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# A Theory-Based Motivational Approach for Reducing Alcohol/Drug Problems in College

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The Campuswide Alcohol and Drug Abuse Prevention Program (CADAPP) was implemented and evaluated over a 1.5-year span at the University of New Mexico (UNM). Drawing on self-regulation theory as a basis for understanding motivation for change, the program was designed to increase risk perceptions and thereby reduce the use of alcohol and other drugs among university students. The program was evaluated from 1988 to 1989 through repeated anonymous random sample surveys of all enrolled students on the UNM campus and on a similar control campus not implementing new prevention efforts during the same period. As predicted, relative to the control campus, students on the CADAPP campus after the program showed significantly higher perceived risks from substance use and significantly reduced levels of alcohol and marijuana use. These findings provide encouraging evidence for this theory-based approach to primary and secondary prevention.

## SELF-REGULATION AND MOTIVATION FOR CHANGE

Self-regulation theory provides a conceptual basis for understanding how people do (or do not) effectively control and alter their behavior in adjusting to changes in the social environment.<sup>1,2</sup> It encompasses both normal processes of behavior change and developmental deficits that may impair an individual's self-control. As a conceptual tool for

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understanding why self-control sometimes fails, it has been particularly useful in addressing addictive behaviors.<sup>3,4</sup>

Miller and Brown<sup>5</sup> extended self-regulation theory as a model to guide both prevention and treatment efforts. They conceptualized self-regulation as involving seven sequential processes:

1. Information about the person's present status is received from the environment.
2. This information is compared with personal goals, norms, and expectations.
3. A discrepancy is detected (or not) between the person's current and desired state.
4. A discrepancy instigates motivation for change.
5. The person searches for ways to reduce the discrepancy.
6. A strategy for reducing discrepancy is planned.
7. The change plan is implemented.

This behavior adjustment process can occur rapidly and without conscious awareness (automatic processing, as in overlearned behaviors such as driving a motor vehicle) or with conscious awareness and intention (controlled processing). When behavior change is made, the status/goal discrepancy decreases below an acceptable threshold, and behavior change stops.

The psychology of self-regulation is useful in understanding not only normal behavior but also apparently abnormal behavior. Addictive behaviors in particular can be understood as a breakdown of one or more self-regulatory steps that ordinarily protect the person from harm.<sup>3,5</sup> The model draws together (a) reasons why normal self-regulation may fail to correct substance use problems (e.g., faulty norm perception), (b) developmental deficits associated with risk for substance use disorders that could compromise self-regulatory capacity, and (c) the impairing effects that psychoactive drugs themselves have on processes of self-regulation. These three factors can interact to enhance or reduce risk for problems related to alcohol and other drug use.

This framework, in turn, suggests specific strategies that could correct these problems, depending on where in the self-regulation chain a disruption of normal behavior control is occurring. Many of the approaches shown to be effective in the treatment of alcohol problems can be readily understood as strategies that compensate for deficient self-regulatory processes.<sup>5,6</sup> Norm correction and personal feedback of risk or harm are effective prevention strategies that may affect the first three steps of self-regulation and thereby trigger behavior change.<sup>7,8</sup>

Self-regulation theory can also be used to guide systemwide changes to decrease risky behavior. Public health professionals have long recognized the interplay between individual and environment and the need to develop and implement population-based interventions.<sup>9</sup> Current social science theories and models of change, on which public health interventions are built, emphasize the importance of targeting multiple levels of change.<sup>10</sup> Advocates of multilevel strategies propose that interventions target at least two levels of change (individual, small group, organization, community, and policy) to achieve health goals. The program described below included components specifically designed to target each of these five levels.

*College as a high-risk period.* The misuse of alcohol and other drugs is linked to a host of problems in college populations, due in part to the fact that traditional-age college students are in the years of life when such risks peak, whether or not one is in college.

Leaving home for college is often a person's first major change of social environment, offering a new set of options and norms. It can be a first real testing of the person's ability to regulate his or her own behavior.

Secondary prevention programs consistent with a self-regulation model have already been tested on college campuses and found to reduce substance use in high-risk subpopulations of students.<sup>8,11,12</sup> The challenge we accepted in implementing this program was to design a combined primary (universal) and secondary (targeted) prevention program based on self-regulation theory to affect an entire campus population.

## METHOD

*General evaluation design.* It is nearly impossible to evaluate the effectiveness of a prevention program without some basis for comparison. Consequently, as we began planning to implement the new Campuswide Alcohol and Drug Abuse Prevention Program (CADAPP) at the University of New Mexico (UNM), we sought a comparison campus to use as a control against which to compare our progress. New Mexico State University (NMSU), the second largest institution of higher education in the state (enrollment of 13,000), graciously agreed to serve as the control campus, in that there were no plans to implement a new prevention effort on campus during the same 2-year period.

Impact of CADAPP was measured through anonymous surveys of students on each campus, a relatively conservative approach. Study procedures were reviewed and approved by the university human research review committee, which found the study to be exempt from consent procedures because survey responses were anonymous. The UNM baseline surveys were completed late in the fall semester (November 30) of 1987, just prior to the launching of CADAPP. The NMSU baseline surveys were completed in the spring semester (March 4) of 1988. To complete the study within a 2-year period of funding, the surveys were repeated toward the end of the spring semester of 1989, when CADAPP had been fully implemented.

*The campus.* UNM is the largest university in the state of New Mexico, with an enrollment stabilized around 24,000 students (53% women). Like the state's population, the study body represents a blend of cultural groups, including 23% Hispanic and nearly 1,000 Native American people. Most students (90%) live off campus, so any intervention to affect the larger student body needed to occur primarily when classes were in session.

At the time CADAPP was implemented, several other programs were already under way, including alcohol/drug education programs through the student health center and assistance programs for university employees and students. A wellness center was also operating on campus, providing general health consultations to students as well as employees of UNM.

*Program goals.* The overall goal of CADAPP was to foster a dominant campus atmosphere, consisting of personal and collective attitudes that would favor the following as perceived norms:

1. Abstinence from alcohol and drugs is acceptable in all situations.
2. Use of illegal substances is unacceptable in all situations (drug-free campus).
3. Moderate use of alcohol is not opposed in low-risk situations (although alcohol use on campus was and is highly regulated).

4. Any use of alcohol is unacceptable in high-risk situations such as driving or in any situation by persons younger than legal age (21).
5. Heavy drinking is unacceptable in all situations.

These goals were consistent with the congressional funding intent to persuade nonusers to remain nonusers, encourage occasional drug users to stop, and urge regular users to reduce or eliminate their use. These goals also matched well the risk perception (discrepancy) component that is a key to instigation of change within a self-regulation model.

### **The Program**

Initially, CADAPP was planned to include 11 components involving both universal and targeted prevention activities. This two-tiered approach was designed to complement existing services on campus. One additional component was added at the end of the 1st year. The universal prevention strategies were as follows.

*Print media.* This strategy made use of printed materials disseminated throughout the UNM community. Educational materials included enclosures in the schedule of classes; posters; 10,000 wallet-sized information and resource cards distributed at multiple sites, including the bookstore and libraries; 2,500 health-oriented pamphlets distributed through the student union and wellness centers; and 5,000 free copies of a “Coping With College” survival handbook widely distributed on campus. These materials were included in new student orientation, in alcohol and drug awareness weeks on campus, and in numerous presentations to student groups and organizations. They were designed specifically to trigger self-regulation through risk perception enhancement. An example was a “Zero Behind the Wheel” campaign with a poster drawn by cartoonist Mort Walker (Beatle Bailey) using his character Zero to illustrate the theme that the only safe blood alcohol level when driving is zero. More than a thousand copies were distributed, along with 20,000 plasticized information cards showing the length of time that men and women must wait to reach zero blood alcohol after drinking various amount over different periods of time. A postprogram survey indicated that nearly 5,000 UNM students (20.4%) recognized the poster. Although the “Coping With College” handbook had only been available for 3 months at the time of posttesting, 24.2% of students said they were familiar with it.

Perhaps the highest-profile print media component, however, involved features in the *Daily Lobo*, a campus newspaper with a daily circulation of 14,500 copies. Besides five feature articles written by *Lobo* reporters, the first author contributed a monthly column emphasizing a central motivational theme of CADAPP—the ways in which alcohol and other drugs adversely affect things that *matter* to college students (e.g., memory and brain functions, social roles, grades, sexuality, career options, and success). Other columns provided information about the continuum of substance use problems (it is not just alcoholics), national norms, medically recommended limits, and the fact that high tolerance is a sign of risk and not safety. On the postprogram survey, 25.3% of respondents said they had read the CADAPP column in the *Daily Lobo*. Cartoons spoofing common advertising myths (e.g., alcohol makes you sexy, drinking is associated with achievement) were also printed in newspaper and poster format. Furthermore, we observed that the *Lobo* staff, without our solicitation, dramatically increased unpaid public service ads on the prevention of drinking and driving from 2 such ads during the prior spring semester to 34 in the first 8 weeks of the fall term alone during CADAPP’s 2nd year. Overall, 52.1% of stu-

dents on the postprogram survey recognized the CADAPP name and logo, indicating that this high-profile print approach did succeed in reaching its audience.

*Videotapes.* A videotape was developed for use in freshman orientation sessions, inviting new students to participate in a brief workshop on "Striking a Healthy Balance in College." Of the hundreds of students shown this film, 17% attended the workshop. A series of five videotapes was also prepared for use in a "Coping With College" course that was developed through CADAPP, including a unit on alcohol and other drugs. This one-credit elective course enrolled 408 freshmen. Instructional materials on alcohol and other drugs, including videotapes, were placed in a CADAPP teaching resource center and publicized to university faculty and staff. During the 2nd year of the program, materials were checked out by 67 different users.

*Speakers.* Ten experts in alcohol and drug studies were brought to the campus to give open lectures, with particular focus on drinking and driving issues. Attendance averaged 30 to 40.

*Peer education.* UNM students were offered the opportunity to be trained as peer educators to work for elective college credit in another prevention program targeting secondary school students. This option engaged only a dozen students.

*Computer resources.* A blood alcohol concentration (BAC) education software program was prepared and publicized through UNM computer systems.<sup>13</sup> It allowed students anonymously to interact with the program and obtain a personalized BAC table showing the projected levels reached by various amounts of drinking within specified time periods, adjusted to gender and body weight. Skinner's<sup>14,15</sup> lifestyle assessment software was also installed, offering a free and confidential review of 15 areas of lifestyle risk. In the post-CADAPP survey, 20% of respondents said they were aware of or had used the BAC program, and 14% had used the lifestyle assessment program.

*Campus policy.* Members of the CADAPP staff also worked with UNM administrators to review and revise campus policy with regard to alcohol and other drugs. The new policy, which was officially adopted, included a tightening of regulations for alcohol/drug use on campus, serving of alcohol at UNM sporting events and other functions, and on-campus advertising. Because the new policy did not take effect until after CADAPP had ended, it is unlikely that this component had any impact on postprogram results.

*Campuswide events.* In its 2nd year, the CADAPP office assumed responsibility for coordination of Alcohol Awareness Week and Drug Awareness Week, as well as annual participation in information fairs, "welcome back days," and new student orientation.

Other components of CADAPP targeted particular at-risk segments of the campus community. These included the following.

*Drinker's checkup.* Students were offered a free and confidential "drinker's checkup" through the UNM Psychology Clinic. It was advertised through the campus newspaper and brochures as being "for drinkers who would like to find out whether alcohol is harming them in any way." It was meant to provide a low-threshold further step that problem drinkers could take as their awareness was raised through the larger CADAPP programs.

The checkup has been described in detail elsewhere<sup>16,17</sup> and has been shown in a separate series of trials to attract problem drinkers who otherwise do not seek treatment and to result in a significant reduction in their drinking.<sup>18,19</sup> It involved a 2-hour assessment, followed a week later by a 1-hour session in which the student received personal feedback of results in an empathic and supportive manner. In the postprogram survey, 24% of students said they had heard about the drinker's checkup, and a total of 117 individuals availed themselves of the service.

*Referral services.* Because referral channels were already available on campus, CADAPP did not itself need to provide referral services. Instead, we developed a directory of alcohol/drug services available in the community, as well as a wallet-sized resource card listing phone numbers for many on-campus services used by students, including alcohol/drug services. These materials were made widely available on campus in public places such as the student union, as well as through campus health and social service offices. Approximately 2,000 directories and 10,000 resource cards were distributed.

*Concerned others.* People with alcohol/drug problems who are not currently motivated to change or seek help can often be reached through concerned friends and family. We had planned to implement a consultation service for people who were concerned about the alcohol or other drug use of a loved one. Implementation was delayed, however, and did not begin during the study period. This component later stimulated a series of programs that were offered and evaluated, involving more than 200 concerned family members in individual consultation,<sup>20</sup> but nothing in this component could have influenced CADAPP outcomes.

*Resourceful people training.* This component trained volunteers from the campus community to be able to recognize alcohol/drug problems and to respond in a manner likely to increase motivation for change. An 8-hour Saturday workshop was developed and publicized to UNM students, faculty, and staff. It covered basic information about the nature and development of substance use problems, an introduction to motivational interviewing,<sup>21</sup> and a review of referral resources. A broad mailing titled "Who Cares About UNM Students?" brought a total of 58 participants to three workshops. Volunteers came particularly from on-campus activity and housing units. After completion of the workshop, participants received a thank you letter from the president of the university, as well as a round program logo sticker as "One of UNM's Resourceful People" that they were encouraged to display on their doors to identify them as a potential resource for those seeking information or help. This program had more limited visibility; only 11.8% of postsurvey respondents recognized the program by name.

*Alcohol self-control training.* One additional component was developed to target on-campus fraternities. A six-session "Alcohol Skills" training program was developed and offered to fraternities through personal contacts with the leadership of each house. Its content drew on self-control training<sup>22</sup> and innovative prevention approaches developed by Marlatt et al.<sup>12</sup> Only two fraternities participated, with a total of 60 students trained.

Components of the CADAPP program reached a relatively high proportion of UNM students. At the follow-up survey, 87% of students were aware of and 57.5% had participated in at least one of the program activities.

*Surveys.* A campus Chemical Health Survey was developed, focusing on the two primary targets for change: alcohol and other drug use and perceptions of related risk. All questionnaires were completed anonymously. To encourage participation, those who returned the survey (by mail) were entered into a lottery for cash prizes by separating a numbered ticket, returning one part with the completed survey and retaining the other half. Winning numbers were announced through the campus newspaper, the *Daily Lobo*. As an additional incentive for the follow-up survey, respondents were invited to participate in a contest to guess the actual levels of alcohol/drug use on campus, as revealed by the first survey. The guesses, which were generally vast overestimates, were published in summary form along with correct answers in the *Daily Lobo*, thus serving as a further norm correction component. The follow-up survey also queried respondents' awareness of and participation in CADAPP program components, as reflected above. Follow-up surveys were conducted on the two campuses late in the spring semester following implementation of CADAPP (17 months after the baseline survey at UNM).

Besides demographic information, the surveys included quantity frequency questions to assess the students' current use of alcohol and other drugs in "a typical month of 30 days."<sup>23</sup> Drugs were separated into 10 groups to provide a clearer picture of use. A range of related problems was also queried.

*Risk.* Risk assessment included 13 items regarding the extent to which students perceived risk or consequences related to alcohol or other drug use. Personal risk for alcohol and other drug problems was judged relative to students' perceptions of "most people" (ranging from 1 = *higher than most people* to 3 = *lower than most people*). Students also reported (3-point scale) their perceptions of the seriousness of alcohol/drug problems on campus and rated (4-point scales) perceived risk related to being a passenger in a vehicle driven by a person who had consumed three or more drinks or had been using illicit drugs. Students were also asked to report the frequency with which they engaged in these risky riding-with behaviors. Finally, students were asked to rate (5-point scales) the extent to which having three or more drinks per day places a person at risk for health problems, accidental injury, getting into trouble, poor grades, and (for women who drink while pregnant) birth defects.

*Use.* Use measures (14 items) included a frequency (number of drinking days per 30) and quantity index of drinking (number of standard drinks consumed per drinking occasion; range: 0-15) that were multiplied to form a single quantity frequency measure (number of drinks per month). Adding to this a traditional variability dimension,<sup>24</sup> we also asked how often students consumed three or more drinks per day and six or more drinks per day (6-point scale from 1 = *never* to 6 = *daily or almost daily*). Recent drug use was measured by asking respondents about the frequency and recency with which they used 10 types of drugs (using commonly recognized names): cannabis, cocaine, other stimulants, tranquilizers, sedative-hypnotics, hallucinogens, opioids, phencyclidine, amyl and butyl nitrates, and inhalants such as glue, paint, or gasoline (4-point scale ranging from 1 = *never* to 4 = *at least once in the past month*). Finally, a 4-item scale queried cigarette smoking rate. All items queried current use.

*Problems.* Problem measures included 14 indicators of alcohol dependence and adverse consequences of heavy drinking or illicit drug use in the prior year. Six items asked about the frequency (6-item scale) of driving after three or more drinks, being unable to stop thinking about alcohol, being unable to stop drinking once started, being unable to



remember a portion of a drinking episode (blackout), needing a drink first thing in the morning, and feeling guilt or remorse after drinking. Other items asked whether the respondent or someone else had been injured as a result of the respondent's drinking and whether anyone had been sufficiently concerned to advise him or her to cut down or stop drinking. Two items asked the extent to which the respondent anticipated problems if his or her current drinking or drug use continued at its present level. Finally, four items assessed self-admission of having current alcohol problems, current drug problems, past alcohol problems, or past drug problems.

The quantity frequency questions used in this study have been found to have excellent test-retest reliability and provide estimates of substance use that are reasonably similar to those resulting from detailed interviews.<sup>23</sup> Problem measures of the kind used in this questionnaire have also been found to yield reliable estimates.<sup>24,25</sup> Specific psychometric information was not compiled for other questionnaire items (e.g., risk estimates).

It was hypothesized that relative to the control (NMSU) campus, the CADAPP (UNM) campus would show at posttest (a) higher perception of risks related to heavy drinking and other drug use, (b) lower use of alcohol and other drugs, and (c) fewer problems related to alcohol and other drug use. These three domains comprised the primary outcome variables for this study.

Factorial analysis of variance was the primary analytic approach, with time (pre vs. post), gender, and campus (CADAPP vs. control) as factors. Although no specific gender differences were predicted in response to CADAPP, this factor was included to study whether men versus women might be more responsive to the prevention programming.

## RESULTS

*Survey samples.* At baseline (fall) assessment, 1,400 surveys were distributed to enrolled UNM students, a sample of approximately 6% selected randomly by the university's computerized mailing list program. Of these, 567 surveys were returned and usable (41%). At the control campus, 1,080 surveys were distributed to a random sample of students, 457 of whom returned them (42.3%). Parallel surveys were distributed during the month before spring term final examinations at both campuses in the following year. The return rates were 431 (31%) at UNM and 434 (34%) at NMSU. Demographic characteristics of students participating in the four surveys are shown in Table 1 and are generally consistent with the composition of student bodies at the two campuses. Return rates were lower at follow-up on both campuses but did not differ between campuses at either pretest or follow-up.

The proportion of females in the UNM survey was somewhat higher at pretest,  $\chi^2(1) = 7.99, p < .01$ , but did not differ significantly from the NMSU campus at follow-up. Consistent with campus composition, ethnic representation was different ( $p < .001$ ) at both pretest and follow-up, owing primarily to a higher proportion of Hispanic respondents on the NMSU campus than on the UNM campus. Students at NMSU were also younger than UNM respondents ( $p < .001$ ) at both pretest and follow-up. The proportion of married students was higher at UNM than at NMSU at both pretest and follow-up.

*Preprogram differences on dependent measures.* To evaluate preintervention equivalence of the two samples, student data were compared at baseline for UNM versus NMSU surveys. On ANOVAs with group and gender as the two factors, the two campuses did not differ significantly on most of the variables comprising the three outcome scales, nor

Table 1. Demographic Characteristics of the University of New Mexico (UNM) and New Mexico State University (NMSU) Samples From Pre- and Postprogram Surveys

Variable	UNM (Program Campus)		NMSU (Control Campus)	
	Pre	Post	Pre	Post
<b>Gender (%)</b>				
Females	62.8	58.4	54.7	62.2
Males	37.2	41.6	45.3	37.8
<b>Ethnicity (%)</b>				
White, non-Hispanic	76.2	72.2	67.2	59.0
Hispanic	16.2	19.5	28.4	29.7
Native American	2.1	3.0	0.4	6.4
Asian	2.3	1.4	1.5	2.1
African American	0.9	1.4	0.9	1.4
Other	2.3	2.1	1.5	1.6
<b>Age</b>				
Median	25	26	22	22
Mean	28.2	28.5	26.6	25.7
<b>Enrollment (%)</b>				
Freshman	14.3	6.3	21.7	18.9
Sophomore	17.1	18.1	21.2	23.7
Junior	19.0	20.9	19.3	20.3
Senior	15.9	20.4	24.1	25.5
Nondegree	11.1	9.5	7.4	8.4
Graduate	22.6	24.8	6.3	3.2
<b>Living on campus (%)</b>				
Dormitories	9.5	8.2	28.9	29.0
Fraternity/sorority	2.6	2.4	1.1	1.8
<b>Marital status (%)</b>				
Single	55.6	54.6	63.3	65.5
Married	35.2	37.7	30.0	25.3
Divorced	8.3	7.5	6.0	8.3
Widowed	0.9	0.0	0.7	0.9

were there any significant gender-by-campus interactions. Within the use scale, NMSU students reported drinking significantly more per occasion than did UNM students, but when frequency was taken into account (on the Q-F index), this difference disappeared even though the two campuses did not differ significantly on frequency of drinking. UNM students reported a higher rate of illicit drug use—computed as the total of all 10 drug use items,  $F(1, 1018) = 26.94, p < .001$ —at baseline, reflected in significantly higher rates of use for marijuana, cocaine, amphetamines, tranquilizers, sedatives, heroin, and LSD. On the 14 components of the problems scale, UNM students reported a higher rate (with  $\alpha$  uncorrected for multiple tests) on only 1 item: perceived problems related to illicit drug use,  $F(1, 993) = 13.86, p < .01$ . Within the 11 items of the risk scale, UNM students perceived themselves to be at greater risk of having future drug-related problems should their drug use not change,  $F(1, 976) = 12.46, p < .001$ . Thus, a consistent preprogram picture

emerges, whereby students on the CADAPP (UNM) campus reported higher rates of drug use and drug-related problems and a higher perception of future risk from their current drug use, relative to students on the control campus.

As is commonly reported,<sup>24</sup> there were substantial differences between men and women on drinking variables. With the two campus samples combined, males reported significantly more alcohol use,  $F(1, 992) = 40.5, p < .001$ , and overall drug use,  $F(1, 1018) = 15.4, p < .001$ . Men were more likely to report drinking and driving,  $F(1, 1014) = 41.9, p < .001$ , and having a drinking incident that resulted in an injury,  $F(1, 802) = 18.7, p < .001$ . Females were also generally more likely at baseline to perceive greater risks related to alcohol and other drug use.

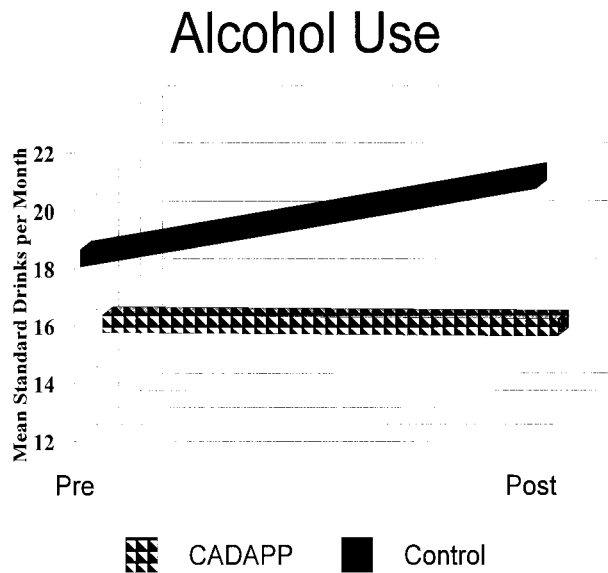
*Differences between campuses at follow-up.* In this quasi-experimental design, program effects could appear as significant differences between campuses at the postprogram follow-up that had not been present at baseline or as the disappearance at follow-up of significant differences that had been present before program implementation. One-way ANOVAs were conducted to compare the UNM and NMSU campuses at follow-up. (ANCOVA adjusting for preprogram levels was not possible because on random anonymous surveys, we could not match individual follow-up scores with baseline values.)

*Changes in substance use.* At follow-up, compared with the CADAPP (UNM) campus, NMSU students on average reported not only drinking significantly more drinks per occasion,  $F(1, 835) = 17.91, p < .001$ , but also higher rates of drinking three standard drinks,  $F(1, 835) = 8.11, p < .01$ , and six standard drinks per day,  $F(1, 835) = 15.69, p < .001$ . This resulted in a higher rate of drinks per month (quantity  $\times$  frequency),  $F(1, 835) = 7.35, p < .01$  (see Figure 1). No difference had been present on the latter three variables at baseline, and the change resulted from a moderate decrease in drinking on the CADAPP campus paralleled by a moderate increase in drinking on the control campus.

On total drug use, UNM students continued to report a higher overall rate of use,  $F(1, 863) = 11.49, p < .001$ , accounted for now by only two specific drug classes on which significant differences remained: tranquilizers,  $F(1, 839) = 10.93, p < .001$ , and LSD,  $F(1, 835) = 11.65, p < .001$ —two drugs not specifically targeted by the CADAPP program. Pretest differences on marijuana, cocaine, amphetamine, sedative, and heroin use were no longer significant. Again, this change occurred because of a modest increase in drug use on the control campus, paralleled by a modest decrease in use of these drugs on the CADAPP campus.

*Changes in problems.* Students on the control campus at follow-up (relative to students on the CADAPP campus) reported a higher rate of driving after drinking,  $F(1, 863) = 8.06, p < .01$ , and a higher rate of alcohol-related problems,  $F(1, 702) = 10.85, p < .001$ . This is consistent with the higher reported rates of drinking and binge drinking on the control campus. The higher rate of drug-related problems on the UNM campus at baseline was no longer significantly different from the control campus at follow-up.

*Changes in perceived risk.* The principal motivational mechanism through which we sought to change drinking and drug use behavior was by influencing perceptions of risk, with particular emphasis on goals valued by college students. It was therefore important that we assess changes on this dimension as well. Once again, the pattern is consistent,



**Figure 1.** Average alcohol use by students on experimental and control campuses.  
NOTE: CADAPP = Campuswide Alcohol and Drug Abuse Prevention Program.

with students on the control campus reporting higher rates of risky behaviors and lower perceived risks associated with drinking. NMSU students reported more frequent riding with a driver who had been drinking,  $F(1, 807) = 23.72, p < .001$ , and perceived less risk in doing so,  $F(1, 852) = 7.33, p < .001$ . There had been no pretest differences on these variables. Relatedly, at baseline, UNM students had reported a higher rate of riding with a drug-using driver, a difference no longer apparent at follow-up. Similarly, UNM students at pretest had perceived themselves to be at significantly higher risk for developing problems related to their drug use, a difference no longer present at follow-up.

*Within-campus changes.* Had we analyzed only the differences between pretest and follow-up scores within a single campus, a rather different picture would have emerged. Despite the large sample, there were no significant changes (even at  $p < .05$ ) at the UNM campus on use or problem measures. On risk variables, UNM students were less likely at follow-up (than at pretest) to ride with a driver who had been using drugs ( $p < .01$ ) and were more likely to perceive alcohol problems ( $p < .05$ ) and drug problems on campus ( $p < .05$ ). On the control campus, there was a significant increase in the frequency of having six or more drinks per day ( $p < .01$ ), as well as increased perception of risks associated with alcohol use ( $p < .01$ ) and drug use ( $p < .001$ ). A few outcome variables that can be simply presented as population percentages are shown in Table 2 to illustrate the effects described above.

Finally, we examined ANOVAs for indications of whether men and women responded differentially to CADAPP. No gender-by-time interactions reached a significance level of  $p < .01$  in comparisons of pretest versus follow-up scores in the UNM sample on any of the 41 outcome scales, suggesting that college men and women responded similarly to the prevention efforts.

Table 2. Illustrative Outcome Percentages for University of New Mexico (UNM) and New Mexico State University (NMSU) Samples From Pre- and Postprogram Surveys

Variable	UNM (Program Campus)		NMSU (Control Campus)	
	Pre	Post	Pre	Post
Regularly having three or more drinks per day	34.6	33.9	46.7	57.6
Marijuana use in past month	14.5	9.3	7.7	9.6
Cocaine use in past month	2.3	2.1	1.5	1.8
Riding with driver who has been drinking	46.0	41.0	52.8	56.1
Riding with driver who has used drugs	27.8	21.9	21.3	26.0

It must be noted that we tested 41 outcome variables and have reported *p* values without Bonferroni adjustment to protect against Type 1 error. If we make the most conservative familywise adjustment (.05/41), only differences at  $p < .001$  are interpreted as statistically significant. By this more stringent standard, the only new differences that appeared at follow-up are those on alcohol variables, with control respondents (relative to CADAPP campus students) reporting heavier drinking (more drinks per drinking day), more frequent binge drinking (six or more drinks), and a higher level of alcohol-related problems, along with more frequent riding with a driver who has been drinking and less perceived risk in doing so.

## DISCUSSION

Our findings provide encouraging evidence for the effectiveness of this self-regulation-based prevention program on a college campus. We subjected the program to a stringent test: its ability to yield changes in respondents randomly surveyed from the full population. Even by conservative statistical standards, differences remained on drinking variables at follow-up. It is clear that drinking went up on the control campus, relative to the campus exposed to CADAPP. To a lesser extent, the use of other drugs decreased more on the prevention campus.

### The Importance of a Control Group

A noteworthy point is that had there been no control campus in this study, we would have concluded incorrectly that the prevention program had little or no impact on student alcohol and drug use. Although there were increases among UNM students in perceived problems on campus (which might be interpreted as either good news or bad news), the absolute declines in alcohol/drug use seen from pre- to postprogram evaluations were modest and not statistically significant, even in a large sample. What we would have failed to recognize is the seasonal variation in drinking on a college campus. In retrospect, it is plain enough. In mid-winter, students may be more focused on their studies. By the

end of the spring term, friendship groups (the primary context within which college substance use occurs) are well established, final exams are approaching, the weather is beautiful, and students grow tired of the rigors of study. The control campus brought this seasonal drift to our attention, and without it we would not have realized that an *increase* in use would be expected from pre- to posttest as a coincidence of our evaluation schedule—an increase that the prevention program appears to have prevented. Instead of increasing steeply, binge drinking declined modestly on the program campus. Similarly, a significantly higher level of various categories of drug use at UNM before implementation of CADAPP had disappeared by follow-up, a change we would not have detected without the control campus. Measuring changes using a random population survey is a difficult test of prevention programming. Although meaningful in a large population, changes resulting from a universal prevention program are often small in magnitude and are easily missed without a reasonable standard against which to judge program performance.

### **Some Study Limitations**

Of course, one cannot confidently conclude from this quasi-experimental design that the observed difference between campuses was due to CADAPP. Neither can changes be attributed to particular components of this multifaceted program or directly support the self-regulation model on which it was based. Many factors can influence substance use levels, though we were not aware of any unusual conditions that would have differentially influenced the campuses. The usual environmental influences—such as prices, taxes, state regulations, campus policies, and enforcement—did not change substantially during the study period. Neither was there any reason to expect that students on the two campuses would respond differentially to anonymous surveys. The only obvious difference between the two campuses that might be expected to affect substance use differentially was the implementation of the prevention program at UNM.

Some limitations of this study must be acknowledged. All outcome data were derived from anonymous random sample surveys that allowed no opportunity to corroborate self-report and prevented the specific matching of individual pretest and follow-up scores. This is an inherent limitation in the use of anonymous surveys to sample an entire population for effects of prevention programming that would affect both campuses similarly. The rate of return of questionnaires was low (42% at pretest and 33% at follow-up overall). Although the demographics of respondents were similar to those for the campus populations, we were not able to compare directly the characteristics of responders versus nonresponders, not having collected data regarding nonresponders. Baseline data were collected 3 months later on the control campus than on the CADAPP campus, although follow-up surveys were completed simultaneously. The two campus populations were similar but by no means identical at baseline, and campuses were not randomly assigned to intervention versus control conditions. Thus, the design was quasi-experimental and cannot be interpreted with the confidence of a randomized trial.

### **Implications for Practice**

When exposing an entire population to a “preventive” intervention, one has a special ethical obligation to ensure that the intervention is likely to be beneficial or at least to evaluate it so that its impact can be judged reliably. This study consolidated for us the vital

importance of having a control with which to compare outcomes. Without it, we might have discarded an effective approach. Similarly, in an uncontrolled design, one could fail to detect a detrimental effect of an intervention.

The CADAPP program also illustrates the usefulness of developing interventions that are multifaceted, multilevel, and ongoing. To affect an entire campus population, we reasoned that broad and varied approaches were warranted. This is sometimes criticized as a “shotgun” approach, and indeed one cannot at this level determine the relative importance of specific components. The finding of an effective multilevel program such as CADAPP can be followed up with further studies (such as additive and subtractive designs) of the impact of its parts. It is also quite possible, however, that the effectiveness of a multifaceted program lies precisely in the synthesis of its components, in their joint and interactive effects. From this perspective, dismantling studies are rather like removing parts of an automobile engine to see which one makes it run.

Our findings also suggest that a clear theoretical perspective can be helpful in designing a multilevel program, so that all of its components function with a common rationale. Self-regulation theory has been quite useful in understanding the etiology and treatment of behavior problems, and this study illustrates how it can be used effectively to guide prevention programs as well.

### **Institutionalization of the Program**

An encouraging closing note is that within 2 years after federal funding ended for the CADAPP program, it received “hard money” status through recognition and support of the university administration. The program continues with UNM funding, more than a decade after its inception, and is now affiliated with the Center on Alcoholism, Substance Abuse, and Addictions (CASAA). Program elements have evolved and changed over time, but much of the original approach remains. The program and its advisory board have become an important forum for reviewing and changing alcohol and other drug-related policies on campus. To date, campuswide policy changes have included (a) significant strengthening of alcohol use and sponsorship policies; (b) a broad ban on tobacco use (smoke-free campus in most university buildings, organized outdoor events, and university vehicles); (c) a variety of new disciplinary policies for students, faculty, and staff; (d) mandatory drug testing programs in selected jobs and programs; and (e) the development of a safe and effective response with employees who show signs of impairment on the job. The drinker’s checkup program was subsequently expanded to include all psychoactive drugs and has been institutionalized as a regular service through the student health center and UNM’s employee assistance program. Such program institutionalization is likely to promote maintenance and continuation of gains, which we are monitoring through repeated campus surveys.

### **References**

1. Kanfer FH: Self-regulation: Research, issues, and speculations, in: Neuringer C, Michael JL (eds.), *Behavioral Modification in Clinical Psychology*. New York, Appleton-Century-Crofts, 1970, pp. 178-220.
2. Kanfer FH: Self-regulation and behavior, in: Heckhausen H, Gollwitzer PM, Weinert FE (eds.), *Jenseits des Rubikon*. Heidelberg, Springer-Verlag, 1987, pp. 286-299.

3. Brown JM: Self-regulation and the addictive behaviors, in: Miller WR, Heather N (eds.), *Treating Addictive Behaviors*. 2nd ed. New York, Plenum, 1998, pp. 61-74.
4. Kanfer FH: Implications of a self-regulation model of therapy for treatment of addictive behaviors, in: Miller WR, Heather N (eds.), *Treating Addictive Behaviors: Processes of Change*. New York, Plenum, 1986, pp. 29-47.
5. Miller WR, Brown JM: Self-regulation as a conceptual basis for the prevention and treatment of addictive behaviours, in: Heather N, Miller WR, Greeley J (eds.), *Self-Control and the Addictive Behaviours*. Sydney, Australia, Macmillan, 1991, pp. 3-79.
6. Miller WR, Andrews NR, Wilbourne P, Bennett ME: A wealth of alternatives: Effective treatments for alcohol problems, in: Miller WR, Heather N (eds.), *Treating Addictive Behaviors*. 2nd ed. New York, Plenum, 1998, pp. 203-216.
7. Agostinelli G, Miller WR: Drinking and thinking: How does personal drinking affect judgments of prevalence and riskiness? *J Stud Alcohol* 55:327-337, 1994.
8. Agostinelli G, Brown JM, Miller WR: Effects of normative feedback on consumption among heavy drinking college students. *J Drug Educ* 25:31-40, 1995.
9. McLeroy KR, Bibeau D, Steckler A, Glanz K: An ecological perspective on health promotion programs. *Health Educ Q* 15:351-377, 1988.
10. Stockols D, Allen J, Bellingham RL: The social ecology of health promotion: Implications for research and practice. *Am J Health Promotion* 10:247-251, 1996.
11. Baer JS, Marlatt GA, Kivlahan DR, Fromme K, Larimer M, Williams E: An experimental test of three methods of alcohol risk-reduction with young adults. *J Consult Clin Psychol* 60:974-979, 1992.
12. Marlatt GA, Baer JS, Kivlahan DR, et al: Screening and brief intervention for high-risk college student drinkers: Results from a 2-year follow-up assessment. *J Consult Clin Psychol* 66:604-615, 1998.
13. Markham MR, Miller WR, Arciniega L: BACCUS 2.01: Computer software for quantifying alcohol consumption. *Behavior Research Methods, Instruments, and Computers* 25:420-421, 1993.
14. Skinner HA: Early identification of addictive behaviours using a computerized lifestyle assessment, in: Baer JS, Marlatt GA, McMahon RJ (eds.), *Addictive Behaviours Across the Lifespan: Prevention, Treatment and Policy Issues*. Newbury Park, CA, Sage, 1993.
15. Skinner HA: *Computerized Lifestyle Assessment: Manual and Computer Program*. Toronto: Multi-Health Systems, 1994.
16. Miller WR, Sovereign RG: The check-up: A model for early intervention in addictive behaviors, in: Løberg T, Miller WR, Nathan WR, Marlatt GA (eds.), *Addictive Behaviors: Prevention and Early Intervention*. Amsterdam, Swets & Zeitlinger, 1989, pp. 219-231.
17. Miller WR, Zweben A, DiClemente CC, Rychtarik RG: *Motivational Enhancement Therapy Manual: A Clinical Research Guide for Therapists Treating Individuals With Alcohol Abuse and Dependence* (Vol. 2, Project MATCH Monograph Series). Rockville, MD, National Institute on Alcohol Abuse and Alcoholism, 1992.
18. Miller WR, Benefield RG, Tonigan JS: Enhancing motivation for change in problem drinking: A controlled comparison of two therapist styles. *J Consult Clin Psychol* 61:455-461, 1993.
19. Miller WR, Sovereign RG, Kreege B: Motivational interviewing with problem drinkers: II. The drinker's check-up as a preventive intervention. *Behav Psychotherapy* 16:251-268, 1988.
20. Meyers RJ, Smith JE, Miller EJ: Working through the concerned significant other, in: Miller WR, Heather N (eds.), *Treating Addictive Behaviors*. New York, Plenum, 1998, pp. 149-162.
21. Miller WR, Rollnick S: *Motivational Interviewing: Preparing People to Change Addictive Behavior*. New York, Guilford, 1991.
22. Miller WR, Muñoz RF: *How to Control Your Drinking*. Rev. ed. Albuquerque, University of New Mexico, 1982.
23. Grant KA, Tonigan JS, Miller WR: Comparison of three alcohol consumption measures: A concurrent validity study. *J Stud Alcohol* 56:168-172, 1995.



24. Cahalan D, Cisin IH: American drinking practices: Summary of findings from a national probability sample: II. Measurement of massed vs. spaced drinking. *Q J Stud Alcohol* 29:642-656, 1968.
25. Miller WR, Tonigan JS, Longabaugh R: *The Drinker Inventory of Consequences (DrInC): An Instrument for Assessing Adverse Consequences of Alcohol Abuse: Test Manual* (Vol. 4, Project MATCH Monograph Series). Rockville, MD, National Institute on Alcohol Abuse and Alcoholism, 1995.