and solicits feedback from all partners; and often represents a long-term commitment by researchers, health care institutions, and the community (Israel et al., 2003).

We report here the results of a survey on underage drinking and associated problems undertaken at a rural AI community health clinic. As noted above, in a previous study (Ehlers et al., 2006) involving retrospective reporting by adults from the same community, earlier ages of first alcohol intoxication were found to be associated with higher rates of alcohol use disorders in adulthood. When feedback from this study was shared with the community, the board of the community health clinic requested assessment of current underage drinking and proposal of a strategy to reduce underage drinking in the reservation population served by the clinic. This paper reports the results of the first phase of the project: assessment of underage drinking in youth served by the clinic.

The goals of this study were to determine whether a survey on underage drinking and associated problems in a rural AI community health clinic is feasible; can yield useful information for further individual and family intervention; can inform further research on individual, family, and community-wide intervention and prevention efforts; and can effectively accomplish many of the goals of CBPR.

METHOD

This study of the usefulness of a survey for underage drinking was conducted as part of a larger project to build the capacity of an AI community health center to assess and implement a program to reduce underage drinking on contiguous Southern California tribal reservations. The capacity-building project is an ongoing collaboration among the AI community health center, The Scripps Research Institute (TSRI), and the Pacific Institute for Research and Evaluation (PIRE). The Institutional Review Board (IRB) representing the nine Southern California tribes included in the study requires that the research team not reveal the name of the health clinic or the names or exact locations of the reservations. For the purposes of this report, the clinic will be called the Southern

California Tribal Health Center (SCTHC). The funding for this study came from NIAAA as part of a grant to assess and reduce underage drinking in rural communities. The protocol for the study was approved by the IRB of PIRE, TSRI, and the IRB representing the nine tribes served by the clinic.

Measure

The research team developed a survey to assess underage drinking in the population of youth served by the clinic, as a preliminary step toward the design and implementation of culturally appropriate individual intervention and community-wide prevention research to study the efficacy of measures to reduce underage drinking. The survey was constructed as a collective effort by scientific advisory personnel at NIAAA and their Rural Underage Drinking Initiative grantees, including the University of Pittsburgh, the SCTHC, TSRI, and PIRE. The Principal Investigator of the project at the SCTHC is a board certified (Internal Medicine, Pediatrics) AI physician. To enhance cultural appropriateness of the survey, the research team solicited input on the design and implementation from a local advisory board made up of reservation elders, community volunteers, clinic administrators, and tribal law enforcement personnel. Several young adult AI research assistants at the SCTHC, including the initial study coordinator (JAL), started working on the project at the beginning of survey construction. They provided valuable input into crafting questions concerning substance use and alcohol problems, so that the items were culturally appropriate and tailored to known specifics about youth drinking on the reservations. The survey included demographics (10 questions); ages of first alcohol drink, first alcohol intoxication, and first drinking ≥ 5 drinks (for boys) or ≥ 4 drinks (for girls) in a 2-hour period (3 questions); past 30-day, past year, and lifetime drinking quantities and frequencies (7 questions); other substance use (8 questions); psychiatric symptoms (4 questions); past year alcohol-related problems and risk behaviors (13 questions); and alcohol availability (13 questions). The full survey is included as Appendix A to this report. All research team members completed the National Institutes of Health human subjects protection training program and a course in research and survey administration organized by TSRI and PIRE study personnel.

Participants

All participants were registered patients at the SCTHC. The SCTHC serves the AI/AN population of San Diego County, which is estimated to be 24,437 individuals (SCTHC, personal communication, January 24, 2013). In 2011, the SCTHC received 4325 unduplicated visits, of which 1301 were from individuals in the age range of 5-19 years. Thus, 30% of unduplicated SCTHC visits were in the approximate age range of the participants in this study (SCTHC, personal communication, January 24, 2013). Participants were recruited from clinic waiting rooms, at

community-wide health fairs, at powwows, and at after-school programs. Children ages 8-12 years verbally assented with written parental consent. Adolescents ages 13-17 years gave written assent with written parental consent. Adults ages 18-20 years gave written informed consent. Prior to providing informed assent and consent, youth and their parents were informed of the nature of the study and were given contact information for the study coordinator in case they had any questions later. Prospective participants were told that, after completion of the survey, they would be given a \$15 gift card to Wal-mart, Target, or Barnes & Noble. Prospective participants were also told that, if at any point they felt uncomfortable answering any question, they could skip that question, and that they could also discontinue their participation in the survey entirely. In either case, the participant would still receive the gift card. The survey was administered by an AI/AN young adult research team member at the clinic in a private room, or at an outside venue using a folding table and chairs in a private area. All survey data were recorded anonymously and subsequently were managed using a coded number unique to each individual. To further safeguard confidentiality, no list linking the participant's name or other unique information with his/her coded number was kept.

Analyses

This report has two aims. The first is to report quantitative information on frequencies of selected alcohol and substance use problems, as well as logistic regression analysis results regarding the association of earlier age of first intoxication with alcohol and substance use problems. The second aim is to report qualitative information on the usefulness of the survey as a vehicle for promoting CBPR, including building the capacity of the SCTHC to intervene to reduce underage drinking in the population that it serves.

To accomplish the first aim, two sets of analyses were undertaken. The first set of analyses determined demographics, age of onset, and frequencies of each use and problem variable. Because there are often significant differences in alcohol-related measures between males and females, frequencies of use and problem variables are reported separately for boys and girls. To determine if there were significant gender differences in use or problem variables, frequencies of dichotomous variables in boys and girls were compared using Fisher exact tests. Continuous variables were compared using the Mann-Whitney test. In these analyses, alpha was set at 0.05, and p values < 0.05 were considered significant. Gender comparisons for dichotomous demographic, alcohol use, and alcohol problem variables where the number of responses in any cell was < 5 are not reported in the tables.

Because alcohol use and problems often increase with age during childhood and adolescence, and given that age of initiation is confounded with current age, age at interview was included as a covariate when assessing the relationship of age of first alcohol intoxication with alcohol use and

problems. Therefore, the second set of analyses used multivariate logistic regression to assess the association of each use and problem variable as the outcome variable with the independent variables age and age of first alcohol intoxication, using the Backward Stepwise approach of Wald (SPSS, Scientific Software International). Independent variables with the highest p value (> 0.10) were removed in each step. Odds ratios and their p values were calculated for each variable in each final logistic model. In preliminary analysis of the entire sample, several outcome variables showed significant gender interaction. Therefore, the entire sample was divided on the basis of gender, and these subsamples were analyzed separately. In these analyses, alpha was set at 0.05, and p values < 0.05 were considered significant.

The second aim of this study is to report qualitative information on the usefulness of the survey as a vehicle for promoting CBPR and for building the capacity of the SCTHC to intervene to reduce underage drinking in the population it serves. We report on several dimensions of the process of survey design, implementation, and data analysis that illustrate ways in which the survey facilitated clinic and community participation, partnership between outside (PIRE, TSRI) and community (SCTHC) personnel, training and mentoring of young adult AI research personnel, dissemination of research findings, and use of research to build capacity of the clinic to address a pressing community health need.

RESULTS

Of the 197 youth who participated in the study, 90 were male (age range 8-20 years, median age 13.5 years) and 107 were female (age range 8-20 years, median age 15.0 years). Recruitment of sample youth from each venue was as follows: 65% percent were recruited from the clinic itself (via fliers, clinic staff, and direct solicitation in waiting rooms), 19% from after-school programs, 14% at community health fairs, and 2% at powwows. Recruitment at the last three venues sometimes coincided with presentations on underage drinking given by the research assistants as part of a “giving back” program included in the survey project. Overall, there were 12 recruitment refusals (6%): 7 at the clinic, 2 from community health fairs, and 3 at powwows. In the sample, 98% of boys and 97% of girls self-identified as AI/AN. Ninety-eight percent of boys and 99% of girls reported speaking English in their homes. Boys were not significantly different from girls in any demographic variable. These results are displayed in Table 1. Not every survey question was answered by each participant, leading to some instances of missing data. In this report, we report positive responses for each variable and the percentage of the total responses (positive and negative) to the survey question for that variable.

Table 1
Demographic and Alcohol Age of Onset Variables Comparing Boys and Girls (N = 197)

Variable	Boys			Girls			Mann-Whitney	p Value
	n ^a	Range, Median (Years)	Mean Rank	n	Range, Median (Years)	Mean Rank		
Age	90	8-20, 13.5	91.7	107	8-20, 15.0	105.1	4162.00	0.10
Age first drink	33	8-16, 13.0	44.8	58	8-18, 14.0	46.7	916.00	0.73
Age first intoxication	24	12-17, 14.5	32.6	42	8-18, 14.0	34.0	483.00	0.78
Age first drinking ≥ 5 (male)/ ≥ 4 (female) drinks in a 2-hour period	23	12-17, 15.0	32.8	43	8-18, 14.0	33.9	478.00	0.82
	n^b	%		n	%		Fisher p Value Exact Test	
Currently in school	77	86		90	84		1.00	

^a n indicates the number of boys or girls responding to the question assessing each continuous variable. For example, 33 boys and 58 girls reported their age of first whole drink (vs. never having had a whole drink).

^b n indicates the number of boys or girls responding positively to the question asking whether they were currently in school

Frequencies of selected substance use, mood, and alcohol-related problem variables and their comparisons in boys and girls can be seen in Tables 2 and 3. Thirty-seven percent of boys and 54% of girls had drunk one or more standard drinks in their lifetimes. Twenty-seven percent of boys and 39% of girls reported having been intoxicated with alcohol one or more times in their lifetimes. Of boys who had drunk alcohol in their lifetimes, 31% had drunk in the past month and 17% had drunk at least weekly in the past year. Of boys who had drunk in the past month, 50% reported drinking ≥ 5 drinks on occasions when they did drink, and 38% reported drinking ≥ 5 drinks at least once a week in the past month. Of girls who had drunk in their lifetimes, 47% had drunk in the past month and 23% had drunk at least weekly in the past year. Of girls who had drunk in the past month, 47% reported drinking ≥ 5 drinks on occasions when they did drink, and 16% reported drinking ≥ 4 drinks at least once a week in the past month. In the entire sample, 13% of boys and 28% of girls reported feeling so sad or hopeless for at least 2 weeks in the past year that they gave up some usual activities (“impairment”). In the entire sample, 9% of boys and 18% of girls had seriously considered suicide in the past year. Frequencies of substance use variables and serious consideration of suicide were not significantly different in boys as compared to girls. However, depressive episode with impairment was significantly more common in girls as compared to boys.

Table 2
Selected Substance Use and Mood Variables Comparing Boys and Girls

Variable	Condition (Boys; Girls) ^a	Boys n (%)	Girls n (%)	Fisher Exact Test
Drank in past month	Ever drank (35; 62)	11 (31%)	29 (47%)	0.20
Drank \geq 5 drinks when did drink in past month	Drank in past month (12; 30) ^b	6 (50%)	14 (47%)	1.00
Drank \geq 5 (male)/ \geq 4 (female) drinks in a 2-hour period at least once/week in past month	Drank in past month (13; 31) ^b	5 (38%)	5 (16%)	0.13
Drank at least weekly in past year	Ever drank (35; 62)	6 (17%)	14 (23%)	0.61
Typically drank \geq 5 drinks when drank in past year	Drank in past year (25; 47)	13 (52%)	22 (47%)	1.00
Use cannabis \geq 40 times in lifetime	Ever used cannabis (30; 43)	11 (37%)	19 (44%)	0.63
Used methamphetamine in past year	Entire sample (90; 107)	5 (6%)	6 (6%)	1.00
Used OTC meds to get high in past year	Entire sample (90; 107)	36 (4%)	54 (50%)	0.15
Used prescription pills to get high in past year	Entire sample (90; 107)	32 (36%)	48 (45%)	0.19
Sad or hopeless with impairment for \geq 2 weeks in past year	Entire sample (90; 107)	12 (13%)	30 (28%)	0.01
Seriously considered suicide in past year	Entire sample (90; 107)	8 (9%)	19 (18%)	0.10

^a (Boys; Girls) indicates the number of boys or girls responding positively to each condition. For example, in the first row, 35 boys and 62 girls responded positively to the question asking whether they had ever had one or more full drinks of alcohol. Then, 11 of the 35 boys (31%) and 29 of the 62 girls (47%) indicated they had drunk in the past month. ^b Numbers of those who drank in past month are discrepant because different numbers of boys and girls answered each question.

Table 3
Selected Alcohol-related Problem Variables Comparing Boys (n = 90) and Girls (n = 107)

Variable	Boys n (%)	Girls n (%)	Fisher Exact Test
Drove a vehicle within 1 hour after drinking	6 (7%)	9 (8%)	0.79
Rode with driver who drove vehicle within 1 hour after drinking	27 (30%)	50 (47%)	0.02
Drunk while in school	12 (13%)	22 (21%)	0.19
Alcohol blackout	8 (9%)	24 (22%)	0.01
Missed school or class because of drinking	11 (12%)	27 (25%)	0.03
Passed out (lost consciousness) while drinking	11 (12%)	26 (24%)	0.04

When frequencies of alcohol-related problems in the past year were examined in the entire sample, 7% of boys and 8% of girls had driven a motor vehicle within one hour of drinking. Thirty percent of boys and 47% of girls had ridden in a motor vehicle with a driver who had been drinking within one hour of driving. Thirteen percent of boys and 21% of girls reported having been drunk in school, 9% of boys and 22% of girls reported having experienced an alcohol blackout, and 2% of boys and 8% of girls reported having been seriously injured due to drinking. Riding in a vehicle whose driver had been drinking within the hour ($p = 0.02$) and experiencing an alcohol blackout ($p = 0.01$) were significantly more common in girls as compared to boys.

When logistic regression models were used to examine for significant association of earlier age of first intoxication taking into account age as covariate, earlier age of first intoxication (OR, p value) was associated with several substance use and alcohol-related problems in boys and girls (Table 4). In boys, earlier age of first intoxication was associated with drinking in the past month (1.99, 0.046) and experiencing an alcohol blackout in the past year (2.15, 0.04). In girls, earlier age of first intoxication was associated with smoking $\geq 1/2$ pack of cigarettes per day in the past month (1.60, 0.04), using cannabis ≥ 40 times in one’s lifetime (1.70, 0.02), using methamphetamine in the past year (1.97, 0.02), being drunk in school in the past year (1.89, 0.01), and suffering a serious injury due to drinking in the past year (1.60, 0.03).

Table 4
Final Logistic Regression Models for Factors Significantly Associated with Selected Substance Use and Alcohol-related Problem Variables for Boys ($n = 90$) and Girls ($n = 107$)^a

Outcome Variable	Independent Variable	Boys			Girls		
		Odds Ratio	95% CI	p Value	Odds Ratio	95% CI	p Value
Drank in past month	Age first intoxication	1.99	1.01-3.91	0.046			
	Current age						
Smoked \geq half pack cigarettes/day in past month	Age first intoxication						
	Current age				1.60	1.01-2.54	0.04
Used cannabis ≥ 10 times in past month	Age first intoxication						
	Current age				1.74	1.03-2.94	0.04
Use cannabis ≥ 40 times in lifetime	Age first intoxication				1.70	1.09-2.66	0.02
	Current age				1.70	1.06-2.72	0.03

continued on next page

Table 4, Continued
Final Logistic Regression Models for Factors Significantly Associated with Selected Substance Use and Alcohol-related Problem Variables for Boys (n = 90) and Girls (n = 107)^a

Outcome Variable	Independent Variable	Boys			Girls		
		Odds Ratio	95% CI	p Value	Odds Ratio	95% CI	p Value
Used methamphetamine in past year	Age first intoxication				1.97	1.14-3.42	0.02
	Current age				2.26	1.05-4.85	0.04
Rode with driver who drove vehicle within 1 hour after drinking in past year	Age first intoxication						
	Current age				1.65	1.00-2.69	0.049
Been drunk in school in past year	Age first intoxication				1.89	1.18-3.05	0.01
	Current age						
Blackout while drinking in past year	Age first intoxication	2.15	1.04-4.42	0.04			
	Current age						
Worried he/she drank too much/often in past year	Age first intoxication				1.60	1.07-2.40	0.02
	Current age						
Serious injury or injuries due to drinking in past year	Age first intoxication				1.60	1.04-2.46	0.03
	Current age						

¹ Multivariate logistic regression was used to assess the association of each substance use and alcohol-related problem variable (as the outcome variable) with independent variables entered into the initial model in each regression: age of first alcohol intoxication and current age. Final logistic models were determined using the Backward Stepwise Approach of Wald. Odds ratios and p values are given for all independent variables that appeared in each final model. A blank cell indicates that the independent variable did not appear or was not significant in the final model.

From a qualitative standpoint, the successful implementation of this survey demonstrated several important findings from the survey project. First, a detailed and informative survey of underage drinking, including quantitative information on age of onset of alcohol use variables, substance use, psychiatric problems, and alcohol-related problems, is feasible and acceptable to youth enrolled at a rural AI community health clinic.

Second, young adult AI research assistants are able to implement such a survey effectively. Examples of the research assistants' effective implementation of the survey include: (1) giving advice on culturally appropriate terminology and wording for survey questions; (2) generating a picture of the most common locally consumed alcoholic beverages as an aid in estimating standard drinks with the participant during survey administration; (3) developing and implementing culturally

sensitive strategies for recruitment, both from within the clinic and from the larger community; (4) purchasing and operating an optical scanner capable of generating scannable survey forms, which were then scanned to transfer data to an Excel file for statistical analysis; (5) attending four training sessions with a statistician at TSRI to learn principles of statistical analysis using SPSS; (6) giving presentations on underage drinking to adult community members and clinicians at the SCTHC, and to middle and high school students in after-school programs; (7) creating and implementing a game-oriented education program on underage drinking for elementary school students; (8) reporting back to the SCTHC board on the implementation and results of the survey; and (9) giving presentations at four national meetings on underage drinking and AI/AN health.

Third, such a survey can yield valuable information for screening and treatment interventions in the clinic. These data can also inform further research on individual and family intervention, as well as community-wide prevention research studies. The information in the survey allows for improved screening for underage drinking and its associated problems at the SCTHC, by providing a few questions that are easy to administer yet informative of risk. Information gained from these questions can be used to advise youth to obtain further evaluation for substance use and emotional problems. Using information obtained in the survey, the SCTHC, with TSRI and PIRE, also submitted a successful application for ongoing funding to study specific individual and family intervention and community-wide prevention strategies in the population served by the SCTHC. In this case, a continuing research program, which studied the efficacy of (1) individual and family Motivational Interviewing to reduce underage drinking and (2) a community-wide reward and reminder program to reduce teenage drinking and driving, was based directly on the findings and on the research capacity that had been built during the survey research effort.

Fourth, the project demonstrates that a survey research project is an effective vehicle for accomplishing many of the qualitative goals of CBPR (see Israel et al., 2003) beyond the quantitative information on underage drinking and associated problems obtained in the survey itself. Examples of the qualitative accomplishments of the survey include:

1. Building on the strengths of the SCTHC (in this case, the administrative, clinical, and educational expertise of the SCTHC, including its student program, whose participants made an invaluable contribution to the project);
2. Building on the strengths in the community (in this case, the advice and support of an informed local advisory board, as well as a generation of elders and parents—some of whom were themselves in recovery—who were committed to building programs to reduce underage drinking on the reservations served by the SCTHC);
3. Facilitating a collaborative research partnership between the SCTHC and outside research entities (in this case, TSRI and PIRE);

4. Promoting co-learning by both the SCTHC staff and the outside investigators (in this case, research assistants at the SCTHC learned research techniques and investigators from TSRI and PIRE learned culturally appropriate assessment of underage drinking and associated problems);
5. Integrating and balancing research and clinically actionable information (in this case, by providing information on the scope of the clinical problem, and screening questions that could easily be used for rapid assessment of underage drinking in all departments of the SCTHC and could serve as a basis for referral for more extensive evaluation and treatment, as appropriate);
6. Achieving relevance to the local community. In this case, elders and parents in the community were well aware of the association of underage drinking with serious, potentially lethal problems, including motor vehicle crashes. From a research standpoint, in this community earlier ages of first intoxication had been found to be associated with high rates of alcohol use disorders in adulthood (Ehlers et al., 2006), but little was known about their association with problems in children and teens themselves. The survey was able to confirm an association between underage drinking and serious alcohol-related problems in youth and to provide new quantitative information on the frequencies of alcohol use, other substance use, mood problems, and alcohol-related risk behaviors as well as their association with earlier ages of intoxication;
7. Promoting a cyclical, iterative process which uses research to build capacity, determine relevant clinical information, and propose culturally appropriate and effective interventions on the basis of that information, leading to further research on the efficacy of those interventions, beginning the cycle anew. In this case, the survey project provided the data and helped build the capacity follow-on efforts to research the effectiveness of individual and family intervention and community-wide prevention strategies to reduce underage drinking in youth served by the SCTHC;
8. Disseminating critical health-related information to the community. In this case, the survey project confirmed existing information and added new information on the clinical significance of underage drinking, and provided a mechanism to disseminate that information to youth and parents in the reservation communities served by the SCTHC, using presentations and the clinic newsletter; and
9. Establishing a long-term commitment to research in the service of health promotion in the participating communities. In this case, under the aegis of funding from the National Institute on Minority Health and Health Disparities and NIAAA, an 8-year research program on the efficacy of clinical and community-wide interventions to reduce underage drinking, with its attendant promotion of a young generation of AI researchers at the SCTHC, is currently underway.

DISCUSSION

This report demonstrates that a brief survey on youth substance use, mood problems, and alcohol-related problems can be administered successfully in a rural AI community health clinic, and can be useful in both quantitative and qualitative terms as a vehicle for improving health in the community served by the clinic.

From a quantitative standpoint, survey findings can inform clinic personnel and community leaders on the specific kinds and extent of health problems experienced by youth. Survey findings can be used for rapid, targeted screening for those problems in behavioral health, medical, and dental departments; provide for referral to appropriate clinic services; and serve as a basis for clinic outreach, education, and prevention programs in the community. For example, the survey reported here found that five (6%) boys and five (5%) girls reported bingeing (defined here as ≥ 5 drinks per drinking day for boys and ≥ 4 per drinking day for girls) at least weekly in the past month. Weekly bingeing in adults has been associated with higher risk of alcohol use disorder symptoms in both those with predominantly European ancestry (Saha, Stinson, & Grant, 2007) and an AI sample (Gilder et al., 2011). In the 1994, 1995, and 1998 National Household Survey on Drug Abuse surveys, teenagers who drank ≥ 5 drinks per day on one or more days in the past month were more likely than those who did not to have used other illicit substances, driven under the influence of alcohol or drugs, experienced school problems, engaged in fights, and had legal problems (Greenblatt, 2000). Thus, a single question about weekly bingeing identifies a high-risk subgroup in the clinic population that can be quickly referred for intervention and treatment. Similarly, use or heavy use of other substances, depressive episode or suicidal ideation, and driving a motor vehicle or riding with a driver under the influence of alcohol are all serious, potentially lethal—but easily screened-for—conditions.

A second important quantitative finding in the survey reported here is that, compared to boys, girls are as much or more at risk, depending on the variable, for alcohol and drug use and for alcohol-related problems. For example, 47% of girls as compared to 30% of boys ($p = 0.02$) reported riding in a motor vehicle in the past year with a driver who had been drinking within the hour. These data suggest that a determined community campaign to educate youth on ways to avoid riding with a driver who has been drinking might be useful in reducing harm in youth. This example again illustrates how a community-based survey can lead to important information on risk behaviors specific to the population the clinic serves, which can easily be used in brief screening in any department.

A third example of important quantitative information from the survey reported here is shown in Table 4, which portrays those substance use and alcohol-related problems that were significantly associated (OR, p value) with earlier age of first intoxication and/or with age in boys

and girls separately. Other substance use, mood problems, and alcohol-related problems assessed in the survey were not found to be significantly related to either age of first intoxication or age in either boys or girls. As can be seen in Table 4, earlier age of first intoxication was associated with several substance use and past year alcohol problem variables, including experiencing a blackout while drinking (2.15, 0.04) in boys and being drunk in school (1.89, 0.01) and serious injury due to drinking (1.60, 0.03) in girls. Taken together with data on median age of first intoxication (Table 1), these findings suggest that concerted efforts to reduce and delay underage drinking might have an important impact on reducing harm from alcohol-related problems in clinic youth. Also of interest is the regression model of riding in a vehicle driven by a driver who had been drinking within the hour. This behavior is significantly associated with age in girls, but not boys, and not with earlier age of first intoxication in boys or girls. This finding indicates that as girls move through their teen and young adult years, they increasingly risk riding with drivers who have been drinking, perhaps because they are riding in vehicles driven by older boyfriends. If this hypothesis could be confirmed, targeting this behavior in teen and young adult girls might be particularly useful in reducing harm.

From a qualitative standpoint, this research project demonstrates that a survey is an effective vehicle for accomplishing many of the qualitative goals of CBPR (see Israel et al., 2003) beyond the quantitative information obtained in the survey itself. In this sense, the process of designing, implementing, analyzing data from, and translating findings of the survey, rather than the survey data itself, accomplishes the goals of CBPR. As noted in the Results, these accomplishments include building on the strengths of the existing SCTHC infrastructure and the reservation communities, facilitating collaborative partnerships between and mutual learning by AI and outside research personnel that benefited both groups, undertaking research in the service of actionable information about clinical problems important to the community, and promoting ongoing research by the clinic on health care problems in the community. The process of undertaking the survey was perhaps most important in fostering young adult AI researcher training and promoting an ethos of ongoing health research to enhance health care by AI researchers.

The results of this study should be viewed in the light of several limitations. The survey was not administered to a random sample, but to a sample of convenience, which may not be representative of the youth population served by the SCTHC, other AI youth populations served by rural clinics, or rural AI youth in general. The survey uses cross-sectional and retrospective data, which may be subject to recall bias. A prospective study that assessed randomly selected youth participants at several time points as they moved from childhood to young adulthood would address these concerns. Our logistic models did not test several covariates that might have been significantly associated with the alcohol and other substance use, depression and suicidal ideation, and alcohol-related problem variables if they had been included in the models. Examples include

earlier age of first use of substances other than alcohol, anxiety, history of personal trauma, family disruption, and socioeconomic status. Another limitation is that of multiple comparisons. In total, 28 logistic regression analyses were undertaken for both boys and girls. None of the significant findings in these analyses would survive Bonferroni correction. A larger sample size might have demonstrated significant differences in alcohol, substance use, mood, and alcohol-related problems or significant associations between age of first alcohol intoxication and those problems, which were not found in the current study. The major weakness of this manuscript is the very small numbers of participants for some items assessed in the survey. The small numbers render assessments of their association with gender, age, and earlier age of first intoxication unreliable from a scientific standpoint. A larger prospective study would remedy this limitation and provide a more firm foundation for community action.

Despite these limitations, we believe the findings of this study represent an important contribution in identifying the quantitative and qualitative ways a brief, easily administered survey of youth served by the SCTHC can be used to identify important substance use, mood, and alcohol-related problems in these youth, and to provide a population-specific and culturally appropriate platform for community-wide education and prevention efforts to reduce the morbidity and mortality associated with underage drinking.

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ACKNOWLEDGEMENT

This study was funded by the National Institutes of Health, Grant U01/R01 AA016479, National Institute on Alcohol Abuse and Alcoholism and the National Center on Minority Health and Health Disparities.

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**Appendix A
Survey on Underage Drinking and Associated Problems**

Please fill out the survey using a #2 pencil or black ballpoint pen, choose the best answer for each question by making a dark mark that fills the circle completely.

Correct mark ● Fill in the bubbles this way

Incorrect mark ✗ Not like this ✓ Not like this

If you want to change your answer once you've marked it, please erase or draw an X through it and mark your new answer.

Please do not make any stray marks on this survey. If you have any questions or difficulties (concerns), please ask the researcher for help.

- | | | | |
|--|--|---|------------------------------|
| 1. How old are you? | <input type="radio"/> 8 yrs or younger | <input type="radio"/> 9 yrs | <input type="radio"/> 10 yrs |
| | <input type="radio"/> 11 yrs | <input type="radio"/> 12 yrs | <input type="radio"/> 13 yrs |
| | <input type="radio"/> 14 yrs | <input type="radio"/> 15 yrs | <input type="radio"/> 16 yrs |
| | <input type="radio"/> 17 yrs | <input type="radio"/> 18 yrs | <input type="radio"/> 19 yrs |
| | <input type="radio"/> 20 yrs | | |
| 2. What is your sex? | <input type="radio"/> Male | | |
| | <input type="radio"/> Female | | |
| 3. Are you in school? | <input type="radio"/> Yes | | |
| | <input type="radio"/> No | | |
| 4. If yes, what grade are you in? | <input type="radio"/> 2nd | <input type="radio"/> 3rd | <input type="radio"/> 4th |
| | <input type="radio"/> 5th | <input type="radio"/> 6th | <input type="radio"/> 7th |
| | <input type="radio"/> 8th | <input type="radio"/> 9th | <input type="radio"/> 10th |
| | <input type="radio"/> 11th | <input type="radio"/> 12th | |
| | <input type="radio"/> College freshman | <input type="radio"/> College sophomore | |
| | <input type="radio"/> College junior | <input type="radio"/> College senior | |
| 5. If no, what was the last grade completed? | <input type="radio"/> 2nd | <input type="radio"/> 3rd | <input type="radio"/> 4th |
| | <input type="radio"/> 5th | <input type="radio"/> 6th | <input type="radio"/> 7th |
| | <input type="radio"/> 8th | <input type="radio"/> 9th | <input type="radio"/> 10th |
| | <input type="radio"/> 11th | <input type="radio"/> 12th | |
| | <input type="radio"/> College freshman | <input type="radio"/> College sophomore | |
| | <input type="radio"/> College junior | <input type="radio"/> College senior | |

continued on next page

Appendix A, Continued
Survey on Underage Drinking and Associated Problems

- | | |
|---|---|
| 6. Are you Mexican, Latin American, or other Hispanic? | <input type="radio"/> Yes
<input type="radio"/> No |
| 7. What is your family background or race? (You can choose more than one) | <input type="radio"/> American Indian, Alaska Native
<input type="radio"/> Asian American
<input type="radio"/> Black or African American
<input type="radio"/> Native Hawaiian or Other Pacific Islander
<input type="radio"/> White
<input type="radio"/> Multiple or bi-racial (i.e., American Indian, White, etc. - please specify which groups) |
| 8. When you are at home, what language do you mostly speak? | <input type="radio"/> English
<input type="radio"/> Spanish
<input type="radio"/> Other (please specify) _____ |



Standard Drink Sizes

12 oz of Beer (5% Alcohol)	=	5 oz of Table Wine (12% Alcohol)	=	1.5 oz of Hard Liquor (40% Alcohol)
				

Number of Drinks per Typical Container	
<u>Alcoholic Beverage</u>	<u>Bottle or Can Size</u> <u>Approximate Number of Standard Drinks</u>
Beer (Budweiser, Coors, Heineken)	12 oz = 
	12 oz = 
Malt liquor (Mike's Hard Lemonade, Olde English, King Cobra, Mickey's)	16 oz = 
	40 oz = 
Wine (Boone's Farm)	750 ml = 
	(about 25 oz)

continued on next page

Appendix A, Continued
Survey on Underage Drinking and Associated Problems

Number of Drinks per Typical Container, Continued

<u>Alcoholic Beverage</u>	<u>Bottle or Can Size</u>	<u>Approximate Number of Standard Drinks</u>
Hard liquor (whiskey, gin, vodka, rum, and tequila)	750 ml = (a "fifth" - about 25 oz)	

9. In your life, have you ever had even a sip of alcohol?

- Yes
- No (If no, skip alcohol questions and go to question 19 on page 7.)

10. How old were you when you had your very first drink (not just a sip or two, but a whole drink)?

- I have never had a whole drink
- 8 yrs old or younger
- 9 yrs old
- 10 yrs old
- 11 yrs old
- 12 yrs old
- 13 yrs old
- 14 yrs old
- 15 yrs old
- 16 yrs old
- 17 yrs old
- 18 yrs old
- 19 yrs old
- 20 yrs old

(If never, skip alcohol questions)

11. During the last 30 days, how many times did you have a whole drink of any kind of drink containing alcohol? (Choose only one)

- 0 days (If 0, skip the next 2 questions and go to question 14 on page 5.)
- 1 to 2 days
- 3 to 5 days
- 6 to 9 days
- 10 to 19 days
- 20 more days

12. During the last 30 days, on those occasions when you drank alcohol, how many whole drinks did you usually have?

- 25 or more drinks
- 19 to 24 drinks
- 16 to 18 drinks
- 12 to 25 drinks
- 9 to 11 drinks
- 7 to 8 drinks
- 5 to 6 drinks
- 3 to 4 drinks
- 2 drinks
- 1 drink

13. If you're male, please answer the following question:

During the past 30 days, how often did you have 5 or more drinks containing any kind of alcohol within a 2-hour period? (Choose only one)

If you're female, please answer the following question:

During the past 30 days, how often did you have 4 or more drinks containing any kind of alcohol within a 2-hour period? (Choose only one)

- Every day
- 5 to 6 days a week
- 3 to 4 days a week
- two days a week
- one day a week
- 2 to 3 days a week
- once a month
- 0 days

continued on next page

Appendix A, Continued
Survey on Underage Drinking and Associated Problems

14. During the last 12 months, how often did you have a whole drink of any kind of drink containing alcohol? (Choose only one)

- Every day 5 to 6 times a week 3 to 4 times a week
 twice a week once a week 2 to 3 times a month
 once a month 3 to 11 times in the past year
 1 or 2 times in the past year
 I did not drink any alcohol in the past year (if none in last year, skip following question.)

15. During the last 12 months, how many whole drinks containing alcohol did you have on a typical day when you drank alcohol?

- 25 or more drinks 19 to 24 drinks 16 to 18 drinks
 12 to 15 drinks 9 to 11 drinks 7 to 8 drinks
 5 to 6 drinks 3 to 4 drinks 2 drinks
 1 drink

16. During your lifetime, what is the greatest number of drinks containing alcohol that you drank within a 24-hour period?

- 36 or more drinks 24 to 35 drinks 18 to 23 drinks
 12 to 17 drinks 8 to 11 drinks 5 to 7 drinks
 4 drinks 3 drinks 2 drinks
 1 drink

17. If you're male, please answer the following question:

How old were you the very first time you had 5 or more whole drinks containing any kind of alcohol within a two-hour period?

If you're female, please answer the following question:

How old were you the very first time you had 4 or more whole drinks containing any kind of alcohol within a two-hour period?

- I have never had 5 (males) or 4 (females) whole drinks 8 yrs old or younger
 9 yrs old 10 yrs old 11 yrs old 12 yrs old
 13 yrs old 14 yrs old 15 yrs old 16 yrs old
 17 yrs old 18 yrs old 19 yrs old 20 yrs old

18. How old were you the very first time you got drunk? (Drunk means you couldn't talk clearly and it was difficult to keep your balance)

- I have never been drunk 8 yrs old or younger
 9 yrs old 10 yrs old 11 yrs old 12 yrs old
 13 yrs old 14 yrs old 15 yrs old 16 yrs old
 17 yrs old 18 yrs old 19 yrs old 20 yrs old

continued on next page

Appendix A, Continued
Survey on Underage Drinking and Associated Problems

19. How old were you when you tried cigarette smoking for the first time, even one or two puffs?

- | | | | |
|--|--|----------------------------------|----------------------------------|
| <input type="radio"/> I have never tried cigarette smoking | <input type="radio"/> 8 yrs old or younger | | |
| <input type="radio"/> 9 yrs old | <input type="radio"/> 10 yrs old | <input type="radio"/> 11 yrs old | <input type="radio"/> 12 yrs old |
| <input type="radio"/> 13 yrs old | <input type="radio"/> 14 yrs old | <input type="radio"/> 15 yrs old | <input type="radio"/> 16 yrs old |
| <input type="radio"/> 17 yrs old | <input type="radio"/> 18 yrs old | <input type="radio"/> 19 yrs old | <input type="radio"/> 20 yrs old |

(If never, skip the following question)

20. How much did you smoke (cigarettes) during the past 30 days?

- | | |
|--|--|
| <input type="radio"/> Not at all | <input type="radio"/> Less than one cigarette per day |
| <input type="radio"/> One to five cigarettes per day | <input type="radio"/> About one-half pack per day |
| <input type="radio"/> About one pack per day | <input type="radio"/> About one and one-half packs per day |
| <input type="radio"/> Two packs or more per day | |

21. How old were you when you tried chewing tobacco for the first time? (Chewing tobacco includes snuff, or dip, such as Redman, Levi Garrett, Beechnut, Skoal, Skoal Bandits, or Copenhagen)

- | | | | |
|--|--|----------------------------------|----------------------------------|
| <input type="radio"/> I have never tried cigarette smoking | <input type="radio"/> 8 yrs old or younger | | |
| <input type="radio"/> 9 yrs old | <input type="radio"/> 10 yrs old | <input type="radio"/> 11 yrs old | <input type="radio"/> 12 yrs old |
| <input type="radio"/> 13 yrs old | <input type="radio"/> 14 yrs old | <input type="radio"/> 15 yrs old | <input type="radio"/> 16 yrs old |
| <input type="radio"/> 17 yrs old | <input type="radio"/> 18 yrs old | <input type="radio"/> 19 yrs old | <input type="radio"/> 20 yrs old |

(If never, skip the next chewing tobacco question)

22. During the past 30 days, on how many days did you use chewing tobacco, snuff, or dip, such as Redman, Levi Garrett, Beechnut, Skoal, Skoal Bandits, or Copenhagen?

- | | | |
|-----------------------------------|-------------------------------------|-------------------------------------|
| <input type="radio"/> 0 days | <input type="radio"/> 1 or 2 days | <input type="radio"/> 3 to 5 days |
| <input type="radio"/> 6 to 9 days | <input type="radio"/> 10 to 19 days | <input type="radio"/> 20 to 29 days |
| <input type="radio"/> All 30 days | | |

23. How old were you when you tried marijuana for the first time, even one or two puffs?

- | | | | |
|--|--|----------------------------------|----------------------------------|
| <input type="radio"/> I have never tried marijuana | <input type="radio"/> 8 yrs old or younger | | |
| <input type="radio"/> 9 yrs old | <input type="radio"/> 10 yrs old | <input type="radio"/> 11 yrs old | <input type="radio"/> 12 yrs old |
| <input type="radio"/> 13 yrs old | <input type="radio"/> 14 yrs old | <input type="radio"/> 15 yrs old | <input type="radio"/> 16 yrs old |
| <input type="radio"/> 17 yrs old | <input type="radio"/> 18 yrs old | <input type="radio"/> 19 yrs old | <input type="radio"/> 20 yrs old |

24. During the past 30 days, how many times did you use marijuana?

- | | | |
|-------------------------------------|---------------------------------------|-----------------------------------|
| <input type="radio"/> 0 days | <input type="radio"/> 1 or 2 days | <input type="radio"/> 3 to 9 days |
| <input type="radio"/> 10 to 19 days | <input type="radio"/> 20 or more days | |

25. During your life, how many times have you used marijuana?

- | | | |
|--------------------------------------|--------------------------------------|---|
| <input type="radio"/> 1 or 2 times | <input type="radio"/> 3 to 9 times | <input type="radio"/> 10 to 19 times |
| <input type="radio"/> 20 to 39 times | <input type="radio"/> 40 to 99 times | <input type="radio"/> 100 or more times |

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Appendix A, Continued
Survey on Underage Drinking and Associated Problems

How often in the past 12 months have you...	Scale of Usage						
	Not at all	1 or 2 times	3 or 4 times	5 or 6 times	7 or 10 times	Once a month	More than once a month
26. Driven a car, truck, 3-4 wheeler or quad, or motorcycle within an hour of having one or more drinks of any alcoholic beverage?	<input type="radio"/>						
27. Ridden with a driver who had one or more drinks of any alcoholic beverage within an hour of driving?	<input type="radio"/>						
28. Missed school or class because of drinking?	<input type="radio"/>						
29. Gotten sick to your stomach because of drinking?	<input type="radio"/>						
30. Been drunk while at school?	<input type="radio"/>						
31. Not been able to remember what happened while you were drinking?	<input type="radio"/>						
32. Passed out while drinking?	<input type="radio"/>						
33. Had a hangover?	<input type="radio"/>						
34. Later regretted something you did while drinking?	<input type="radio"/>						
35. Gotten into trouble with your parents or guardian for drinking?	<input type="radio"/>						
36. Worried that you drank too much or too often?	<input type="radio"/>						
37. Had unprotected sex after drinking?	<input type="radio"/>						
38. Had a serious injury after drinking?	<input type="radio"/>						

How often in the past 12 months have you...	Scale of Usage						
	Not at all	1 or 2 times	3 or 4 times	5 or 6 times	7 or 10 times	Once a month	More than once a month
39. Bought alcohol yourself from a store <i>with</i> a fake ID	<input type="radio"/>						
40. Bought alcohol yourself from a store <i>without</i> a fake ID	<input type="radio"/>						
41. Bought alcohol yourself from a restaurant or bar <i>with</i> a fake ID	<input type="radio"/>						

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Appendix A, Continued
Survey on Underage Drinking and Associated Problems

How often in the past 12 months have you...	Scale of Usage						
	Not at all	1 or 2 times	3 or 4 times	5 or 6 times	7 or 10 times	Once a month	More than once a month
42. Bought alcohol yourself from a restaurant or bar <i>without</i> a fake ID	<input type="radio"/>						
43. Gotten alcohol from home <i>with</i> your parent's or guardian's permission	<input type="radio"/>						
44. Gotten alcohol from home <i>without</i> your parent's or guardian's permission	<input type="radio"/>						
45. Gotten alcohol from your brother or sister. (Check here if you don't have a brother or sister ____)	<input type="radio"/>						
46. Gotten alcohol from another relative (not your parents, guardians, or your brother or sister).	<input type="radio"/>						
47. Gotten alcohol from someone you know (but not a relative) who is 21 or <i>older</i> .	<input type="radio"/>						
48. Gotten alcohol from someone you know (but not a relative) who is <i>under</i> 21.	<input type="radio"/>						
49. Had a stranger buy alcohol for you.	<input type="radio"/>						
50. Taken alcohol from a store without paying for it.	<input type="radio"/>						
51. Served yourself alcohol at a party or some other event that you attended.	<input type="radio"/>						

How many times, if any, did you use any of these drugs to get high during the last 12 months?	Scale of Usage						
	Not at all	1 or 2 times	3 or 4 times	5 or 6 times	7 or 10 times	Once a month	More than once a month
52. Marijuana (pot, weed)	<input type="radio"/>						
53. Methamphetamines (crystal, meth, flavored meth, speed, ice, crank)	<input type="radio"/>						
54. "Sniff" something like glue, gasoline etc.	<input type="radio"/>						
55. Prescription pills like Oxycontin	<input type="radio"/>						
56. Over the counter drugs (such as cough syrup and cold remedies)	<input type="radio"/>						

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Appendix A, Continued
Survey on Underage Drinking and Associated Problems

Question		Your Response				
57.	During the past 12 months, did you ever feel so sad or hopeless almost every day for two weeks or more in a row that you stopped doing some usual activities?	<input type="radio"/> Yes	<input type="radio"/> No			
58.	During the past 12 months, did you ever seriously consider attempting suicide?	<input type="radio"/> Yes	<input type="radio"/> No			
59.	During the past 12 months, have you ever had a panic attack, been too scared to give a presentation in class in front of other kids, or been too scared to go out of your house alone?	<input type="radio"/> Yes	<input type="radio"/> No			
60.	During the past 12 months, have you gotten into fights, carried a gun or other weapon, or sold illegal drugs?	<input type="radio"/> Yes	<input type="radio"/> No			
61.	Suppose you wanted to get each of the following beverages. How easy or difficult do you think it would be for you to get each one? (Just check one box for each beverage.)					
		Very difficult	Difficult	Unsure	Easy	Very Easy
Beer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Wine	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Wine cooler	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Liquor	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
62.	If a kid drank some alcohol in your neighborhood, would he or she be caught by law enforcement personnel?					
	<input type="radio"/> NO! (definitely not true)		<input type="radio"/> no (mostly not true)			
	<input type="radio"/> yes (mostly true)		<input type="radio"/> YES! (definitely true)			
63.	Please mark the community you belong to: (You can choose more than one)					
	<input type="radio"/> [first geographic area] TRIBES					
	<input type="radio"/> [second geographic area] TRIBES					
	<input type="radio"/> Other (please specify) _____					
64.	Did you mainly grow up in...					
	<input type="radio"/> a rural/reservation setting or					
	<input type="radio"/> an urban area?					

THE ASSOCIATION OF RESILIENCE WITH MENTAL AND PHYSICAL HEALTH AMONG OLDER AMERICAN INDIANS: THE NATIVE ELDER CARE STUDY

Marc B. Schure, PhD, Michelle Odden, PhD, and R. Turner Goins, PhD

Abstract: We examined the association of resilience with measures of mental and physical health in a sample of older American Indians (AIs). A validated scale measuring resilience was administered to 185 noninstitutionalized AIs aged ≥ 55 years. Unadjusted analyses revealed that higher levels of resilience were associated with lower levels of depressive symptomatology and chronic pain, and with higher levels of mental and physical health. Resilience remained significantly associated with depressive symptomatology after controlling for demographic and other health measures. Our findings suggest that resilience among older AIs has important implications for some aspects of mental and physical health.

INTRODUCTION

Psychosocial factors have an important role in promoting and maintaining positive health outcomes (Zautra, Hall, & Murray, 2010). One such factor is resilience, the ability to adapt in the face of adversity (Ong, Bergeman, Bisconti, & Wallace, 2006). Resilience is viewed as a multidimensional construct, yet it is typically operationalized as a set of psychosocial behavioral qualities that enable one to thrive in spite of stressful events (Connor & Davidson, 2003; Davydov, Stewart, Ritchie, & Chaudieu, 2010; Luthar, Cicchetti, & Becker, 2000). Theoretical models posit that greater resilience buffers the negative effects of adverse events and conditions on both mental and physical health (Franco et al., 2009; Tugade, Fredrickson, & Feldman Barrett, 2004; Van Breda, 2001).

Resilience has been identified as one of many factors contributing to successful aging, which refers to how older adults achieve and maintain a sense of well-being despite age-related challenges (Young, Frick, & Phelan, 2009). Previous studies with older adults have used a number of constructed psychometric scales to capture resilience, including the Connor-Davidson Resilience

Scale (CD-RISC; Connor & Davidson, 2003), the Hardy-Gill Resilience Scale (Hardy, Concato, & Gill, 2004), and the Resilience Scale (Wagnild & Young, 1993). These studies have shown resilience to be positively correlated with greater social engagement, higher optimism, stronger grip strength, and functional independence (Hardy et al., 2004; Lamond et al., 2009; Wagnild, 2003; Wells, 2009). Conversely, resilience has been found to be negatively correlated with a range of poor mental and physical health conditions, such as increased depressive symptomatology, post-traumatic stress disorder, and physical disability (Burns & Anstey, 2010; Connor, Davidson, & Lee, 2003; Hardy et al., 2004; Mehta et al., 2008). Therefore, examining the role of resilience among older adults may provide important insight about the pathways by which they can achieve better mental and physical health.

Assessing resilience in different racial and ethnic populations is important, as group members often share distinct cultural practices and beliefs that, in turn, affect internal (psychological) and external (social and physical) resources (Ungar, 2010). With respect to American Indians (AIs), resilience may be particularly important for several reasons. AIs have suffered from generations of historical trauma due to a legacy of extermination and loss of culture (Brave Heart & DeBruyn, 1998). Many AI tribal communities have substantial rates of poverty, domestic violence, and suicide (Centers for Disease Control and Prevention, 2010; Macartney, Bishaw, & Fontenot, 2013; Perry, 2004). Older AIs have the highest prevalence of functional disability (Goins, Moss, Buchwald, & Guralnik, 2007) and high prevalence rates of poor mental and physical health compared to other racial and ethnic groups (Indian Health Service, 2012). Furthermore, AIs born today have a life expectancy 5.5 years less than all other U.S. race populations combined (Indian Health Service, 2012).

To date, only two studies have examined resilience among older AIs (Goins, Gregg, & Fiske, 2012; Grandbois & Sanders, 2009) and no studies have examined the association of resilience with mental and physical health in this population. Given the range of challenges currently experienced by AIs and our limited understanding of resilience with respect to their health, our objective was to examine the association of resilience with mental and physical health in a sample of older AIs. We hypothesized that higher levels of resilience would be positively associated with better mental and physical health.

METHODS

Study Population and Data Collection

Data for this research were collected as part of the Native Elder Care Study, a cross-sectional study of older members of a federally recognized AI tribe residing in the rural Southeast (Goins, Garroutte, Leading Fox, Geiger, & Manson, 2011). Data were collected from July 2006 to August

2008 using in-person interviewer-administered surveys to gather information on functional ability, mental and physical health, personal assistance needs, health care use, and psychosocial resources. Inclusion criteria for this study included being an enrolled tribal member, aged ≥ 55 years, a resident in the tribal service area, and noninstitutionalized at the time of the study, and having demonstrated adequate cognitive ability. A lower age criterion than usual was used because research suggests that health declines with age more rapidly in AIs than in other racial groups (Hayward & Heron, 1999). In addition, many AI communities, including the tribe participating in this study, consider elders to be those aged ≥ 55 years.

Tribal enrollment records indicated that 1,430 persons were potentially eligible for this study on the basis of residential location and age. To ensure equal representation across the range of ages, an age-stratified random sample was taken of 680 tribal members using the tribal enrollment records from three age groups: 55-64, 65-74, and ≥ 75 years. Randomly selected persons were recruited by an interviewer via telephone call or home visit to participate in the study. Of the 680 potentially eligible persons in the sample, 47 could not be located, 78 declined participation, and 50 were found to be ineligible. For the main study, interviews were administered to the remaining 505 recruited participants. Interviewers also asked a random sample of the 505 participants to join in a substudy that involved answering additional questions, including the resilience measure reported here. Of the 191 participants asked to join the substudy, two declined, yielding a total of 189 substudy participants. All participants received a \$20 gift card for completing the main study and an additional \$10 gift card for completing the substudy interview. The tribe's Institutional Review Board, tribal council, and tribal elder council, and the West Virginia University Institutional Review Board, approved the project. The Oregon State University Institutional Review Board approved the secondary data analyses.

Measures

Demographic Characteristics

Age, sex, and marital status were measured by self-report.

Resilience

The 10-item abbreviated version (Campbell-Sills & Stein, 2007) of the CD-RISC (Connor & Davidson, 2003) was our independent variable of interest. The original scale was developed as a self-reported measure of successful stress-coping ability (Connor & Davidson, 2003), and was based on a conceptual model of resilience as the successful adaptation to disruptive events (Richardson, 2002; Richardson, Neiger, Jensen, & Kumpfer, 1990). The abbreviated version of the CD-RISC (see Table 1) was selected because it has demonstrated better psychometric properties

than the full version in our sample, with a more stable factor structure, good internal consistency, and convergent and divergent validity (Goins et al., 2012). The 10 items were scored on a 5-point response scale (0 = *not true at all* to 4 = *true most of the time*). To score this measure, items were summed to create a count scale with a range from 0 to 40.

Table 1
Items from the Abbreviated CD-RISC^a Measure

Respondents noted the frequency with which they experienced each item during the past month, with the following response options: Not true at all, Rarely true, Sometimes true, Often true, or True most of the time

1. Able to adapt to change
 2. Can deal with whatever comes
 3. See the humorous side of things
 4. Coping with stress strengthens
 5. Tend to bounce back after illness or hardship
 6. You can achieve your goals
 7. Under pressure, focus and think clearly
 8. Not easily discouraged by failure
 9. Think of self as strong person
 10. Can handle unpleasant feelings
-

^a CD-RISC = The Conner-Davidson Resilience Scale

Mental Health

We used two measures of mental health, including the Center for Epidemiologic Studies Depression Scale (CES-D; Radloff, 1977) and the mental health component of the SF-8 Health Survey (MCS-8; Ware, Koskinksi, Dewey, & Gandek, 2001). These measures were selected based on the theoretical linkages of chronic or acute stress to neuronal mechanisms, which thereby alter overall mental health (Davydov et al., 2010).

The CES-D contains 20 items describing the frequency of conditions within the last week, using a 4-point scale (0 = *rarely or none of the time* to 3 = *most or all of the time*). Three items indicating positive symptoms were reverse coded. Scoring of this measure included summing the item responses to obtain a range from 0 to 60, with higher scores indicative of greater depressive symptomatology. Scores were analyzed as a binary variable using the standard cutoff score of 16 to reflect a clinically significant level of depressive symptomatology (Radloff, 1977). The CES-D has previously been validated in older AIs (Chapleski, Lamphere, Kaczynski, Lichtenberg, & Dwyer, 1997).

The MSC-8 is based on eight items indicating how frequently mental and physical health problems interfered with respondents' usual functional and social activities during the past week, with specific mental health weights applied to each item. The result is a composite norm-based weighted score, with higher scores indicative of better mental health (Ware et al., 2001). This measure was analyzed as a continuous variable. The SF-12 scale, a longer version of the SF-8, has been found to be valid among other AI adults (Edwards et al., 2012).

Physical Health

We used the SF-8 physical health component (PCS-8; Ware et al., 2001) and the Chronic Pain Grade scale (Von Korff, Ormel, Keefe, & Dworkin, 1992) to assess physical health. These measures were selected based on theorized mechanisms by which the collective impact of chronic strain weakens physiological functioning, thereby increasing vulnerability to physical disability, disease, and injury (Davydov et al., 2010).

Like the MCS-8, the PCS-8 is based on eight items indicating how frequently mental and physical health problems interfered with respondents' usual functional and social activities during the past week, with specific physical health weights applied to each item. This scale was treated as a continuous measure, with higher scores representing better physical health (Ware et al., 2001).

The Chronic Pain Grade scale is a composite measure consisting of six items that capture the severity of chronic pain and its impact on daily physical and social functioning (Von Korff et al., 1992). Three items measuring pain intensity have a response scale from 0 to 10, with higher scores indicative of higher chronic pain intensity. Two items measuring pain-related disability have a response scale from 0 to 10, with higher scores reflective of the extent to which chronic pain contributes to greater disability. Thus, the three chronic pain intensity items and the two disability items were averaged separately. The last item asks "About how many days in the last 6 months, have you been kept from your usual activities because of physical pain?" This item was scored on a scale from 0 to 180 days. We generated an overall composite scale based on the Guttman scaling method, in which chronic pain was classified into five categories with the following scheme: 1) The mean chronic pain intensity scale was coded as low (< 5) and high (5-10) intensity; 2) Disability days were coded as 0 points = 0-6 days, 1 point = 7-14 days, 2 points = 15-30 days, and 3 points = ≥ 31 days; and 3) Disability score values generated 0 points = 0-2, 1 point = 3-4, 2 points = 4-5, or 3 points = 7-10.

We then converted disability days and disability scoring to an overall count variable with a range from 0 to 6. The overall composite scale was then coded in the following fashion: Grade 0 indicated no chronic pain (e.g., all items = 0), Grade 1 = low disability/low-intensity chronic pain,

Grade 2 = low disability/high-intensity chronic pain, Grade 3 = high disability-moderately limiting (3-4 disability points) regardless of chronic pain intensity, and Grade 4 = high disability-severely limiting (5-6 disability points) regardless of chronic pain intensity.

Statistical Analyses

We used descriptive statistics to examine sample characteristics and scores on the abbreviated CD-RISC measure. Chi-square tests were used to assess the prevalence of low, medium, and high resilience scores by demographic characteristics, depressive symptomatology, and chronic pain. We used the Kruskal Wallis test to generate mean composite scores and corresponding standard deviations (*SD*) for the MCS-8 and PCS-8 by low, medium, and high resilience. We then estimated the variance inflation factor to test for multicollinearity among the independent variables; the variance inflation factor values were low, indicating that multicollinearity did not present as a serious computational issue.

For the four mental and physical health measures, we estimated a series of nested regression models. Specifically, we used logistic regression models for depressive symptomatology, ordered logistic regression models for chronic pain, and Poisson regression models for the MCS-8 and the PCS-8. The series of nested regression models progressed from an unadjusted bivariate association model of resilience with each of the mental and physical health measures, followed by a model that adjusted for the demographic characteristics, then a model that adjusted for the demographic characteristics and physical health measures, and finally a fully adjusted model. We excluded four participants from the analyses because they did not provide any responses to the CD-RISC. There were no significant differences with respect to demographic characteristics and each of the mental and physical health measures for those participants who did not have CD-RISC data compared to those who did. We used multivariate normal imputation (Lee & Carlin, 2010) for those who had missing data on the CD-RISC and correlated measures. Of the measures included, 5% of cases had missing data on the MCS-8 and PCS-8; no missing cases were observed for depressive symptomatology and chronic pain. All analyses were conducted with Stata version 12 (Stata Statistical Software, 2007).

RESULTS

Table 2 presents descriptive statistics for the demographic and mental and physical health characteristics of our sample by low, medium, or high resilience. Twenty-five percent of respondents reported low resilience, 41% reported medium resilience, and 34% reported high resilience. The mean age of the respondents was 68.7 ± 10.4 years (data not shown) with the majority of the sample being female (69%) and unmarried (54%). The mean MCS-8 score was 51.1 (*SD* = 10.3,

range = 16.5-66.7). Most respondents (87%) had a CES-D score of < 16. The mean PCS-8 score was 44.9 ($SD = 11.1$, range = 15.6-59.3). Of the chronic pain grade categories, 20% were pain free, 40% were low disability/low intensity, 17% were low disability/high intensity, 10% as high disability-moderately limiting, and 14% as high disability-severely limiting. Resilience level did not significantly differ by age, sex, or marital status. Low levels of resilience were associated with lower MCS-8 scores ($p < 0.001$), the presence of clinically significant depressive symptomatology ($p < 0.001$), lower PCS-8 scores ($p < 0.01$), and higher chronic pain grades ($p < 0.01$).

Table 2
Sample Demographic, Mental Health, and Physical Health Characteristics

	Total Sample N = 185	High n = 63 (34%)	Medium n = 76 (41%)	Low n = 46 (25%)	p Value^a
Demographics					
Age, n (%)					0.44
55-64 years	80 (43.2%)	25 (39.7%)	33 (43.4%)	22 (47.8%)	
65-74 years	54 (29.2%)	23 (36.5%)	22 (29.0%)	9 (19.6%)	
≥ 75 years	51 (27.6%)	15 (23.8%)	21 (27.6%)	15 (32.6%)	
Sex, n (%)					0.61
Female	128 (69.2%)	41 (65.1%)	53 (69.7%)	34 (73.9%)	
Male	57 (30.8%)	22 (34.9%)	23 (30.3%)	12 (26.1%)	
Marital Status, n (%)					0.49
Married/Life Partner	86 (46.5%)	30 (47.6%)	38 (50.0%)	18 (39.1%)	
Unmarried	99 (53.5%)	33 (52.4%)	38 (50.0%)	28 (60.9%)	
Mental Health					
MCS-8 Mental Health, mean (SD)	51.1 (10.3)	54.4 (7.1)	51.5 (9.3)	45.6 (13.1)	<0.001
CES-D ^b , n (%)					<0.001
≥ 16 symptoms (high)	25 (13.5%)	1 (1.6%)	8 (10.5%)	16 (34.8%)	
< 16 symptoms (low)	160 (86.5%)	62 (98.4%)	68 (89.5%)	30 (65.2%)	
Physical Health					
PCS-8 Physical Health, mean (SD)	44.9 (11.1)	48.2 (10.6)	44.7 (10.4)	40.4 (11.6)	<0.01
Chronic Pain Grade, n (%)					<0.01
0 (pain free)	37 (20.0%)	18 (28.6%)	11 (14.5%)	8 (17.4%)	
1 (low disability/low intensity)	73 (39.5%)	29 (46.0%)	31 (40.8%)	13 (28.3%)	
2 (low disability/high intensity)	32 (17.3%)	8 (12.7%)	14 (18.4%)	10 (21.7%)	
3 (high disability-moderately limiting)	18 (9.7%)	4 (6.4%)	12 (15.8%)	2 (4.4%)	
4 (high disability-severely limiting)	25 (13.5%)	4 (6.4%)	8 (10.5%)	13 (28.3%)	

^a p values generated from chi-square tests for categorical variables and Kruskal Wallis tests for continuous variables. ^b CES-D = Centers for Epidemiologic Studies Depression Scale

Table 3 presents unadjusted and adjusted odds ratios and 95% confidence intervals (CIs) for the nested regression models examining the association of resilience with depressive symptomatology and chronic pain and the beta coefficients and standard errors for the nested regression models examining the association of resilience with the MCS-8 and PCS-8. Results from the bivariate regression analyses (Model 1) showed statistically significant associations of resilience with all of the mental and physical health measures, which remained significant after controlling for demographic characteristics (Model 2). After controlling for the physical health measures (Model 3), the association of resilience with the PCS-8 was attenuated; significant associations remained between resilience and depressive symptomatology and the MCS-8, and marginally so for chronic pain. Results from the fully adjusted regression analyses (Model 4) showed that resilience remained independently associated only with depressive symptomatology. Specifically, those with higher levels of resilience, compared to those with low resilience, had significantly decreased odds of clinically significant depressive symptomatology (OR = 0.88, 95% CI [0.81, 0.96]).

Table 3
Multivariate Models Estimating Correlations of Resilience with Mental and Physical Health (N = 185)

	Model 1: Unadjusted associations	Model 2: Demographic adjusted	Model 3: Adjusted for physical health measures	Model 4: Fully adjusted models
Odds Ratio (95% Confidence Interval)				
CES-D^a				
Resilience	0.87 (0.81, 0.93)***	0.85 (0.78, 0.94)***	0.87 (0.79, 0.96)**	0.88 (0.81, 0.96)**
PCS-8			1.00 (0.94, 1.08)	1.01 (0.94, 1.09)
Chronic Pain			1.56 (0.91, 2.69)	0.98 (0.57, 1.66)
MCS-8				0.89 (0.84, 0.94)***
Chronic Pain				
Resilience	0.93 (0.89, 0.98)**	0.93 (0.89, 0.97)**	0.96 (0.92, 1.00) [‡]	0.98 (0.94, 1.03)
PCS-8			0.85 (0.82, 0.88)***	0.86 (0.83, 0.89)***
MCS-8				0.95 (0.91, 0.98)**
CES-D				1.20 (0.47, 3.08)
Beta Coefficient (Standard Error)				
MCS-8				
Resilience	0.01 (0.003)***	0.01 (0.003)***	0.01 (0.002)**	0.00 (0.002)
PCS-8			0.00 (0.002)	0.00 (0.002)
Chronic Pain			-0.06 (0.019)**	-0.04 (0.017)**
CES-D				-0.25 (0.058)***

continued on next page

Table 3, Continued
Multivariate Models Estimating Correlations of Resilience with Mental and Physical Health (N = 185)

	Model 1: Unadjusted associations	Model 2: Demographic adjusted	Model 3: Adjusted for physical health measures	Model 4: Fully adjusted models
	Beta Coefficient (Standard Error)			
PCS-8				
Resilience	0.01 (0.003)***	0.01 (0.003)***	0.01 (0.003)	0.00 (0.003)
Chronic Pain			-0.14 (0.014)***	-0.14 (0.016)***
MCS-8				0.00 (0.002)
CES-D				0.02 (0.053)

^a CES-D = Centers for Epidemiologic Studies Depression Scale

[‡] $p < 0.10$, * $p < .05$, ** $p < .01$, *** $p < .001$

DISCUSSION

This study examined the association of resilience with mental and physical health among older AIs, a population known to have persistent and disproportionate health disparities compared to other U.S. racial and ethnic populations. We expected that higher resilience would be associated with better mental and physical health, thereby representing a significant key component of improved health among older adults. Our study results demonstrated significant unadjusted associations of resilience with better mental and physical health. High levels of resilience were significantly associated with lower depressive symptomatology, as found in previous studies (Hardy et al., 2004; Mehta et al., 2008). Even after controlling for demographic characteristics and other mental and physical health measures, this association remained robust.

Research has provided evidence for the link among stress, emotional regulation, and mental health (Sojo Monson & Guarino, 2010). However, there is limited evidence that delineates how resilience impacts the stress-emotion-mental health relationship. Ong and colleagues (2006) have demonstrated that resilience moderates the effect of daily stress on negative emotion, and accounts for a substantial proportion of the variance in daily stress resistance. Based on their findings, they concluded that, compared to those with lower resilience, those with higher resilience were more likely to experience positive emotions and less likely to have difficulty regulating negative emotions. In this context, it is not surprising that we found a significant adjusted correlation between resilience and depressive symptomatology, or that depressive symptomatology attenuated the association of resilience with the MCS-8.

We found weak evidence of the relationship of resilience with the PCS-8 and with chronic pain. Although our unadjusted and demographic adjusted models showed significant associations of greater resilience with better physical health and lower chronic pain, the addition of the other physical health measures in the model attenuated these relationships. These findings are not surprising in that physical health measures are likely to be more correlated with each other than with mental health measures.

However, it is interesting to note that chronic pain was a significant correlate of the MCS-8 but not the CES-D. This finding may suggest an important distinction between negative emotion and depressive symptomatology, and may offer support for the role of emotion in responding to chronic pain-induced stress. In fact, findings from a longitudinal study among older adults have shown that positive emotion mediates the relationship of stressors with resilience (Ong et al., 2006).

None of our demographic characteristics demonstrated a significant association with resilience, although we found a substantially higher proportion of men with higher resilience levels compared to women. Indeed, Boardman and colleagues (2008) demonstrated in a twin study that, despite equal odds of developing positive affect (i.e., feelings of happiness, satisfaction, peacefulness, etc.), after controlling for a large number of social and interpersonal stressors, remaining levels of positive affect indicated stronger inheritable resilience among men compared with women.

Our findings point to important areas for further inquiry. Studies are needed to test whether resilience is dependent upon the presence of positive emotions and whether resilience remains a critical moderator of the development of mental health issues among older adults suffering from more severe disabling conditions. As with chronic pain management studies (Gatchel, 2004), resilience research could contribute a wealth of needed scientific data by adopting a biopsychosocial perspective (Davydov et al., 2010). This perspective allows researchers to operationalize and examine resilience factors at the biological level (i.e., immune system functioning), the psychological level (i.e., emotional resilience), and the social level (i.e., family and community resilience).

This study has several limitations that deserve acknowledgement. First, the data are cross-sectional, prohibiting us from assessing direction of causality. Although we treated resilience as the independent variable in our analyses, we were unable to determine the direction of these associations. It could be theorized that adverse mental or physical health conditions lead to higher resilience. Indeed, a literature review on adjustment to chronic conditions suggests a similar theoretical framework of stress and coping inherent in the emergence of resilience (Stanton, Revenson, & Tennen, 2007). It is also plausible that health processes and outcomes are occurring in a synchronic fashion with resilience. Second, we did not assess social support or other psychosocial measures that may have supportive roles in promoting resilience, as other researchers indicate (Davydov et al., 2010). Third, we were unable to assess the relative role of prescription medication use to

manage either depression or chronic pain. Use of such medications could have affected results from this study by reducing the probability of finding significant correlations of resilience with these measures. Fourth, these findings are specific to a single AI tribe, limiting their generalizability to other older AIs, as large variations in health and health risk exist among AI cultures (Levin, Welch, Bell, & Casper, 2002; Welty et al., 2002). Lastly, the construct of resilience has been measured in various ways across biological, psychological, and socio-environmental domains (Davydov et al., 2010). Our measure is most representative of the psychological domain whereas respondents provided their own self-evaluation of their resilience and, therefore, a subjective view of their successful coping abilities.

Determining the role that resilience may have in mental and physical health in older adults holds potential to guide health promotion and disease prevention efforts. For example, recent evidence suggests that resilience training may improve disease management behaviors for persons with type 2 diabetes (Bradshaw et al., 2007; Steinhardt, Mamerow, Brown, & Jolly, 2009). Evidence suggests that resilience is an important component of successful aging, but further investigation is needed to understand the mechanisms and circumstances by which this may be true among older adults.

Future studies can help us to better understand the internal and external resources needed to increase the likelihood of developing greater resilience, as well as the impact of resilience on different mental and physical health outcomes, quality of life, and longevity. Sturgeon and Zautra (2010) suggest that equal attention should be given to social-environmental resources as is given to internal resources, because social environments can help foster resilience. Such efforts could apply the broader biopsychosocial perspective for resilience research that has recently emerged (Davydov et al., 2010). This framework has the capacity to affect greater positive health outcomes among disadvantaged populations, such as AIs, where community-level resources may be equally important as individual-level resources, if not more so. Such an approach could provide an opportunity to narrow the mental and physical health disparities gap experienced by older AIs.

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FUNDING

This work was supported by the National Institute on Aging at the National Institutes of Health (K01 AG022336) and Oregon State University College of Public Health and Human Sciences.

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CONSISTENCY IN THE REPORTING OF SENSITIVE BEHAVIORS BY ADOLESCENT AMERICAN INDIAN WOMEN: A COMPARISON OF INTERVIEWING METHODS

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Abstract: Computer-assisted interviewing techniques have increasingly been used in program and research settings to improve data collection quality and efficiency. Little is known, however, regarding the use of such techniques with American Indian (AI) adolescents in collecting sensitive information. This brief compares the consistency of AI adolescent mothers' reporting of sensitive sexual and drug use behaviors gathered through three distinct interviewing techniques: computer-assisted (ACASI), self-administered questionnaire (SAQ), and face-to-face interview (FTFI). Endorsement of drug use and reporting of sexual activity was highest for ACASI, followed by SAQ, and was significantly lower for FTFI. Relatively strong agreement was measured between ACASI and SAQ, and relatively poor agreement was measured between the ACASI and FTFI. Findings support the use of computer-assisted interviewing techniques with AI adolescents, and implications for future research are discussed.

INTRODUCTION

Computer-assisted interviewing techniques have been increasingly explored in the last decade to improve reporting of sensitive behaviors. Compared to self-report or interview data collected on paper, audio computer-assisted interviewing (ACASI) can overcome literacy constraints by allowing participants to listen to questions over headphones, improve data quality and efficiency as data are uploaded directly as participants answer questions, and improve data validity by affording respondents greater privacy in answering questions. Available evidence suggests ACASI techniques yield higher reporting of both sexual behaviors (Langhaug, Sherr, & Cowan, 2010; Phillips, Gomez, Boily, &

Garnett, 2010) and drug use (Turner et al., 1998) compared to paper-and-pen self-administered questionnaires (SAQ) and in-person face-to-face interviews (FTFI)—although some cross-cultural differences have been found (Jaya, Hindin, & Ahmed, 2008).

Computer-assisted interviewing has rarely been used in research with American Indian (AI) communities. Low use is commonly attributed to resource constraints and concerns regarding computer literacy (Edwards et al., 2007). However, when ACASI was used to gather dietary and lifestyle information among Southwestern AIs, authors reported high usability and acceptance, particularly among younger participants (ages 18-49 years; Edwards et al., 2007; Murtaugh et al., 2010). Similarly, Redwood et al. (2010) successfully utilized ACASI techniques to examine tobacco use among AIs ages ≥ 18 years. To our knowledge, there are no previous studies comparing ACASI to other interviewing techniques among AI adolescents. The availability of accurate and valid data on sexual and drug use behaviors is critical for AI reservation communities due to urgent behavioral health disparities (Whitesell et al., 2007; Eaton et al., 2012) and the need for evidence-based intervention.

This brief compares consistency of data on sensitive sexual and drug use behaviors gathered through three interviewing techniques—ACASI, SAQ, and FTFI—as part of a randomized controlled trial in four Southwestern reservations among adolescent AI mothers.

METHODS

A total of 322 AI expectant adolescent mothers were enrolled during pregnancy in the Family Spirit Trial. The research goal was to evaluate the impact of a paraprofessional-delivered home- visiting intervention to reduce health and behavioral risks for AI teen mothers and children. The trial was conducted from 2006-2011, and its methods and participant characteristics have been previously published (Mullany et al., 2012). All study methods were approved by a total of 11 tribal research review and advisory boards and tribal councils, the Phoenix Area Indian Health Service Institutional Review Board, and the Johns Hopkins Bloomberg School of Public Health Institutional Review Board. The intervention and its evaluation spanned a period of 39 months, from participants' third trimesters through their children's third birthdays. At the children's second birthdays, a methodological substudy was embedded in the trial to compare data quality on sensitive behaviors as gathered through ACASI, SAQ, and FTFI.

All three interviewing techniques (ACASI, SAQ, and FTFI) were administered to participants in a private location (home, vehicle, or private study office). Responses to drug use questions were compared across ACASI, SAQ, and FTFI formats. Sexual behavior responses were compared only between ACASI and FTFI because these data were not gathered via SAQ.

Drug use and sexual behavior questions were adapted from instruments previously used with AI populations, including the Voices of Indian Teens Project (Novins & Mitchell, 1998) and the Montana Meth Survey (Montana Meth Project, 2008). Drug use questions were asked nearly identically across all three formats (ACASI, SAQ, and FTFI). For example, lifetime use of marijuana was ascertained by asking “Have you ever tried marijuana?” on both the SAQ and ACASI. Past month use of marijuana was assessed by asking “On how many days did you use marijuana in the past month?” (ACASI), “How many times did you use marijuana in the last month?” (SAQ), and “How many times did you use marijuana in the past 30 days?” (FTFI). Sexual behavior questions aimed to gather the same data but used slightly different wording across ACASI and FTFI formats. Specifically, current sexual activity was asked as “Are you currently having sex?” on ACASI and as “Are you currently sexually active?” on FTFI. Contraceptive use was assessed by asking “Are you currently doing anything to prevent getting pregnant?” on ACASI and by asking “Are you currently using any method of protection?” on FTFI.

Analyses were limited to participants who completed different interview formats within a one-week period ($n = 92$ for women with ACASI, SAQ, and FTFI, $n = 129$ for women with SAQ and ACASI, and $n = 110$ for women with SAQ and FTFI). Since these analytic sample sizes well exceed the minimum number of approximately 66 individuals needed in interrater agreement studies to detect statistically significant kappa values at the $p < 0.05$ level for dichotomous variables (Sim & Wright, 2005), we had at least 90% power for each of our statistical tests.

We present risk behaviors by mode of interview using percentages. We calculated ratios of affirmative responses and their confidence intervals, and tested significance using McNemar’s chi-squared statistic for matched case-control data. We calculated Cohen’s kappa coefficients to measure agreement in responses to the same questions across different interview formats. Kappa values are interpreted as follows: 0.0-0.2 = poor agreement, 0.2-0.4 = fair agreement, 0.4-0.6 = moderate agreement, 0.6-0.8 = good agreement, and 0.8-1.0 = very good agreement. Mean differences in quantitative data were calculated using paired t -tests.

RESULTS

Respondents were ages 15-23 years (mean = 20.2). Unfortunately, our sample was not large enough to stratify by age groups with statistical significance, so we did not examine age differences between younger and older adolescents. Reported drug use and sexual behaviors are compared in Tables 1 and 2.

Table 1
Reported Endorsement of Past Month and Lifetime use of Drugs and Current Sexual Behaviors Across Interview Formats^a

Endorsement of Behavior	Interview Format		
	ACASI (% yes)	SAQ (% yes)	FTFI (% yes)
For women with ACASI, SAQ, and FTFI completed within one week of each other (<i>n</i> = 92)			
Past month alcohol use	16.3%	13.0%	8.7%
Past month marijuana use	14.1%	13.0%	2.2%
Past month crack/cocaine use	2.2%	2.2%	0.0%
Past month methamphetamine use	2.2%	3.3%	1.1%
For women with ACASI and SAQ completed within one week of each other (<i>n</i> = 129)			
Ever used alcohol	69.8%	73.4%	N/A
Ever used marijuana	65.9%	61.2%	N/A
Ever used crack/cocaine	15.5%	12.4%	N/A
Ever used methamphetamine	24.0%	14.7%	N/A
For women with ACASI and FTFI completed within one week of each other (<i>n</i> = 110)			
Currently sexually active	51.8%	N/A	35.5%
Currently using any contraception	30.0%	N/A	22.7%
Method of contraception:			
Pill	0.9%	N/A	2.7%
Condom	15.5%	N/A	16.4%
Depo-Provera	10.0%	N/A	2.7%
Withdrawal	0.9%	N/A	0.0%
Rhythm	5.5%	N/A	0.0%

^a ACASI = audio computer-assisted interview, SAQ = self-administered questionnaire, FTFI = face-to-face interview

Table 2
Comparison and Agreement Test Results of Reported Past Month and Lifetime Use of Drugs and Current Sexual Behaviors Across Interview Formats^a

ACASI versus SAQ					
Endorsement of Behavior	Ratio of Affirmative Responses on ACASI vs. SAQ	Ratio Confidence Interval	Kappa Score	% Said Yes on SAQ but No on ACASI	% Said Yes on ACASI but No on SAQ
For women with ACASI, SAQ, and FTFI completed within one week of each other (<i>n</i> = 92)					
Past month alcohol use	1.25	0.85-1.84	0.70	2.2%	5.4%
Past month marijuana use	1.08	0.72-1.64	0.68	3.3%	4.3%
Past month crack/cocaine use	1.00	1.00-1.00	1.00	0.0%	0.0%
Past month methamphetamine use	0.67	0.17-2.67	0.38	2.2%	1.1%
For women with ACASI and SAQ completed within one week of each other (<i>n</i> = 129)					
Ever used alcohol	0.96	0.88-1.04	0.69	7.8%	4.6%
Ever used marijuana	1.06	0.97-1.16	0.78	3.1%	7.0%
Ever used crack/cocaine	1.19	0.92-1.53	0.83	0.8%	3.1%
Ever used methamphetamine	1.63**	1.23-2.16	0.71	0.0%	9.3%
ACASI versus FTFI					
Endorsement of Behavior	Ratio of Affirmative Responses on ACASI vs. FTFI	Ratio Confidence Interval	Kappa Score	% Said Yes on FTFI but No on ACASI	% Said Yes on ACASI but No on FTFI
For women with ACASI, SAQ, and FTFI completed within one week of each other (<i>n</i> = 92)					
Past month alcohol use	1.88*	1.10-3.21	0.56	1.1%	8.7%
Past month marijuana use	6.50**	1.82-23.26	0.24	0.0%	12.0%
Past month crack/cocaine use	-	-	0.00	0.0%	2.2%
Past month methamphetamine use	2.00	0.50-7.99	0.66	0.0%	1.1%
For women with FTFI and ACASI completed within one week of each other (<i>n</i> = 110)					
Currently sexually active	1.46**	1.18-1.81	0.53	3.6%	20.0%
Currently using any contraception	1.32	0.97-1.79	0.53	5.4%	12.7%
Method of contraception:					
Pill	0.33	0.03-3.20	-0.01	2.7%	0.9%
Condom	0.94	0.65-1.37	0.63	5.4%	4.5%
Depo-Provera	3.67**	1.40-9.62	0.40	0.0%	7.3%
Withdrawal	-	-	0.00	0.0%	0.9%
Rhythm	-	-	0.00	0.0%	5.4%

^a ACASI = audio computer-assisted interview, SAQ = self-administered questionnaire, FTFI = face-to-face
 p* < .05, *p* < .01 for McNemar's significance probabilities from matched case-control analyses

Proportions reporting past month drug use were similar, and in some cases slightly higher, for ACASI versus SAQ (e.g., 16% vs. 13% for alcohol, 14% vs. 13% for marijuana). Past month alcohol (ratio = 1.88, $p < 0.05$) and marijuana (ratio = 6.50, $p < 0.01$) use were significantly higher on ACASI versus FTFI. Kappa values comparing ACASI and SAQ formats indicated good agreement for past month use of alcohol (0.70), marijuana (0.68), and cocaine (1.00), and fair agreement for methamphetamine use (0.38). Lower overall agreement was found between ACASI and FTFI (kappas ranging from 0-0.66).

With the exception of alcohol, reported lifetime drug use was higher on ACASI versus SAQ, including: marijuana (66% vs. 61%), cocaine (16% vs. 12%) and methamphetamine (24% vs. 15%). For methamphetamine, there was significant difference in ACASI versus SAQ formats (ratio = 1.63, $p < 0.01$). Agreement levels for lifetime use between ACASI and SAQ were in the good to very good range: methamphetamine (kappa = 0.71), marijuana (0.78), cocaine (0.83), and alcohol (0.69).

Regarding age at initiation, participants on average first used marijuana (mean age = 14.3 years, $SD = 2.1$), followed by alcohol (mean age = 14.6 years, $SD = 2.2$ years), crack/cocaine (mean age = 15.4 years, $SD = 1.8$), and methamphetamine (mean age = 16.6 years, $SD = 1.8$). No significant differences were found for mean age of first drug use for ACASI versus SAQ (unadjusted mean differences ranged from -0.22 to 0.53 and p values for t -test results ranged from 0.31-0.94; data not shown).

For sexual behaviors, a significantly larger proportion of participants reported being sexually active (52% vs. 36%) on ACASI versus FTFI (ratio = 1.46, $p < 0.01$). Though not statistically significant, more women reported using contraception on ACASI versus FTFI (30% vs. 23%). Agreement levels were in the moderate range (kappa = 0.53 for both). Agreement for reported contraception was highest for condom use (kappa = 0.63) and lowest for birth control pills, withdrawal, rhythm, and Depo-Provera (kappa values ranging from -.01 to 0). The only birth control with significant differences in reporting was Depo-Provera, with 3.67 times more women endorsing it on ACASI ($p < 0.01$).

DISCUSSION

Endorsement of drug use behaviors among this sample of AI adolescent mothers was highest for ACASI, followed by SAQ, and was significantly lower for FTFI. These patterns were seen consistently across different drug use questions, despite the similar contexts of question administration (e.g., question wording, setting and timing of data collection,). Kappa values indicated overall good to very good agreement between ACASI and SAQ, and poor to moderate agreement between the ACASI and FTFI. Quantitative questions (i.e., age of first use) were less affected by interview format.

The largest differentials in drug use reporting across data collection formats were seen for lifetime use of methamphetamine and past month use of alcohol and marijuana, with ACASI eliciting higher rates of reported use than SAQ or FTFI. While we were unable to determine what the “truth” actually was for these participants, we believe ACASI is likely to yield the most valid data, because participant response bias is more likely to lead youth to under-report, rather than over-report, illicit behavior. For example, in reporting of lifetime methamphetamine use, all cases of disagreement were attributed to respondents saying yes on ACASI and no on SAQ.

We feel it is easier to identify and understand possible motivations for youth to answer incorrectly and report that they had not used drugs when they really had (particularly when a study team member is conducting the interview or sitting nearby) than to answer incorrectly on a computer-administered questionnaire and say they had used drugs when they really had not. It is likely that participants perceived ACASI to be more confidential.

Our data on reporting of sexual behaviors were limited to comparisons between ACASI and FTFI. Respondents were significantly more likely to report sexual behaviors on ACASI versus FTFI, even though FTFI data were gathered by a trusted community member and eligibility criteria included being pregnant (thus revealing previous sexual activity). Regarding reported methods of contraception, agreement levels were highest for condoms and lowest for birth control pills, withdrawal, rhythm methods, and Depo-Provera. It is unclear why disagreement was so high for Depo-Provera, given it is not self-administered; this finding deserves further exploration.

Several other factors may have influenced the findings reported here. Agreement levels for drug use and sexual behavior reporting may have been influenced by the slightly different question wording across assessment formats. In most cases, however, the wording differences were so minor (e.g., “in the past month” vs. “in the last month,” “past month” vs. “past 30 days”), that they were unlikely to have significantly influenced disagreement levels. The exception is contraceptive use, where the differences in question wording were more substantial; it is possible that participants’ differing interpretations of the varied wording contributed to the measured disagreement levels in contraceptive use reporting.

Additionally, kappa coefficients are, in part, a function of the prevalence of an attribute (in this case, an affirmative response of the sensitive behavior). In situations of very low prevalence, chance agreement is higher, thereby reducing the value of the corresponding kappa statistic (Sim & Wright, 2005). The relatively low prevalence of past month use of methamphetamine and of crack/cocaine may have contributed to the lower kappa values for these questions.

To our knowledge, this is the first paper providing results from a methodological examination of three interviewing techniques among AI adolescents. This research supports the use of ACASI with

AI adolescents, given the urgent need for understanding high-risk behaviors, the utility of ACASI to overcome literacy issues, and ACASI's contribution to efficient data management.

Future research should examine whether or how age, education levels, or computer literacy influence agreement levels; perhaps individuals that are older, have more formal education, or have greater computer exposure would be more comfortable with the different interviewing techniques and less likely to modify their responses across assessment formats. In addition, the behavioral health field would be strengthened by further in-depth examination of the reporting differences found here. Conducting follow-up qualitative interviews with youth that have contributed discordant responses across data collection formats would help to determine underlying factors that influence reporting of sensitive behaviors, which could, in turn, strengthen the ability of behavioral and mental health program planners and researchers to implement the most appropriate and valid data collection methodologies in their local contexts.

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ACKNOWLEDGEMENTS

We respectfully acknowledge the mothers and children who participated in this study, and all study team members. We give thanks to tribal leaders and community stakeholders who generously contributed time and wisdom to shaping the study. We are grateful to Indian Health Service for their long-standing collaboration in health promotion and for their review of the research. *Disclaimer:* The opinions expressed are those of the authors and do not necessarily reflect the views of Indian Health Service.

Financial support for this work was provided by National Institute on Drug Abuse (R01 DA019042).

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