

COMMUNITY AWARENESS OF OUTREACH EFFORTS TO REDUCE UNDERAGE DRINKING ON CALIFORNIA INDIAN RESERVATIONS

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Abstract: We report an evaluation of a combined individual- and community-level treatment and prevention effort to reduce underage drinking by American Indian (AI) youths on rural California Indian reservations. The interventions included: brief motivational interviewing and psychoeducation for Tribal youths, restricting alcohol sales to minors in alcohol sales outlets, and community mobilization and awareness activities. Surveys were collected from 120 adults and 74 teens to evaluate the awareness and effectiveness of the interventions. A high proportion of adult (93%) and youth (96%) respondents endorsed being aware of one or more of the intervention activities, and 88% of adults and 71% of youth felt the program impacted the community in a positive way. Eighty-four percent of adults and 63% of youth agreed that as a result of the activities that they decided to take action to reduce teen drinking in their community. Being aware of more of the intervention activities significantly increased the odds of taking action to change drinking behaviors. This study documents that a significant proportion of the community was aware of the intervention efforts and that awareness caused them to take action to reduce underage drinking. Such efforts may benefit other AI/AN communities seeking to reduce underage drinking.

INTRODUCTION

American Indians and Alaska Natives (AI/ANs) have significant health disparities with regard to alcohol use, substance use disorders, and related morbidity and mortality. It is particularly important that intervention efforts begin at a young age in AI/ANs since early initiation of alcohol use and heavy drinking increases the risks for lifetime alcohol use disorders (Grant & Dawson, 1997; Hingson, Heeren, & Winter, 2006), particularly among AI/ANs where it has been documented that drinking begins at a younger age than other groups (Chartier & Caetano, 2010;

Ehlers, Slutske, Gilder, Lau, & Wilhelmsen, 2006). Additionally, since youth from rural communities have elevated risk for underage drinking, as compared to their urban and suburban counterparts (De Haan, Boljevac, & Schaefer, 2009), AI/AN youth on rural Indian reservations may have particularly heightened risk (Blum, Harmon, Harris, Bergeisen, & Resnick, 1992; Cheadle & Whitbeck, 2011; Friese & Grube, 2008; Potthoff et al., 1998; Stanley, Harness, Swaim, & Beauvais, 2014; Walsh & Baldwin, 2015).

Recent reviews of interventions among AI/AN youth reveal that AI/AN populations have been relatively underrepresented in evidence-based prevention efforts to reduce underage drinking (Walsh & Baldwin, 2015). Many authors have additionally stressed the importance of using a community-based comprehensive and collaborative strategy to address the problems of youth substance abuse in AI/AN communities in order to effect long term solutions. One such program is the community readiness model (see Donnermeyer, Plested, Edwards, Oetting, & Littlethunder, 1997; Edwards, Jumper-Thurman, Plested, Oetting, & Swanson, 2000; Oetting et al., 1995; Oetting, Jumper-Thurman, Plested, & Edwards, 2001; Plested, Jumper-Thurman, Edwards, & Oetting, 1998; Plested, Smitham, Jumper-Thurman, Oetting, & Edwards, 1999). That model has six primary dimensions of which community knowledge of the efforts is a key component (Thurman, Plested, Edwards, Foley, & Burnside, 2003). Another program aimed at increasing community awareness and providing psychoeducation focusing on empathy, cultural humility, and cultural responsiveness in substance use disorder (SUD) treatment is the “Through the Diamond Threshold” program (Robbins, Stare, & Riggin, 2019). Community involvement and awareness of SUD programs thus is key to obtaining stakeholder buy in to a program and to foster sustainability.

In a review of the epidemiology and etiology of substance use in AIs, Whitesell and colleagues (2012) also suggest that “the development of effective prevention strategies, built through collaboration between researchers and Native communities, drawing from the wisdom of both, is a high priority” (p. 1). Novins and Baron (2004) found few studies with sufficient research rigor to draw firm conclusions about effectiveness, but another review by Jiwa, Kelly, and Pierre-Hansen (2008) highlighted infrastructure development and community involvement as key components of successful AI substance use prevention programs. More recently, two studies have demonstrated that multi-level prevention trials can successfully reduce alcohol use among AI teens (Komro et al., 2017; Moore et al., 2018), opening up the possibility that such programs can be successfully applied more widely to reduce substance-related harm among AIs. One study used a multi-level prevention trial among AI teens in the Cherokee Nation (see Komro et al., 2017; Komro

et al., 2015). That study found that the combination of a community organizing intervention targeting alcohol access and a school-based screening with brief intervention was effective in reducing 30-day alcohol use and heavy episodic drinking. In our own study, reported in Moore and colleagues (2018), we found that a multi-level intervention was also successful in reducing past 30-day drinking and heavy episodic drinking in rural California Indian reservation communities exposed to the interventions.

In assessing the effectiveness of a multi-level intervention, it is not always possible to determine 1) to what extent the youth and other community members were aware of the intervention and 2) which programs among the intervention efforts were the most effective. The present study reports data assessing the awareness and perceived effectiveness of the successful multi-level intervention we carried out (see Moore et al., 2018) from 2008–2011 to reduce and prevent underage drinking in nine contiguous rural California Indian reservations. The main results of the study have been described previously (see Gilder et al., 2017; Gilder, Gizer, Lau, & Ehlers, 2014; Gilder et al., 2011; Lee et al., 2015; Moore et al., 2018; Moore et al., 2012). The overall project was initiated following requests from leaders of these sovereign Tribal nations and included both individual-level and community-level strategies (described later). Extended outreach efforts aimed at raising the awareness of alcohol problems and mobilizing extended community support for the project goals were also accomplished. Since the Tribal communities did not want to participate in a randomized control study, previous assessments of the overall impacts of the combined interventions relied on alcohol use data from the California Healthy Kids Survey (CHKS). This anonymous survey was collected in the school districts serving the nine participating reservations and in nine comparison reservations who were not part of the intervention. Although evaluation of the CHKS spotlighted the effectiveness of the multi-level intervention (Moore et al., 2018), the aims of the present report are to: 1) more fully describe the methods used in the community outreach program, 2) present results of a community survey that queried youth and adults on their awareness of the different aspects of the interventions, and 3) describe results from the survey that assessed the perceived effectiveness of the interventions.

METHODS

This project represents a collaboration between AI/AN clinicians and community members among nine consortium Tribes within a half-hour drive of a primary and satellite

branch of the Southern California Tribal Health Clinic (a pseudonym used to protect confidentiality) and prevention scientists. Prior to the advent of the study, an advisory panel of AI leaders was convened to ensure community participation and approval (Lee et al., 2011). A description of the overall strategy has been published previously (Moore et al., 2018). Briefly, the individual-level strategy included eligible youths that were randomized to receive a culturally tailored brief motivational interviewing (MI) session or a psychoeducation (PE) session. The MI component assessed the readiness of the individual youth to change their alcohol drinking (or not start) and then implemented a directive psychotherapeutic treatment tailored to that stage of change (Miller, 1996; Miller & Rollnick, 2013; Venner, Feldstein, & Tafoya, 2006). The PE session was delivered by the therapist and consisted of watching two DVDs on the consequences of drinking and dangers of binge drinking. MI and PE were delivered in both individual and group formats (Gilder et al., 2017). The community-level Environmental Prevention strategy included a Reward and Reminder program aimed at reducing youth access to alcohol. This program enlisted AI young adults who were aged < 21 years, but judged to look younger, to visit off-premise alcohol stores located on and near the reservations and attempt to purchase alcoholic beverages (Moore et al., 2012). Project staff “rewarded” clerks who asked for age identification or “reminded” clerks who did not request identification of the existence of underage sales laws (Biglan et al., 1996; Biglan, Ary, Smolkowski, Duncan, & Black, 2000; Flewelling et al., 2013).

The treatment and prevention strategies were supported by a community outreach program to: 1) raise community awareness about the risks of underage substance use, 2) inform the community members about the different strategies that were being used to reduce drinking in youth, and 3) to mobilize support for the interventions. The research team developed informational materials on underage alcohol use for distribution to youths, parents, Tribal leaders, and health clinic professionals. Presentations were given using clinical and scientific information on the risks of underage drinking and prevention strategies that were combined with traditional arts activities and discussion of historical trauma that was tailored to the age group of the participants and the particular venue of the presentations. In addition, “activities” were used to engage parents and youth to participate and to listen carefully to the presentations. These activities included a series of five games that are presented in Table 1.

**Table 1
Presentation Activities**

| Activity | Description |
|-------------------------------|---|
| Who wants to be a millionaire | Prior to the activity, the team presents on the consequences of underage drinking. Then, following the format of the popular television show, youth are quizzed on information presented earlier in the activity. |
| Puzzle piece | Each youth receives a white puzzle piece after a presentation on preventing underage drinking. Pens, markers, and sharpies are available for the youth to write, draw, color or however they choose to express what alcohol means to them. |
| Obstacle course | Youth are asked to walk through an obstacle course with beer goggles (i.e., goggles worn to simulate the effect of intoxication). Obstacles included walking on a line that was curved and straight, shooting a basketball in a basket and jumping through hula hoops. |
| Distract-A-Match | Youth count out loud from 100 back to 0 while matching shapes and colors. Youth then wear beer goggles (i.e., goggles worn to simulate the effect of intoxication) and try to complete the same tasks while counting backwards from 100. |
| Nuts and bolts | Youth must unscrew and screw a nut off a bolt and then re-screw the nut. Next, the youth must complete the same task wearing thick gloves. Finally, youth wear the beer goggles (i.e., goggles worn to simulate the effect of intoxication) and try to complete the same tasks. |

A total of 298 presentations and activities were completed. Research staff from the local AI communities presented the materials and activities and discussed alcohol-related risks and alcohol-free strategies with the youths and parents. The venues included health fairs, pow-wows, and cultural gatherings (98 events). The research staff also gave presentations at after-school programs for each Tribe, at a reservation charter school, at Tribal councils, and other meetings (101 presentations to youths and 72 to parents and Tribal leaders), and gave presentations and trainings to the medical, dental, and community health departments at the tribal health clinics (27 events), as seen in Table 2. As an additional outreach strategy, Tribal youths were invited to design billboards placed alongside roads on and between reservations that contained messages aimed at reducing underage drinking among Tribal youth (Moore et al., 2012). Cultural tailoring of the activities was a focus of the outreach effort but to an extent was complicated by the fact that the study area contains at least four major language groups and nine reservations, which share some, but by no means all, spiritual, symbolic, and artistic traditions. Therefore, the tailoring touched on familiar elements of local storytelling styles and referenced some familiar iconography from basket designs, but could be characterized as “surface” rather than “deep” cultural adaptation (Resnicow, Baranowski, Ahluwalia, & Braithwaite, 1999). For example, to create the billboard, the study team held a series of youth workshops on the different reservations in which various alternative designs were presented, including reference to local traditional musical instruments

(e.g., gourd rattles) and dreamcatchers. Youth offered their own designs (some relying upon generic Western cultural motifs and others more focused on Tribal imagery) and then voted on their favorites, which contributed to a collaborative ownership of the billboard when it was printed and placed along a central roadway linking many of the reservations.

Table 2
Format of Community Outreach Activities

| Activity | Number |
|---|---------------|
| Information Booths | 98 |
| Age-Tailored Presentations to Youth | 101 |
| Presentations to Parents and Tribal Leaders | 72 |
| Presentations to Tribal Clinic Health Professionals | 27 |
| Total | 298 |

At the conclusion of the interventions, a survey was taken of the local community to assess the awareness and perceived effectiveness of the interventions, including the outreach component. Surveys were collected at multiple tribal events from 120 adults (21 yrs. and older) and 74 youth (20 yrs. or less) who were residing in the reservation study area. The survey queried, for each component of the intervention, whether an individual was aware of the component and, if aware, whether he or she took action to reduce underage drinking (adults) or reduced their own drinking (youth, if they had already begun drinking). Additional questions assessed whether the intervention as a whole (all components) moved individuals along the transtheoretical model of stages of behavior change from pre-contemplation to action to reduce underage drinking.

Statistical Analyses

Descriptive statistics of participants' ages and gender, and how many participants endorsed each scale item were tabulated and compared. Two sets of outcome variables from the surveys were analyzed: awareness of an intervention and perceived effectiveness to change a behavior. Awareness of an activity was a dichotomous measure (yes vs. no). Perceived effectiveness was assessed using Likert scale variables, and they were treated as dichotomous ("Strongly agree" and "Agree" vs. "Neutral," "Disagree," and "Strongly disagree"). In the youth survey a participant could also indicate that they had never drank and, thus, would not be included in the perceived effectiveness measure. Gender effects on outcome variables were conducted using Fisher's exact

test. Age effects on outcome variables were determined using ANOVA. Fisher's exact test was also used to compare responses between adults and youth. Logistic regression, that included age and/or gender when it was significant for that item, was used to determine the relationship between the number of interventions that the participant was aware of and the perceived effectiveness of the intervention to change behavior. Analyses were carried out using SPSS Version 20 (IBM Corp., 2011). Significance was set at $p < 0.05$.

RESULTS

This study sought to evaluate the awareness and perceived effectiveness of combined individual- and community-level interventions to reduce underage drinking by AI youths on rural California Indian reservations. A survey was drafted to query both adults ($n = 120$) and youth ($n = 74$).

Adult Survey

The mean age of the adults who completed the survey was 43.5 years (± 2.6). There were 90 women and 30 men who participated in completing the survey. As seen in Table 3, the first five questions of the survey queried the participant as to whether they: 1) were aware of the existence of the overall intervention; 2) saw the billboard; 3) were aware of the Reward and Reminder program; 4) were aware of the MI/PE intervention; and 5) were aware of the alcohol information outreach activities described in the present report. A high proportion (93%, $n = 111$) of respondents endorsed being aware of one or more of the intervention activities. With respect to individual items, as seen in Table 3, the highest percentage were aware of the Reward and Reminder (77%; $n = 92$), and the least number (49%; $n = 59$) had seen the billboard. There were no age differences in the proportion of participants who responded positively to having been aware of any of the intervention activities. The only gender difference seen was in response to the Reward and Reminder program where a higher proportion of men endorsed knowing about that program than women (Fisher's exact test = 4.0; $df = 1,119$; $p < 0.05$).

The second seven items on the survey are listed in Table 4, as well as the proportion of adult respondents who agreed or disagreed with each item. There were no age or gender differences in the proportion of respondents who agreed or disagreed with these items. Ninety percent ($n = 108$) of respondents agreed to liking the intervention activities, and 88% ($n = 106$) felt the

interventions impacted the community in a positive way. Seventy-one percent ($n = 84$) agreed that the overall intervention prompted them to take an action against teen drinking. Sixty-seven percent ($n = 78$) said that the Reward and Reminder program and 64% ($n = 76$) said that the MI/PE program helped them to take an action to reduce a teen’s drinking. The most highly endorsed item was the alcohol information presentations. Seventy-two percent ($n = 85$) of adults indicated that the presentations helped them to take an action to reduce a teen’s drinking.

Table 3
Awareness of Prevention Activities. Number and percent shown for those surveyed who was aware of prevention activities.

| | Community Prevention Activities Awareness Survey Question | Adult | Youth |
|---|--|--------------|--------------|
| 1 | I was aware of the youth alcohol prevention efforts conducted by the Southern California Tribal Health Center (SCTHC) preventing underage drinking program | 91 (76%) | 54 (73%) |
| 2 | I saw the billboard with the alcohol prevention message along the [name removed] state highway on the [name removed] Reservation | 59 (49%) | 23 (31%) |
| 3 | I was aware of the convenience store checks that the program conducted to ensure proper ID checking by clerks when selling alcohol | 92 (77%) | 50 (68%) |
| 4 | I was aware of the motivational interviewing and alcohol education videos conducted by the SCTHC’s preventing underage drinking program | 76 (63%) | 45 (61%) |
| 5 | I was aware of the alcohol information presentations that SCTHC staff conducted at local schools, tribal afterschool programs, and community youth events | 78 (65%) | 55 (74%) |

Table 4
Effectiveness of Prevention Activities. Number and percentage of those surveyed who “strongly agree” or “agree.”

| | Community Prevention Activities Awareness Survey Question | Adult | Youth |
|----|---|--------------|--------------|
| 6 | I liked these prevention activities | 108 (90%) | 32 (55%) |
| 7 | These activities impacted the community in a positive way | 106 (88%) | 44 (71%) |
| 8 | These activities prompted me to take an action against a teen’s drinking (cut down or stop drinking) | 84 (71%) | 20 (56%) |
| 9 | The billboard helped me to take an action to reduce a teen’s drinking (cut down or stop drinking) | 70 (60%) | 18 (56%) |
| 10 | The convenience store checks helped me to take an action to reduce a teen’s drinking (cut down or stop drinking) | 78 (67%) | 21 (64%) |
| 11 | The motivational interviewing or alcohol education videos helped me to take an action to reduce a teen’s drinking (cut down or stop drinking) | 76 (64%) | 18 (56%) |
| 12 | The alcohol information presentations helped me to take an action to reduce a teen’s drinking (cut down or stop drinking) | 85 (72%) | 19 (63%) |

Note: Survey wording differed slightly for adult and youth, with youth survey indicated in parentheses. Total numbers of youth answering each question varied because on the Youth Survey youth had an option to answer “Didn’t know about them” (Questions 6-7) and “I don’t drink” (Questions 9-12).

The final three items on the survey queried whether, as a result of the activities, the person felt empowered to do something about teen drinking and if they moved along the transtheoretical model of stages of behavior change from pre-contemplation to contemplation or from contemplation to preparation to take action to reduce drinking. There were no age or gender effects on these three items. As seen in Table 5, a high percentage of respondents (80%, $n = 86$) agreed that they went from not realizing there was a problem to realizing there was a problem with teen drinking in their community. Eighty-four percent ($n = 93$) said that the activities resulted in their going from thinking that they couldn't do anything to thinking that they could do something about teen drinking in their community. Eighty-four percent ($n = 92$) agreed that as a result of the activities they decided to take action to reduce teen drinking in their community.

Table 5
Empowerment (Q14) and Movement along the Transtheoretical Model of Stages of Behavior Change from Pre-contemplation to Contemplation (Q13) and from Contemplation to Preparation (Q15). Number and percent shown for those surveyed whom "strongly agree" or "agree."

| | Community Prevention Activities Awareness Survey Question | Adult | Youth |
|----|---|--------------|--------------|
| 13 | As a result of these activities I went from not realizing there was a problem to realizing there was a problem with teen drinking in my (family or) community | 86 (80%) | 20 (57%) |
| 14 | As a result of these activities I went from thinking I couldn't do anything to thinking I could do something about teen drinking in my (family or) community | 93 (84%) | 19 (63%) |
| 15 | As a result of these activities I decided to take action to reduce teen drinking in my family or community | 92 (84%) | 19 (63%) |

Note: Survey wording differed slightly for adult and youth, with youth survey indicated in parentheses. Total numbers of youth answering each question varied because on the Youth Survey youth had an option to answer "Already realized it" (Question 13), "Already thought so" (Question 14), and "Already decided" (Question 15).

Table 6 presents the odds ratios and p -values for a set of analyses that investigated whether having been aware of multiple numbers of the intervention activities (responses to items 1 to 5 in Table 2) resulted in an increase in the odds that they would endorse the 10 other items in the survey. Using logistic regression, it was found that being aware of more of the activities significantly increased the odds of positively endorsing all other items except two of the change items (moving from not knowing there was a problem to knowing, and going from thinking they couldn't do anything to thinking that they could).

Table 6
Increased Awareness of Prevention Activities and Effect on Action

| | Community Prevention Activities Awareness Survey Questions | Adult | | Youth | |
|----|---|-------|----------|-------|----------|
| | | OR | <i>p</i> | OR | <i>p</i> |
| 6 | I liked these prevention activities | 2.06 | 0.001 | 1.86 | 0.009 |
| 7 | These activities impacted the community in a positive way | 1.61 | 0.008 | 1.76 | 0.012 |
| 8 | These activities prompted me to take an action against a teen's drinking (cut down or stop drinking) | 1.40 | 0.01 | 2.01 | 0.024 |
| 9 | The billboard helped me to take an action to reduce a teen's drinking (cut down or stop drinking) | 1.63 | 0.001 | 1.29 | 0.472 |
| 10 | The convenience store checks helped me to take an action to reduce a teen's drinking (cut down or stop drinking) | 1.46 | 0.004 | 1.45 | 0.156 |
| 11 | The motivational interviewing or alcohol education videos helped me to take an action to reduce a teen's drinking (cut down or stop drinking) | 1.59 | 0.001 | 1.66 | 0.114 |
| 12 | The alcohol information presentations helped me to take an action to reduce a teen's drinking (cut down or stop drinking) | 1.59 | 0.001 | 1.45 | 0.168 |
| 13 | As a result of these activities I went from not realizing there was a problem to realizing there was a problem with teen drinking in my (family or) community | 1.16 | 0.32 | 1.36 | 0.263 |
| 14 | As a result of these activities I went from thinking I couldn't do anything to thinking I could do something about teen drinking in my (family or) community | 1.25 | 0.16 | 1.45 | 0.17 |
| 15 | As a result of these activities I decided to take action to reduce teen drinking in my family or community | 1.67 | 0.003 | 1.45 | 0.17 |

Note: Survey wording differed slightly for adult and youth, with youth survey indicated in parentheses.

Youth Survey

The mean age of the youth who completed the survey was 14.2 years (± 0.5). There were 38 girls and 36 boys who participated in completing the survey. There were no age or gender differences in the proportion of youth who responded positively to having been aware of the intervention activities. A high proportion (96%, $n = 71$) of youth endorsed being aware of one or more of the activities. With respect to individual items, as seen in Table 3, the highest percentage were aware of the educational outreach (74%; $n = 55$), and the least number (31%; $n = 23$) had seen the billboard.

The second seven items on the survey are listed in Table 4, as well as the proportion of youth respondents who agreed or disagreed with each item. There was only one age difference on these items. Youth who agreed that the billboard helped them to cut down on or stop drinking were younger than those who did not agree with this item ($F = 9.3$; $df = 1,93$; $p < 0.005$). There were also some gender differences in the proportion of respondents who agreed or disagreed with these items. Girls were more likely to say that the billboard ($F = 8.7$; $df = 1,31$; $p < 0.005$) and the MI/PE ($F = 5.0$; $df = 1,31$; $p < 0.04$) helped them to cut down or stop drinking as compared to boys. Fifty-five percent ($n = 32$) of youth agreed to liking the intervention activities, and 71% ($n = 44$) felt the

interventions impacted the community in a positive way. Fifty-six percent ($n = 20$) agreed that the overall intervention prompted them to cut down or stop drinking. The most highly endorsed items that prompted them to change their drinking behavior were the alcohol presentations at the community outreach sessions (63%; $n = 19$) and the Reward and Reminder program (64%; $n = 21$).

There were no age effects on the final three items on empowerment and the transtheoretical model of stages of behavior change from pre-contemplation to action to reduce drinking in the youth. However, girls were more likely than boys to agree that they went from not realizing there was a problem to realizing there was a problem with teen drinking in their family or community ($F = 5.04$; $df = 1,34$; $p < 0.04$). As seen in Table 5, 57% ($n = 20$) overall agreed that they went from not realizing there was a problem to realizing there was a problem, 63% ($n = 19$) said that the activities resulted in them going from thinking that they couldn't do anything to thinking that they could do something, and 63% ($n = 19$) agreed that as a result of the activities they decided to take action to reduce teen drinking in their family or community.

Table 6 presents the odds ratios and p -values for a set of analyses that investigated whether having been aware of multiple numbers of the intervention activities (responses to items 1 to 5 in Table 3) resulted in an increase in the odds that the youth would endorse the 10 other items in the survey. Using logistic regression that included age and/or gender when it was significant for that item revealed that being aware of more of the activities significantly increased the odds of positively endorsing three of the items (liking intervention activities, feeling they positively impacted the community, and activities prompted me to cut down or stop drinking).

Comparison of Youth and Adult Surveys

There were some differences between the youth and adults in endorsement of individual items on the survey. A higher percentage of adults endorsed having seen the billboard ($F = 6.1$; $df = 1,193$; $p < 0.02$) than youth. Adults were more likely than youth to endorse liking the activities ($F = 28.2$, $df = 1,177$; $p < 0.0001$) and that the activities impacted the community positively ($F = 8.5$; $df = 1,181$; $p < 0.007$). Adults were also more likely than youth to endorse that they overall agreed that they went from not realizing there was a problem to realizing there was a problem ($F = 7.5$, $df = 1,141$; $p < 0.01$), said that the activities resulted in their going from thinking that they couldn't do anything to thinking that they could do something ($F = 6.05$, $df = 1,140$; $p < 0.02$), and agreed that as a result of the activities they decided to take action to reduce teen drinking in their family or community ($F = 6.5$, $df = 1,138$; $p < 0.02$).

DISCUSSION

It has been suggested that health outcomes in intervention studies are the result of three factors: 1) the magnitude of the effect of the intervention, 2) the awareness and penetration of an intervention into the community, and 3) the sustainability of the effects (Hawe, Noort, King, & Jordens, 1997). Several studies have shown the efficacy of Environmental Prevention strategies to reduce community alcohol problems, including underage drinking, by reducing commercial alcohol availability (Holder et al., 2000; Treno, Gruenewald, Lee, & Remer, 2007; Treno & Lee, 2002; Wagenaar, Toomey, & Erickson, 2005). However, few investigators have described interventions on alcohol use among AI/AN youths (see Cheadle et al., 1995; Gabriel, Leichtling, Bolan, & Becker, 2013; Kulis, Ayers, & Harthun, 2017; May & Moran, 1995; Usera, 2017; Wagenaar, Livingston, Pettigrew, Kominsky, & Komro, 2018; Whitesell et al., 2012; Williams & Perry, 1998). A few studies have included AI/ANs in the study design but were not powered to test for effects that might be specific to the AI/AN sample (Livingston et al., 2018; Perry et al., 2000; Perry et al., 1996). In one of those studies, community-level and individual approaches were employed and the 2-year intervention resulted in significant reductions in alcohol use (Komro et al., 2017). However, that study also found a convergence in outcomes during the final year, suggesting that the effects of the intervention might not have been sustained (Komro et al., 2017). The overall study, on which the current set of analyses are based, was a multi-level intervention for underage drinking in AI youth that included analyses for two years before the intervention and four years following the intervention. That study showed a significant and sustained effect on underage drinking (Moore et al., 2018).

The current study described the response to a multi-component community-based intervention to reduce and prevent underage drinking that could be culturally tailored by other tribal communities. A small survey of youth visiting an Indian Health Clinic, in the catchment area of this study, found that 37% of boys and 54% of girls had drunk one or more standard drinks in their lifetimes, and that 27% of boys and 39% of girls reported having been intoxicated with alcohol one or more times (Gilder et al., 2013), thus documenting the need for reducing underage drinking. With respect to the interventions, we found that a high proportion of AI individuals queried endorsed knowing about one or more of the intervention activities (93% of adults and 96% of youth). There were some differences between adults and youth in what individual components of the intervention they were aware of, with adults being more likely to know about the intervention activities than youth. The importance of engagement of youth in intervention activities

has been stressed by others who have conducted successful multi-level trials for reducing adolescent alcohol use (Perry et al., 2000).

In assessing the effectiveness of a multi-level intervention, it is not always possible to determine which components among the intervention efforts were the most effective. The present study sought to query both youth and adult AIs as to what activities they thought led to changes in their (teen) or their teen's (adult) drinking behaviors. Overall, over half of the adults felt that the interventions prompted them to behavioral change with the most highly endorsed individual item being alcohol information presentations at the community outreach sessions. Interestingly, a lower percentage of youth agreed that the interventions prompted them to cut down or stop drinking (although many youth also indicated that they did not drink). Additionally, there were some gender differences in youth responses with girls appearing to have been more affected by the interventions than boys. Overall, the youth also felt that the alcohol presentations at the community outreach were effective in prompting them to cut down or stop drinking.

These data are consistent with a component analysis of the effects of different intervention strategies that were used in Project Northland, a multi-level intervention trial to prevent and reduce alcohol use in rural Minnesota that included some AI youth (Stigler, Perry, Komro, Cudeck, & Williams, 2006). In those sets of analyses, the strongest effects were documented for the planners of parent program components and extra-curricular activities, and only modest effects were seen for the classroom curricula. There has been widespread consensus that although classroom education programs are the most common venue for prevention (Botvin & Griffin, 2007), they have resulted in sparse evidence for efficacy in reducing teen substance use (Pan & Bai, 2009; Spoth, Greenberg, & Turrisi, 2009). There have been some suggestions that the most effective programs include interactive activities (Botvin & Griffin, 2007). Our studies support this construct and further suggest that engaging both parents and teens in interactive educational activities can result in action toward behavioral change of underage drinking by both adults and teens.

Our results suggest that exposure to multiple types of intervention strategies can significantly enhance the odds that an adult will take action to prevent underage drinking and that a teen will change their drinking behavior. These findings support the multi-level intervention approach. It has been suggested that a “paradigm shift” from using European American prevention science techniques to those that are culturally relevant to the community are needed in order to create a “grass roots” level approach to AI substance use prevention (Whitbeck, Walls, & Welch, 2012). Our study group supports this idea and our study suggests that involving both teens and

adults in each step of the process in designing an intervention is important. Our findings are of particular importance for AI/AN communities because of the value AI/AN Tribes place on the well-being of their children, which can be potentially threatened by alcohol involvement (Connors, 2011). Considering the relative young age of many AI/AN populations (National Congress of American Indians, 2019), developing culturally relevant and effective interventions to reduce youth drinking takes on additional significance.

This study has several limitations and strengths that should be considered. Working within the guidelines of tribal consent, this survey was not conducted using randomized sampling methods and may represent a biased sample of the AI community. Among adult respondents there were more women than men who chose to participate. Furthermore, although the results strongly suggested that the interventions had substantial effects, we were also unable to randomly assign reservations to intervention and control conditions. Additionally, since the Reward and Reminder component was not designed to modify individuals' behaviors, but to reduce commercial availability of alcohol to underage youths at the community level, exposure to this component could also not be randomized. Study strengths included tribal participation and the demonstration of significant impact and multiplicative effects of the interventions. Tribal leader ownership and support of this project was key in the successful implementation of the described project activities and provided ongoing insight and guidance that ensured that intervention activities and goals were locally acceptable and culturally appropriate. In addition, participation by young adult AI/AN project research staff might well have been critical to the successful outcomes achieved. In conclusion, this study documents that a significant proportion of the community was aware of the intervention efforts and that awareness caused them to take action to reduce underage drinking. Such efforts may benefit other AI/AN communities seeking to reduce underage drinking.

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