

Prevention of Underage Drinking on California Indian Reservations Using Individual- and Community-Level Approaches

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Objectives. To evaluate combined individual- and community-level interventions to reduce underage drinking by American Indian/Alaska Native (AI/AN) youths on rural California Indian reservations.

Methods. Individual-level interventions included brief motivational interviewing and psychoeducation for Tribal youths. Community-level interventions included community mobilization and awareness activities, as well as restricting alcohol sales to minors. To test effects, we compared 7 waves of California Healthy Kids Survey data (2002–2015) for 9th- and 11th-grade AI/AN and non-AI/AN students in intervention area schools with California AI/AN students outside the intervention area ($n = 617$, $n = 33\,469$, and $n = 976$, respectively).

Results. Pre- to postintervention mean past 30-day drinking frequency declined among current drinkers in the intervention group (8.4–6.3 days) relative to comparison groups. Similarly, heavy episodic drinking frequency among current drinkers declined in the intervention group (7.0–4.8 days) versus the comparison groups.

Conclusions. This study documented significant, sustained past 30-day drinking or heavy episodic drinking frequency reductions among AI/AN 9th- and 11th-grade current drinkers in rural California Indian reservation communities exposed to multilevel interventions.

Public Health Implications. Multilevel community-partnered interventions can effectively reduce underage alcohol use in this population. (*Am J Public Health*. Published online ahead of print June 21, 2018; e1–e7. doi:10.2105/AJPH.2018.304447)

Underage drinking is a public health concern for US youths, including American Indians and Alaska Natives (AI/ANs),^{1,2} and has acute and long-term consequences.^{3–5} Early initiation of alcohol use and heavy drinking increase risks for lifetime alcohol use disorders,^{6,7} especially among AI/ANs who have reported younger onsets than other groups.^{8,9} Because adolescents from rural areas may be at increased risk for underage drinking,¹⁰ AI/AN adolescents on rural Indian reservations may be at greater risk than are other adolescents.^{2,11–14} However, reviews of interventions among AI/AN adolescents have found few studies with sufficient research rigor to establish program acceptability or effectiveness in Tribal communities.¹⁵

Interventions to prevent underage drinking tend to be either: (1) community-level approaches to reduce alcohol availability or (2)

individual-level approaches to discourage alcohol use via clinical or educational efforts with children or parents. Combining these approaches is rare,^{16,17} especially for AI/AN youths.¹⁸ However, multilevel interventions have the potential to work synergistically to reduce both supply of and demand for alcohol.

The present study reports on a long-term collaborative effort (2006–2015) between clinicians, prevention scientists, and Tribal leaders to prevent underage drinking in 9

contiguous rural California Indian reservations. We initiated the project at the request of leaders of these sovereign Tribal nations. We developed the partnerships and interventions during a capacity-building and pilot phase. During the intervention phase (2008–2011), the project staff implemented both community- and individual-level prevention strategies. Following the intervention phase, program staff continued to hold outreach events at community gatherings and Tribal after school programs.

The individual-level strategy consisted of a randomized trial of brief motivational interviewing (MI) compared with psychoeducation (PE) for reducing and preventing underage drinking. MI has been found to be effective for youths,^{19,20} including AI/ANs,²¹ is acceptable to California Indians,²² and is culturally adaptable for use with AI youths.^{23,24} The community-level strategies targeted the sale of alcohol to minors, together with outreach efforts to raise awareness of alcohol problems and mobilize support for project goals. Previous prevention studies have shown significant reductions in drinking and drinking problems as a result of modifying the alcohol environment.^{25–27} Despite some evidence that modifying the alcohol environment can have beneficial effects for AI/ANs,^{28,29} effects of environmental prevention programs for Tribal populations have been rarely tested.

We hypothesized that combined individual- and community-level interventions

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to reduce alcohol consumption by Tribal youths in reservation settings would be associated with lower prevalence and frequency of alcohol consumption than among Tribal youths in reservations outside the intervention catchment area. Because the Tribal communities did not wish to implement a randomized control study, we assessed the overall impacts of the combined interventions by analyzing alcohol use data from the California Healthy Kids Survey (CHKS), which was collected anonymously in the school districts serving the 9 participating reservations and the 9 comparison reservations.

METHODS

Our project combined the clinical, research, and environmental prevention expertise of the scientific partners together with the medical and cultural expertise of AI/AN clinicians serving the 9 consortium Tribes within half an hour drive of the primary and satellite branches of the Southern California Tribal Health Clinic (a pseudonym used to protect confidentiality). Local Tribal members provided the medical and administrative leadership of the clinic. In addition, we convened advisory panels of local Indian leaders to ensure the efforts complied with their wishes. The project provided ongoing training opportunities for AI/AN college interns involved in data collection, analysis, implementation, and dissemination.³⁰

Individual-Level Strategy

Eligible youths were randomized to receive MI or PE. MI assesses the readiness of an individual to change and then implements a directive psychotherapeutic treatment tailored to that stage of change, using a collaborative and nonconfrontational approach³¹ that encourages clients to adopt changes in unhealthy behaviors, in this case, drinking alcohol.³²

Clinic therapists underwent intensive training in MI techniques and used a culturally tailored MI manual previously tested with diverse AI/ANs for the MI condition.³³ The PE condition consisted of watching 2 DVDs on the consequences of drinking and dangers of binge drinking, assisted by the therapist. Both conditions lasted 1.5 hours. MI and PE

were delivered in individual and group formats.

Community-Level Strategy

The environmental strategies focused on decreasing underage access to alcohol and reinforcing community norms against providing alcohol to youths. Within the study area, 7 of the 9 Tribes allowed alcohol sales and consumption, and off-premise outlets operated on or near most of the reservations.³⁴ Based on input from our project advisory board, we implemented a recognition and reminder program to reduce sales to minors. In recognition and reminder programs, apparent minors (i.e., volunteers who were aged ≥ 21 years, but judged to look younger) visited stores and attempted to purchase alcoholic beverages. Project staff reinforced clerks who asked for age identification or reminded clerks who did not request identification of underage sales laws. Recognition and reminder programs have been found to reduce alcohol and tobacco sales to minors.^{35–37}

We first sought Tribal council proclamations supporting underage drinking prevention, including recognition and reminder efforts. Next, apparent minors attempted to purchase alcohol without identification in all licensed off-premise outlets on or within 10 miles of the reservations ($n = 13$). Clerks who asked for identification were given gift cards and congratulatory letters. Clerks who did not were given reminder letters about the law regarding sales to minors. Following a single baseline attempt at each store with no feedback provided to clerks, staff and volunteers made 3 recognition and reminder visits with a different volunteer each time (1 store opened following the baseline observations, thus there were 51 total attempts). Increases in identification checking were observed following implementation of this program.³⁴

Community Mobilization

We implemented an outreach program to raise community awareness about the risks of underage substance use and to mobilize support for the interventions. Project staff developed informational materials on underage alcohol use for distribution to youths, parents, Tribal leaders, and health clinic professionals. Outreach staff from local

communities presented these materials and discussed alcohol-related risks and alcohol-free strategies with youths and parents at health fairs, pow-wows, and cultural gatherings (98 events). Staff also gave age-appropriate presentations at the after school programs of each Tribe, a reservation charter school, Tribal councils, and other meetings (101 presentations to youths and 72 to parents and Tribal leaders), and gave 27 presentations and trainings to the medical, dental, and community health departments at the clinic. When wildfires destroyed a billboard located on a road linking participating Tribal communities, staff engaged Tribal youths to design a new billboard with culturally specific messaging related to the project goals. Overall, staff conducted 298 community awareness activities or presentations.

These activities supported staff requests for community participation, including Tribal council proclamations and recruitment to the MI-PE study. Because community awareness and mobilization activities engaged project staff directly with community members at both leadership and grassroots levels, this component ensured that project activities were responsive to community knowledge, interests, and concerns, including tailoring program activities to local and culturally specific conditions.

Overall Program

To evaluate the overall program, we analyzed data from the 2002 to 2003 through 2014 to 2015 CHKS. CHKS consists of successive cross-sectional, self-administered anonymous surveys that are administered biennially in schools with funding from the California Department of Education. The CHKS assesses substance use and asks about demographic characteristics, including race and ethnicity. The survey is administered to 7th, 9th, and 11th graders. Because drinking rates were low among 7th graders, our analyses for this study focused on 9th and 11th graders. For participating school districts, 100% of eligible schools and 100% of classrooms in those schools are required to participate. WestEd, a nonprofit research organization, coordinates the CHKS data collection and works with schools to achieve response rates of 70% or greater.³⁸ The high schools attended by AI/AN students from the

participating reservations are located off Tribal lands, but within a half-hour drive of the reservations and participate in the CHKS survey.

Participants were asked their age (≤ 10 , 11, 12, 13, 14, 15, 16, 17, or ≥ 18 years) and their race (AI/AN, Asian, Black or African American, Native Hawaiian or Pacific Islander, White, or mixed races). We coded responses as AI/ANs if participants endorsed AI/ANs, otherwise they were coded as non-AI/ANs.

Alcohol consumption was measured by (1) lifetime frequency of drinking, (2) frequency of drinking in the past month, and (3) frequency of heavy drinking in the past month. These measures closely correspond to the National Institute for Alcohol Abuse and Alcoholism recommended survey items.³⁹ Lifetime consumption was measured by asking respondents how many times during their life they had a full drink of alcohol. Response categories changed over time, and this question was dichotomized as any lifetime drinking. Drinking in the previous month was measured by asking on how many days during the past 30 days respondents had at least 1 whole drink of alcohol. Heavy drinking was measured by asking on how many days during the past 30 days respondents had 5 or more drinks of alcohol within a couple of hours (0, 1, 2, 3–9, 10–19, and 20–30 days). To convert response categories into a meaningful metric, they were recoded into number of drinking days (0, 1, 2, 6, 14.5, and 25 days). For 30-day use and heavy drinking, we considered both prevalence (yes, no) and frequency of use in the analyses.

Our analyses compared 3 groups: (1) AI/AN students from the schools surrounding the reservations participating in the interventions (INT-AI/AN), most of whom would have been exposed to the intervention ($n = 617$); (2) non-AI/AN students from these same schools (COMP-NAI/AN), most of whom would not have been exposed to the intervention ($n = 33\,469$); and (3) AI/AN students ($n = 976$) from schools serving Tribes that were kin to the Tribes in our project, but did not participate in the intervention study (COMP-AI/AN). Mountains form natural barriers between the comparison and intervention reservations; thus few, if any, of the COMP-AI/AN students would have been exposed to the interventions. We included the COMP-NAI/AN group as a control group for prevention programing or other

unmeasured school-level factors (e.g., drinking norms) that might have influenced the INT-AI/AN students at the same schools. Few of the non-AI/AN control group were exposed to the environmental interventions because most did not live on the reservation lands. The recognition and reminder program targeted convenience stores near the intervention reservations, which most of the non-AI/AN comparison students would not patronize.

Statistical Analyses

Our primary analyses consisted of multi-level hierarchical regressions using Stata version 15 (StataCorp, College Station, TX). We used logistic regression for dichotomous outcomes (prevalence of drinking) and Poisson regression for count outcomes (e.g., number of drinking days). Zero-inflated negative binomial regression was used for outcomes (e.g., number of heavy drinking days) when excessive zeros were observed. We obtained cluster robust SEs in all analyses.

The analyses included 2 dummy variables indicating INT-AI/AN and COMP-AI/AN, with COMP-NAI/AN as the excluded group. We included a series of dummy variables indicating survey year to capture secular trends and other year-to-year differences, with the first survey wave (2002–2003) as the reference category. Intervention effects were represented by 2 variables contrasting pre- to postintervention changes in drinking in the INT-AI/AN group with each of the comparison groups. The COMP-AI/AN contrast was coded as 0 in all years for the INT-AI/AN and COMP-NAI/AN groups. For the COMP-AI/AN group, it was coded as 0 during the preintervention years, -0.5 for the first (partial) intervention year, and -1 for the full intervention years. The intervention contrast for the COMP-NAI/AN group paralleled that of the COMP-AI/AN group. It was coded as 0 in all years for the INT-AI/AN and COMP-AI/AN groups, and as 0, -0.5 , and -1 for the COMP-NAI/AN group in the preintervention, partial intervention, and full intervention years, respectively. Age and gender were controlled in all analyses.

Motivational Interviewing vs Psychoeducation

The results of the MI intervention versus PE intervention were assessed for quantity $\times$

frequency, maximum drinks per drinking occasion, and problem behaviors using a repeated measures general linear model analysis with the following main independent variables: gender, MI versus PE, and time. Results were analyzed separately for participants who were drinking and not drinking at baseline and for the entire sample.⁴⁰

RESULTS

In this study we sought to evaluate combined individual- and community-level interventions to reduce underage drinking by AI/AN youths on rural California Indian reservations. We compared their CHKS responses with those of non-AI/AN students from their region, as well as with rural AI/AN students outside the intervention area.

Overall Program

The annual samples for the INT-AI/AN group ranged from 68 to 104; for the COMP-AI/AN group, the annual samples ranged from 82 to 195. The COMP-NAI/AN group samples were much larger, ranging between 3984 and 5547 annually. The groups were similar in age, averaging 15.3, 15.0, and 15.4 years, respectively. The COMP-NAI/AN had more females (51.7%) than did the INT-AI/AN group (41.7%; $z = 4.93$; $P < .001$) or the COMP-AI/AN group (41.7%; $z = 6.16$; $P < .001$).

Lifetime prevalence of alcohol use pre- and postintervention was 60.4% and 48.6% for the INT-AI/AN group, 55.9% and 46.3% for the COMP-AI/AN group, and 53.0% and 39.6% for the COMP-NAI/AN group, respectively (Table 1). Changes in prevalence of lifetime drinking in the INT-AI/AN group did not differ significantly from those in the comparison groups.

Prevalence of 30-day drinking among lifetime drinkers in the INT-AI/AN group was 58.2% and 57.1% pre- and postintervention, respectively. For the COMP-AI/AN group, the rates were 61.6% and 46.9%, and for the COMP-NAI/AN group, the rates were 58.1% and 48.9%, respectively. Changes in 30-day prevalence did not differ significantly between the INT-AI/AN group and the comparison groups.

TABLE 1—Pre- and Post-Intervention Alcohol Use Outcomes Across Study Groups: Southern California, 2002–2015

	Intervention AI/AN Group		Comparison AI/AN Group		Comparison Non-AI/AN Group	
	Preintervention	Postintervention	Preintervention	Postintervention	Preintervention	Postintervention
Lifetime prevalence of alcohol use, %	60.4	48.6	55.9	46.3	53.0	39.6
30-day prevalence of alcohol use among lifetime drinkers, %	58.2	57.1	61.6	46.9	58.1	48.9
30-day drinking frequency among current drinkers, mean	8.4	6.3	8.1	9.2	6.2	6.2
30-day drinking frequency among lifetime drinkers, mean	4.9	3.6	5.0	4.3	3.6	3.0
30-d heavy drinking frequency among current drinkers, mean	7.0	4.8	6.0	6.1	3.9	4.2

Note. AI/AN = American Indian/Alaska Native.

Table 2 summarizes a Poisson regression predicting 30-day drinking frequency (number of days) among those who consumed any alcohol in the past 30 days. There was a significant reduction in 30-day drinking frequency for the INT-AI/AN group relative to both comparison groups. Overall, there was a 25.0% relative decline in pre- to postintervention mean frequency of 30-day drinking in the INT-AI/AN group. By 2010–2011, the drinking levels in the INT-AI/AN group had converged with those of the COMP-NAI/AN group (Figure 1). No declines were observed for either comparison group.

A zero-inflated negative binomial regression analysis of 30-day drinking frequency among lifetime drinkers showed there was a decrease in frequency of drinking following the intervention in the INT-AI/AN group relative to the COMP-AI/AN group (incidence risk ratio [IRR] = 0.61; 95% confidence interval [CI] = 0.38, 0.99; $P = .044$) and the COMP-NAI/AN group (IRR = 0.69; 95% CI = 0.48, 1.01; $P = .054$). Overall, the INT-AI/AN group showed a 26.5% relative decline in mean drinking days from pre- to postintervention compared with more modest declines in the COMP-AI/AN group (14.3%) and the COMP-NAI/AN group (16.7%).

Pre- to postintervention frequency of heavy drinking decreased significantly in the INT-AI/AN group relative to the COMP-AI/AN group (Table 2). The decrease relative to the COMP-NAI/AN group was suggestive, but not statistically significant ($P = .065$). Figure 2 shows the frequency of heavy drinking for the 3 groups over the project. There was a 31.4% relative decline in frequency of heavy drinking following the intervention in the INT-AI/AN group.

Slight increases were observed in the COMP-AI/AN group and the COMP-NAI/AN group.

Motivational Interviewing vs Psychoeducation

One hundred nine individuals received the MI or PE intervention; 69 received the individual session MI or PE and 40 received group MI or PE. We estimated that 109

participants represented approximately one sixth of the eligible population. Of the 69 who received individual sessions, 60 were followed up at a mean follow-up of 2.0 (SE = 0.20) years. Participation in either the MI or PE session was associated with significant reductions in quantity $\times$ frequency of drinking, maximum drinks per occasion, and problem behaviors. Main effects of the MI versus PE interventions did not differ significantly. Therefore, for the purposes of the

TABLE 2—Intervention Effects on Frequency of 30-Day Drinking and Heavy Drinking Among Current Drinkers: Southern California, 2002–2015

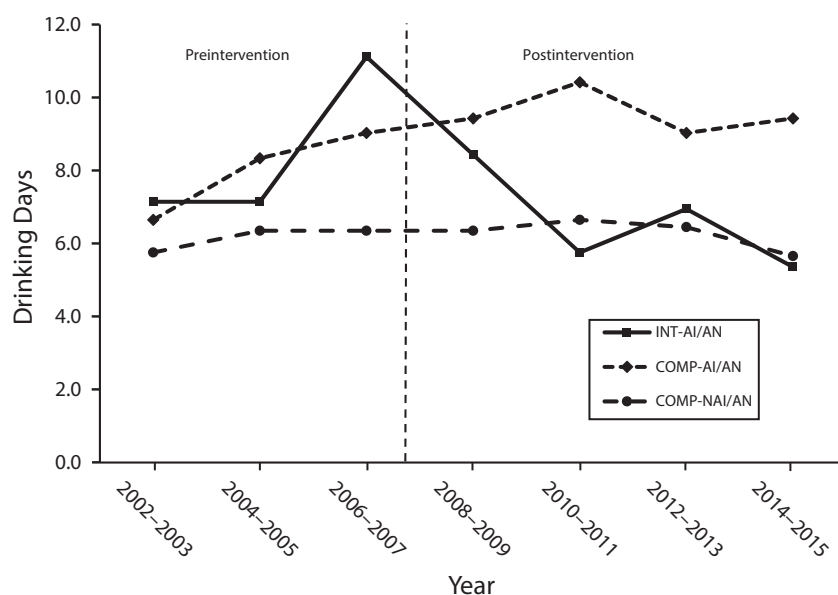
	Frequency of Drinking ^a (n = 9097)	Frequency of Heavy Drinking ^b (n = 9010)
Covariates, IRR (95% CI)		
Age	0.97 (0.98, 1.01)	0.97 (0.94, 0.99)
Gender (male)	1.28 (1.23, 1.34)	1.53 (1.45, 1.62)
Intervention AI/ANs	1.40 (1.14, 1.72)	1.87 (1.49, 2.36)
Comparison AI/ANs	1.27 (1.11, 1.46)	1.50 (1.22, 1.85)
2004–2005 ^c	1.10 (1.03, 1.17)	1.17 (1.01, 1.36)
2006–2007	1.12 (1.03, 1.21)	1.16 (0.97, 1.39)
2008–2009	0.94 (0.77, 1.13)	0.93 (0.71, 1.22)
2010–2011	0.83 (0.60, 1.16)	0.74 (0.47, 1.14)
2012–2013	0.80 (0.57, 1.13)	0.71 (0.44, 1.16)
2014–2015	0.71 (0.47, 1.05)	0.59 (0.36, 0.97)
Intervention contrasts, IRR (95% CI)		
Intervention AI/ANs vs comparison AI/ANs	0.60 (0.40, 0.91)	0.61 (0.36, 1.03)
Intervention AI/ANs vs comparison non-AI/ANs	0.72 (0.52, 1.00)	0.58 (0.38, 0.91)
Zero inflation, b (95% CI)		
Age	...	−0.75 (−1.02, −0.49)
Gender	...	−0.42 (−0.81, −0.03)
Intervention AI/ANs vs comparison AI/ANs	...	−0.89 (−2.72, 0.94)
Intervention AI/ANs vs comparison non-AI/ANs	...	0.44 (−0.14, 1.02)

Note. AI/AN = American Indian/Alaska Native; CI = confidence interval; IRR = incidence rate ratio.

^aPoisson regression.

^bZero-inflated negative binomial regression.

^cThe first survey wave (2002–2003) is the excluded reference category.



Note. COMP-AI/AN = AI/AN adolescent comparison group; COMP-NAI/AN = non-AI/AN adolescent comparison group; INT-AI/AN = AI/AN adolescents exposed to the intervention. Current drinkers only.

FIGURE 1—Mean Drinking Days in Past 30 Days Among American Indian/Alaska Native (AI/AN) Adolescents Exposed to the Intervention: Southern California, 2002–2015

present article, the MI versus PE trial was considered to be 1 intervention. Detailed results of the MI versus PE trial were published elsewhere.⁴⁰

DISCUSSION

Although we did not find decreases in the prevalence of drinking as a result of the interventions, our results showed reductions among drinkers in frequency of 30-day drinking and heavy episodic drinking for AI/AN youths living on the Indian reservations that participated in the interventions. These findings are important to prevention science in general and to AI/AN communities in particular.

Few studies have described successful interventions to reduce alcohol use among AI/AN youths. One study combined individual- and community-level approaches with a sample that included nonreservation AI/AN youths in the Southern Plains. The 2-year intervention showed significant reductions in alcohol use for AI/AN and non-AI/AN students.⁴¹ However, that study did not focus on AI youths and was not powered to test effects for AI/ANs compared with non-AI/ANs. In addition, that study found a convergence in outcomes between the

intervention and control groups during the final year, which suggested the effects of the intervention might have been dissipating. Our study, which occurred over a longer time and included analyses for 2 years before the intervention and 4 years following the intervention, showed a sustained effect.

In terms of the individual-level intervention, MI and PE showed associations with reduced drinking and behavior problems at a mean follow-up of 2 years. These results were consistent with previous studies in non-AIs that demonstrated efficacy of a single MI session intervention 2 years later.^{42–44} Importantly, both MI and PE individual-level interventions were associated with significant reductions in drinking and problem behaviors over time, although there were no significant differences comparing one approach to the other.⁴⁰ If future studies confirm that PE has equivalent efficacy to MI for reducing underage drinking and problem behaviors, it could represent a lower-cost, more feasible intervention for AI/AN youths.

Multilevel programs can enhance sustainability and link individual-level prevention with the social-structural determinants of health problems.^{45–48} In high alcohol availability contexts, these combined

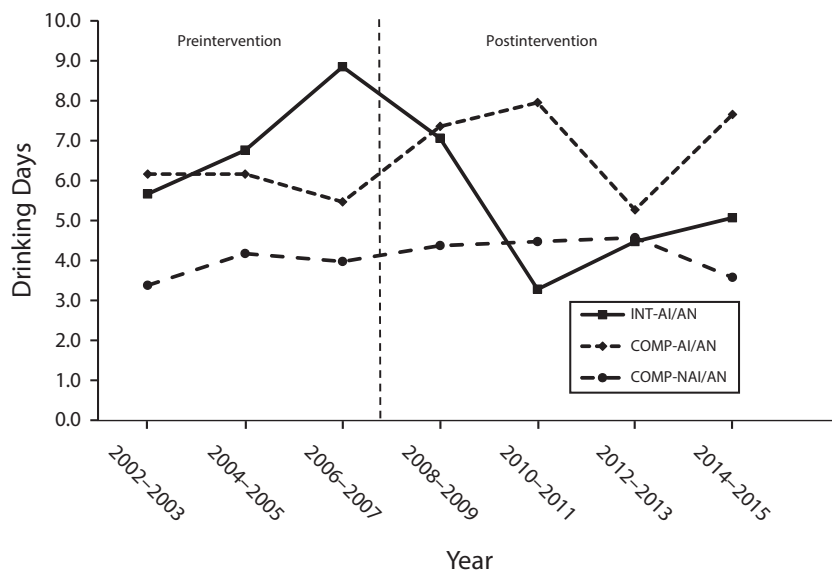
interventions may be more likely to affect drinking frequency than lifetime drinking prevalence. Youths use a variety of social and commercial sources to acquire alcohol. Research suggests that a significant number of alcohol outlets sell to underage purchasers.^{37,49–52} These youths may then serve as sources of alcohol for other young people. Because ready access to alcohol may undermine any gains made by reducing youths' predispositions to drink through individually focused programs, the latter can be strengthened by combining with environmentally focused alcohol access reduction programs. From a health equity perspective, multilevel approaches have the potential to harness the power of the community to achieve health outcomes that are superior to approaches that treat only the individual.

Tribal leadership support and ownership of this project were key in the successful implementation of project activities. Tribal leaders in multiple institutions (clinic, Tribal councils, and advisory group) provided ongoing insights and guidance that ensured that intervention goals and activities were culturally appropriate and locally acceptable. In addition, housing the project activities within the Tribal clinic, staffing by AI/AN interns, clinicians, and community outreach staff might well have been key to the successful outcomes achieved. Community mobilization and outreach activities at Tribal events, including community nights, after school programs, and events on each of the reservations, increased vital trust to support sustained effects and engaged the community outside of the clinic setting.

Our findings were particularly important for AI/AN communities because of the value AI/AN Tribes place on the current and future well-being of their children, which is threatened by alcohol involvement.⁵³ Considering the relative youth of many AI/AN populations,⁵⁴ effective interventions to reduce underage drinking take on additional significance.

Limitations

Study limitations included the inability to identify which students were exposed to the community-level interventions and lack of survey coverage of youths who refused participation or who were not in school during survey administration. Furthermore,



Note. COMP-AI/AN = AI/AN adolescent comparison group; COMP-NAI/AN = non-AI/AN adolescent comparison group; INT-AI/AN = AI/AN adolescents exposed to the intervention. Current drinkers only.

FIGURE 2—Mean Heavy Drinking (≥ 5 Drinks) Days in Past 30 Days Among American Indian/Alaska Natives (AI/AN) Exposed to the Intervention: Southern California, 2002–2015

although the results strongly suggested that the interventions had substantial effects on alcohol use by AI/AN youths on the participating reservations, the results must be interpreted with caution because the findings reflect average treatment effects and our inability to randomly assign reservations to intervention and control conditions. Study strengths included a large sample size and a sustained intervention effect.

Public Health Implications

The study demonstrated responsiveness to long-standing requests from Tribes for research that benefits their communities and builds the evidence base for effective ways to reduce and prevent alcohol-related problems in these communities. Our multilevel approach demonstrated effective means to reduce both supply of and demand for alcohol to reduce underage drinking behavior in AI/ANs and other communities. *AJPH*

CONTRIBUTORS

R. S. Moore was the lead investigator for the project and this article, and D. J. Calac and C. L. Ehlers were the respective leads from their institutions. All 3 made substantial contributions to the conceptualization, design and implementation of the study, and interpretation of the data. J. W. Grube conceptualized the CHKS analyses, which were conducted by B. Friesen and L. J. Finan. D. A.

Gilder led the drafting of the individual-level study elements. J. A. Geisler led the data collection efforts. J. P. Lee contributed to the interpretations and writing of the article. All authors participated in substantial critical revisions of the article for intellectual content and approved the submission of the final version.

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HUMAN PARTICIPANT PROTECTION

The institutional review boards of the Pacific Institute for Research and Evaluation, the Scripps Research Institute,

and the Southern California Tribal Health Center all reviewed and approved this research. Parental consent was obtained for participation in the intervention activities and the anonymous CHKS.

REFERENCES

- Walls M, Sittner Hartshorn KJ, Whitbeck LB. North American Indigenous adolescent substance use. *Addict Behav.* 2013;38(5):2103–2109.
- Stanley LR, Harness SD, Swaim RC, Beauvais F. Rates of substance use of American Indian students in 8th, 10th, and 12th grades living on or near reservations: update, 2009–2012. *Public Health Rep.* 2014;129(2):156–163.
- Degenhardt L, O’Loughlin C, Swift W, et al. The persistence of adolescent binge drinking into adulthood: findings from a 15-year prospective cohort study. *BMJ Open.* 2013;3(8):e003015.
- Hingson RW, Zha W. Age of drinking onset, alcohol use disorders, frequent heavy drinking, and unintentionally injuring oneself and others after drinking. *Pediatrics.* 2009;123(6):1477–1484.
- Silveri MM. Adolescent brain development and underage drinking in the United States: identifying risks of alcohol use in college populations. *Hav Rev Psychiatry.* 2012;20(4):189–200.
- Grant BF, Dawson DA. Age at onset of alcohol use and its association with DSM-IV alcohol abuse and dependence: results from the National Longitudinal Alcohol Epidemiologic Survey. *J Subst Abuse.* 1997;9:103–110.
- Hingson RW, Heeren T, Winter MR. Age at drinking onset and alcohol dependence: age at onset, duration, and severity. *Arch Pediatr Adolesc Med.* 2006;160(7):739–746.
- Chartier K, Caetano R. Ethnicity and health disparities in alcohol research. *Alcohol Res Health.* 2010;33(1–2):152–160.
- Ehlers CL, Slutske WS, Gilder DA, Lau P, Wilhelmsen KC. Age at first intoxication and alcohol use disorders in Southwest California Indians. *Alcohol Clin Exp Res.* 2006;30(11):1856–1865.
- De Haan L, Boljevac T, Schaefer K. Rural community characteristics, economic hardship, and peer and parental influences in early adolescent alcohol use. *J Early Adolesc.* 2009;30(5):629–650.
- Blum RW, Harmon B, Harris L, Bergeisen L, Resnick MD. American Indian–Alaska Native youth health. *JAMA.* 1992;267(12):1637–1644.
- Chandle JE, Whitbeck LB. Alcohol use trajectories and problem drinking over the course of adolescence: a study of North American indigenous youth and their caretakers. *J Health Soc Behav.* 2011;52(2):228–245.
- Friesen B, Grube J. Differences in drinking behavior and access to alcohol between Native American and white adolescents. *J Drug Educ.* 2008;38(3):273–284.
- Potthoff SJ, Bearinger LH, Skay CL, Cassuto N, Blum RW, Resnick MD. Dimensions of risk behaviors among American Indian youth. *Arch Pediatr Adolesc Med.* 1998;152(2):157–163.
- Walsh ML, Baldwin JA. American Indian substance abuse prevention efforts: a review of programs. *Am Indian Alsk Native Ment Health Res.* 2015;22(2):41–68.
- Jones DE, Feinberg ME, Cleveland MJ, Cooper BR. A multidomain approach to understanding risk for underage drinking: converging evidence from 5 data sets. *Am J Public Health.* 2012;102(11):2080–2087.
- Spoth R, Greenberg M, Turrissi R. Overview of preventive interventions addressing underage drinking:

- state of the evidence and steps toward public health impact. *Alcohol Res Health*. 2009;32(1):53–66.
18. Komro KA, Wagenaar AC, Boyd M, et al. Prevention trial in the Cherokee Nation: design of a randomized community trial. *Prev Sci*. 2015;16(2):291–300.
 19. Becker SJ, Spirito A, Hernandez L, et al. Trajectories of adolescent alcohol use after brief treatment in an emergency department. *Drug Alcohol Depend*. 2012;125(1–2):103–109.
 20. Hingson R, White A. New research findings since the 2007 Surgeon General's Call to Action to Prevent and Reduce Underage Drinking: a review. *J Stud Alcohol Drugs*. 2014;75(1):158–169.
 21. Villanueva M, Tonigan JS, Miller WR. Response of Native American clients to three treatment methods for alcohol dependence. *J Ethn Subst Abuse*. 2007;6(2):41–48.
 22. Gilder DA, Luna JA, Calac D, Moore RS, Monti PM, Ehlers CL. Acceptability of the use of motivational interviewing to reduce underage drinking in a Native American community. *Subst Use Misuse*. 2011;46(6):836–842.
 23. Dickerson DL, Brown RA, Johnson CL, Schweigman K, D'Amico EJ. Integrating motivational interviewing and traditional practices to address alcohol and drug use among urban American Indian/Alaska Native youth. *J Subst Abuse Treat*. 2016;65:26–35.
 24. Venner KL, Feldstein SW, Tafoya N. Helping clients feel welcome: principles of adapting treatment cross-culturally. *Alcohol Treat Q*. 2008;25(4):11–30.
 25. Grube JW. Preventing sales of alcohol to minors: results from a community trial. *Addiction*. 1997;92(suppl 2):S251–S260.
 26. Holder HD, Gruenewald PJ, Ponicki WR, et al. Effect of community-based interventions on high-risk drinking and alcohol-related injuries. *JAMA*. 2000;284(18):2341–2347.
 27. Treno AJ, Gruenewald PJ, Lee JP, Remer LG. The Sacramento Neighborhood Alcohol Prevention Project: outcomes from a community prevention trial. *J Stud Alcohol Drugs*. 2007;68(2):197–207.
 28. May PA. Arrests, alcohol, and alcohol legalization among an American Indian tribe. *Plains Anthropol*. 1975;20(68):129–133.
 29. Wood DS, Gruenewald PJ. Local alcohol prohibition, police presence and serious injury in isolated Alaska Native villages. *Addiction*. 2006;101(3):393–403.
 30. Lee JP, Calac D, Montag AC, et al. Indian student involvement in tribal community-based research: underage drinking prevention among rural native Californians. *J Rural Community Psychol*. 2011;14(2).
 31. Miller WR, Rollnick S. *Motivational Interviewing: Helping People Change*. 3rd ed. New York, NY: Guilford Press; 2013.
 32. Miller WR. Motivational interviewing: research, practice, and puzzles. *Addict Behav*. 1996;21(6):835–842.
 33. Venner KL, Tafoya N. *Native American Motivational Interviewing: Weaving Native American and Western Practices: A Manual for Counselors in Native American Communities*. Albuquerque, NM: Center on Alcoholism, Substance Abuse and Addictions; 2006.
 34. Moore RS, Roberts J, McGaffigan R, et al. Implementing a reward and reminder underage drinking prevention program in convenience stores near Southern California American Indian reservations. *Am J Drug Alcohol Abuse*. 2012;38(5):456–460.
 35. Biglan A, Ary D, Koehn V, et al. Mobilizing positive reinforcement in communities to reduce youth access to tobacco. *Am J Community Psychol*. 1996;24(5):625–638.
 36. Biglan A, Ary DV, Smolkowski K, Duncan T, Black C. A randomised controlled trial of a community intervention to prevent adolescent tobacco use. *Tob Control*. 2000;9(1):24–32.
 37. Flewelling RL, Grube JW, Paschall MJ, et al. Reducing youth access to alcohol: findings from a community-based randomized trial. *Am J Community Psychol*. 2013;51(1–2):264–277.
 38. WestEd. California Healthy Kids Survey Reports. Available at: <http://chks.wested.org/reports>. Accessed May 27, 2017.
 39. National Institute on Alcohol Abuse and Alcoholism. Recommended alcohol questions. 2003. Available at: <https://niaaa.nih.gov/research/guidelines-and-resources/recommended-alcohol-questions>. Accessed December 9, 2017.
 40. Gilder DA, Geisler JR, Luna JA, et al. A pilot randomized trial of motivational interviewing compared to psycho-education for reducing and preventing underage drinking in American Indian adolescents. *J Subst Abuse Treat*. 2017;82:74–81.
 41. Komro KA, Livingston MD, Wagenaar AC, Kominsky TK, Pettigrew DW, Garrett BA. Multilevel prevention trial of alcohol use among American Indian and white high school students in the Cherokee Nation. *Am J Public Health*. 2017;107(3):453–459.
 42. Baer JS, Kivlahan DR, Blume AW, McKnight P, Marlatt GA. Brief intervention for heavy-drinking college students: 4-year follow-up and natural history. *Am J Public Health*. 2001;91(8):1310–1316.
 43. Monti PM, Colby SM, Barnett NP, et al. Brief intervention for harm reduction with alcohol-positive older adolescents in a hospital emergency department. *J Consult Clin Psychol*. 1999;67(6):989–994.
 44. Roberts LJ, Neal DJ, Kivlahan DR, Baer JS, Marlatt GA. Individual drinking changes following a brief intervention among college students: clinical significance in an indicated preventive context. *J Consult Clin Psychol*. 2000;68(3):500–505.
 45. Clauser SB, Taplin SH, Foster MK, Fagan P, Kaluzny AD. Multilevel intervention research: lessons learned and pathways forward. *J Natl Cancer Inst Monogr*. 2012;2012(44):127–133.
 46. Fagan AA, Hawkins JD, Catalano RF. Engaging communities to prevent underage drinking. *Alcohol Res Health*. 2011;34(2):167–174.
 47. Schensul JJ. Community, culture and sustainability in multilevel dynamic systems intervention science. *Am J Community Psychol*. 2009;43(3–4):241–256.
 48. Trickett EJ. Multilevel community-based culturally situated interventions and community impact: an ecological perspective. *Am J Community Psychol*. 2009;43(3–4):257–266.
 49. Freisthler B, Gruenewald PJ, Treno AJ, Lee JP. Evaluating alcohol access and the alcohol environment in neighborhood areas. *Alcohol Clin Exp Res*. 2003;27(3):477–484.
 50. Lynne-Landsman SD, Kominsky TK, Livingston MD, Wagenaar AC, Komro KA. Alcohol sales to youth: data from rural communities within the Cherokee Nation. *Prev Sci*. 2016;17(1):32–39.
 51. Paschall MJ, Grube JW, Black C, Flewelling RL, Ringwalt CL, Biglan A. Alcohol outlet characteristics and alcohol sales to youth: results of alcohol purchase surveys in 45 Oregon communities. *Prev Sci*. 2007;8(2):153–159.
 52. Wagenaar AC, Livingston MD, Pettigrew DW, Kominsky TK, Komro KA. Communities Mobilizing for Change on Alcohol (CMCA): secondary analyses of an RCT showing effects of community organizing on alcohol acquisition by youth in the Cherokee Nation. *Addiction*. 2018;113(4):647–655.
 53. Connors T. Our children are sacred: why the Indian Child Welfare Act matters. *Judges J*. 2011;50(2):33–39.
 54. National Congress of American Indians. About tribes: demographics. Available at: <http://www.ncai.org/about-tribes/demographics>. Accessed May 27, 2017.