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To cite this article: Patchareeya Pumpuang Kwan, Steve Sussman & Thomas W. Valente (2015) Peer Leaders and Substance Use Among High-Risk Adolescents, *Substance Use & Misuse*, 50:3, 283-291

To link to this article: <http://dx.doi.org/10.3109/10826084.2014.977395>



Published online: 19 Nov 2014.



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ORIGINAL ARTICLE

## Peer Leaders and Substance Use Among High-Risk Adolescents

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**Objective:** To examine the association between individual drug use and peer leaders use. **Method:** Analysis of drug use behaviors of 525 students randomized into three arms—control, standard, and networked where peers serve as group leaders. **Results:** Among the combined male and female group, there was no association between peer leader and individual use. Among males, peer leader use at baseline was positively associated with individual alcohol use at post-test. Among females, peer leader use at post-test was negatively associated with marijuana and cigarette use. **Conclusion:** Having peer leaders in the network condition decreased the odds of marijuana and cigarette use among females. The opposite effect was found in males.

**Keywords** peer leaders, substance use, peer influence, high risk, adolescents, peer culture

### INTRODUCTION

Adolescent peer groups share similar norms, values, attitudes, and behaviors. Peer group culture, especially among adolescents, is an important factor in individual identity construction (Sherriff, 2007). Peers influence what clothes to wear, what music to listen to, what things to eat, whom to like and imitate as well as how to behave in various settings. When these behaviors are positive and pro-social behaviors like playing sports, academic excellence, not smoking or taking drugs, peer modeling is encouraged. However, when these behaviors are negative and anti-social behaviors like physical violence and substance abuse, peer modeling is not only discouraged but can be dangerous. This paper reports on the effects of peer influences on substance use among high-risk adolescent males and females. More specifically, we looked at the effects of peer leader substance use on individual substance use and how these effects differ by gender. It is hypoth-

esized that adolescents with peer leaders who increased their substance use will report increases in substance use themselves. On the other hand, adolescents whose peer leaders reported a decrease in substance use, will in-turn report a decrease in substance use. We also expect to see a stronger relationship among adolescent males than adolescent females due to the nature of adolescent males and deviancy (Dishion, McCord, & Poulin, 1999).

### Peer Influences

Adolescents are strongly influenced by their peers on a variety of dimensions (Berndt, 1979). Behaviors such as physical activity (Anderssen & Wold, 1992), consumer decisions (Childers & Rao, 1992), educational and occupational aspirations (Duncan, Haller, & Portes, 1968), performance in school (Berndt & Keefe, 1996), risk taking (Gardner & Steinberg, 2005), and alcohol use (Nash, McQueen, & Bray, 2005) have been strongly linked to peer influences. Approximately 300 seventh and eighth grade students who reported having best friends with good behaviors improved their behaviors during the school year while those who reported having disruptive best friends increased their disruptive behaviors during the school years (Berndt & Keefe, 1996). Individuals take more risk and are more likely to think about the benefits rather than the consequences of these risks when in a peer group (Gardner & Steinberg, 2005). Peer influences and individual behavior are strongly associated when it comes to behaviors such as substance use and abuse. Studies have shown that adolescent substance use is strongly influenced by peers but it is even more so among peers who are also substance users (Hawkins, Lishner, Catalana, & Howard, 1985; Kandel, 1978; Valente et al., 2007). Peer influences in the form of peer norms and peer modeling are strongly related to alcohol use (Biddle, Bank, & Marlin, 1980; Nash et al., 2005) and smoking (Chassin,

Presson, Sherman, Corty, & Olshavsky, 1981; Levitt, 1971) during middle adolescence (i.e., around age 15). Among approximately 500 Caucasian and Hispanic youths who were substance users, it was concluded that peer influence is stronger than parental influence. This same study found that marijuana use by friends is the strongest predictor of individual drug use (Coombs, Paulson, & Richardson, 1991). A study among Caucasian and Hispanic youths age 9–17 years showed that the strongest predictor of drug use among these adolescents was their friend's level of marijuana use (Coombs et al., 1991). Another study of 294 young adults found that peer use was predictive of individual cigarette use, binge drinking, and problem use (Andrews, Tildesley, Hops, & Li, 2002). Peer influences have a larger impact on adolescents' attitudes toward substance use and abuse than adults because adolescents are especially influenced by the expectations, attitudes, and behavior of the group to which they belong (Linsey, 1997).

### Gender Differences

What is important to note when looking at peer influences is the difference between adolescent males and females and how these differences impact behavior. Girls have been found to be more highly influenced by their best friends than boys (Berndt & Keefe, 1996). Adolescent peer influence was a strong predictor of body dissatisfaction among overweight and at risk of being overweight girls in a study conducted in Florida (Thompson et al., 2007). A study looking at the influence of best friend's sexual activity among Caucasian and African American students in grades seventh through ninth showed that Caucasian girls were influenced by the sexual behaviors of both their male and female best friends (Billy & Udry, 1985). Data from the National Longitudinal Study of Adolescent Health showed that adolescents in same-sex friendships have equal influence on each other when it comes to alcohol consumption. However, in mixed-sex friendships, female adolescents are more influenced by males but do not have the same influence on their male friends' alcohol use behavior (Gaughan, 2006). A study looking at parental involvement and peer deviance on substance use showed that substance use among female adolescents is highly associated with having deviant peers and low parental involvement and monitoring (Svensson, 2003).

### High-Risk Adolescents and Substance Use

It is important to note that the definition of "high risk" varies according to the context of the subjects that are being studied, characteristics such as age and gender, predisposing factors such as social status, and environmental and other causal factors (Dryfoos, 1990). For this paper, "high risk" refers to adolescents who are at risk of being substance abusers due to the large proportion of substance users within their peer group and overall surroundings (Johnson et al., 1990; Pentz, 1994). High-risk youths generally are individuals who come from disadvantaged

socioeconomic groups, children of substance-users, risk-takers, those suffering academic problems, or targets of drug promotion by the tobacco and alcohol industries (Sussman et al., 2004). Of the many delinquent behaviors exhibited by high-risk adolescents such as physical violence (Broidy et al., 2003; Orpinas, Basen-Enquist, Grunbaum, & Parcel, 1995) and risky sexual behaviors like unprotected sex (Biglan et al., 1990; Luster & Small, 1994; Turner et al., 1998), substance abuse ranks as one of the most prevalent and serious. Substance abuse is one of the major causes of morbidity and mortality among adolescents in the United States (Sussman, Skara, & Ames, 2008). Due to the nature of their peer group and environmental surroundings, high-risk adolescents are at an increased risk of being substance abusers and suffering the consequences of substance abuse.

### Peer Leaders

The purpose of this paper is to identify the association between peer leader substance use and individual substance use among high-risk adolescents enrolled in a substance use cessation program with a peer leader component. It is hypothesized that each student's drug use will mirror the drug use behaviors of their peer leaders. Like peer groups, peer leaders have substantial influence over adolescent behaviors. These peer leaders usually share similar backgrounds such as age, ethnicity, and socioeconomic backgrounds with the people they lead. These peer leaders are often imitated by other students in the school or usually engage in behavior that are considered the "norm" for that school. If peer leaders use drugs then it is highly likely that others around them will use drugs. If however, peer leaders abstained from drug use, there is likelihood that others in the same peer group will mirror this behavior.

## METHODS

### Transdisciplinary Prevention Research Center (TPRC)

Secondary data analysis was conducted on data collected by the Transdisciplinary Prevention Research Center (TPRC) at the Institute for Prevention Research housed within the University of Southern California's Keck School of Medicine. TPRC was funded by the National Institute on Drug Abuse to study the effects of Project Towards No Drug Abuse (TND) on high-risk adolescents in continuation high schools. Project TND is a 12-session school-based curriculum designed to motivate youths to change their perspectives and perceptions of drug use and teach social skills, life skills, and decision-making techniques to help them plan good solutions to difficult problems and situations (Sussman, Dent, & Stacy, 2002; Sussman, Sun, Rohrbach, & Spruijt-Metz, 2012). One-year follow-up study of TND has shown decreased use of cigarettes, alcohol, marijuana, hard drugs, and weapons carrying (Sussman et al., 2002). Effects of TND on cigarette smoking were also maintained at two-year follow-up (Sussman, Sun, McCuller, & Dent, 2003).

### Intervention

A total of 14 continuation high schools from 7 school districts in Southern California provided 75 classrooms for the randomized controlled trial. Continuation high schools are schools for high-school-age adolescents who cannot continue in the traditional high school setting due to emotional, behavioral, or function problems (Sussman et al., 1997). The 14 schools were randomized to one of three study conditions—control, standard TND, or TND-Network. Twenty-eight classrooms were used as the control, 22 received the standard curriculum, and 25 received TND-Network. Only one session lasting approximately 45–60 min was delivered in the classroom each day for a period covering three to four weeks. A total of 16 trained health educators were used to deliver the curriculum. Students in the TND-Network condition received a modified version of the standard TND curriculum. The network condition, which involved more interactive group work, utilized peer leaders to lead small groups of students in addition to the health educators (Valente et al., 2007).

### Peer Leader Selection

Peer leaders were identified prior to the start of the curriculum by student nominations. The students were asked to nominate people in the class who they felt made good leaders. Data from these surveys were then used to identify peer leaders in each classroom and grouped students into individual groups led by the peer leaders. Peer leaders were trained on facilitating group discussions and were introduced to program materials the week prior to each session. While students in the standard condition participated individually and were grouped into two teams at the end of each session to play a review game, students in the network condition worked and played the review game together as a team and stayed in the same team led by a peer leader throughout the 12 session curriculum.

### Data Collection

Baseline data were collected approximately one week prior to implementation of the curriculum and gathered information on basic demographic characteristics, main effects variables of interest for the study (i.e., current drug use) and network nominations. Pre-test data were collected prior to the start of the first curriculum and contained similar questions as those on the baseline survey but with the addition of knowledge questions pertaining to the curriculum. Post-test data were collected after the 12th session was implemented while follow-up data was collected approximately 12 months after the completion of the study. Except for the follow-up data, all observations were collected in person on the school grounds via a paper-and-pencil survey. Follow-up data were either collected in person by research staff or via telephone surveys conducted by trained staff members.

### Measures

Individual substance use at baseline and post-test are the outcome measure of interest in this paper. We did not look

at substance use at 12-month follow-up because of the high attrition rates, which provided limited data available for our analysis. Initially based on a total of 11 drug items including alcohol, marijuana, cocaine/crack, cigarettes, ecstasy, hallucinogens, stimulants/amphetamines, tranquilizers, opiates, inhalants/vapors, and other club/party drugs, this particular analysis will look at alcohol, cigarettes, and marijuana separately and take the average of the remaining drug items to represent “hard drugs” and the average of all the drug items to create a composite drug variable labeled “all drugs.” For each drug item, students were asked how many times they have used the drug in the past 30 days and were given answers choices that ranged from 1 for zero times, 2 for 1–10 times, 3 for 11–20 times, 4 for 21–30 times, 5 for 31–40 times, all the way up to 11 for 91 or more times in the past 30 days. Since descriptive statistics showed that data on the drug use variables were not normally distributed and skewed, the drug use variables were recoded and changed into dichotomous variables—0 for no use and 1 for use (i.e., at least once in the past 30 days).

Information on age, sex, socioeconomic status (SES), and ethnicity at baseline were used as covariates for this analysis. Information on the highest grade completed by the subject’s father and mother were used as a proxy for socioeconomic status with higher values representing higher SES. Response on father’s and mother’s education ranged from 1 “not completed elementary school” to 6 “completed graduate school.” The sum of both parents’ education level were used for SES. Descriptive analysis of the variable on SES showed approximately 40% missing data and thus the mean of SES was imputed (mean SES = 5.75). Since SES is a sum of both parents’ education level (12 being the highest level of education possible), a mean of 5.75 depicts a relatively low level of education or in this particular sample, low SES. Hispanics made up more than 60% of the study population and thus, a “Hispanic” dummy variable was used to represent ethnicity (i.e., Hispanic = 1 for all Hispanic students, Hispanic = 0 for all other ethnicities).

In order to measure the association between peer leader use and individual use, peer leader alcohol, cigarettes, marijuana, hard drug, and all drug use were matched to that of the students in their group. A total of 10 new variables were created to represent peer leader use of alcohol, cigarettes, marijuana, hard drugs, and all drugs at baseline and post-test, matched to students in their group. Data on study participants plus their corresponding peer leaders identified via unique subject IDs and peer leader IDs were merged and cross-referenced so that each participant had data for the 10 variables that was based on their peer leader’s corresponding alcohol, cigarette, marijuana, hard drug, and all drug use at both points in time. This means that there will be about three to five participants who have the same values for all 10 variables since they all shared one peer leader. Peer leaders technically led themselves and thus, the 10 peer leader-related variables for them will reflect their own use.

As mentioned, only students in the network condition were assigned into groups led by a peer leader. Students in the control and standard TND condition were not assigned into groups and did not have designated peer leaders. However, because we were still interested in how students in these two conditions would have behaved if they had peer leaders, peer leader nomination data for students in the control and standard TND conditions were analyzed and students were assigned to network groups with peer leaders, post intervention. Peer leader drug use data for these students were handled in the same way as that of network students.

### Analysis

Data analysis for this study was conducted in STATA version 10.0. We first conducted a *t*-test to assess potential differences between peer leader substance use and individual substance use in the entire sample and in the network condition only. We wanted to know if peer leaders used substances more so than non-peer leaders because “popular” students tend to engage more in behaviors that are considered “cool” or socially normal among at risk adolescents. We then utilized a mixed model logistic regression with school, classroom, and peer groups as the random effects. The outcome of interest in the regression models is individual use of alcohol, marijuana, cigarettes, hard drugs, and all drugs at post-test dichotomized into use and no-use. Predictor variables included individual use at baseline, peer leader use at baseline and post-test, study condition, and the interaction between being in the network condition and the peer leader for the group. All models were adjusted for age at baseline, SES, and ethnicity. The three-level model was used because students were grouped at the school level, classroom level, and placed into peer groups and thus there may be significant differences between these groups that must be accounted for in the analysis. Students may choose peer leader with particular characteristics and different peer groups may then take on different characteristics, which warrants looking at peer groups as a random effect. For students in the control and standard condition who did not get placed in groups, we speculate that group level effects were still present and thus analysis was done accordingly.

### RESULTS

A total of 985 continuation high school students completed the baseline survey. Twenty-seven percent were randomized to the control condition, 34% to the standard TND condition, and 39% were randomized to the network condition. Ideally 33% of students should have been randomized to each of the three conditions but classroom and school infrastructure as well as student attendance disabled us from the evenly distributing students into each condition. A total of 525 students completed the post-test survey and provided complete network data. As mentioned, peer leader drug use data was collected from students in the network condition as well as generated from students in the control and standard TND condition. Since

TABLE 1. Demographic characteristics at baseline (all condition vs. network condition only)

	All conditions		Network condition only	
	Peer leaders <i>N</i> = 187	Members <i>N</i> = 798	Peer leaders <i>N</i> = 73	Members <i>N</i> = 311
Mean age (years)	16.42	16.39	16.21	16.42
Male (%)	48.85	62.76	48.53	64.79
Mean grade	10.80	10.57	10.61	10.37
Ethnicity (%)				
Asian American	3.05	2.58	0.00	1.95
African American	7.93	5.88	9.38	8.20
Hispanic/Latino	69.51	68.87	68.75	67.58
White/Caucasian	9.15	13.49	10.94	14.06
Amer. Indian/Native Amer.	1.83	0.57	1.56	0.39
Mixed ethnicities	7.93	8.03	7.81	7.03
Other	0.61	0.57	1.56	0.78

there was no protocol to handle missing network data on students in the control and standard curriculum group, missing network data from these groups remained missing and thus resulted in only 525 participants.

Table 1 shows the basic demographic data of the all study conditions combined and network condition only at baseline. A total of 73 students in the network condition served as peer leaders and 311 were members. Combining all study conditions, a total of 187 students were identified as peer leaders (some post intervention) with 798 group members at the start of the study. Mean age of the sample at baseline was about 16 years of age. Close to 49% of peer leaders were males while 62.76% of the group members were males in the combined group. If looking specifically at the network condition, 48.53% of the peer leaders were males and 64.79% of the group members were males. It is interesting to note that male students make up about 60%–65% of the sample population but among peer leaders, they make up less than 50%, which means that more females were chosen as peer leaders (i.e., female students make up about 40% of the sample population but over 50% of the peer leaders). Hispanic students were proportionately selected as peer leaders (i.e., Hispanics made up close to 70% of the sample population as well as 70% of the peer leader group). Although utilized as a covariate, SES is not represented in this table because of the large number of missing and incomplete data.

Table 2 shows the result of the *t*-test for differences between peer leader substance use and individual substance use among all conditions combined and the network condition only. Results of the *t*-test showed no significant differences between baseline peer leader substance use of alcohol, marijuana, cigarettes, hard drugs, and all drugs and baseline substance use behaviors of those who were not peer leaders in both the combined group and the network only group. A *t*-test of substance use at post-test also showed no significant differences between peer leaders and students who were not peer leaders. Based on these results, it can be safely assumed that all the students in

TABLE 2. Test for differences between peer leader substance use and individual substance use

	<i>All conditions combined</i> Mean substance use			<i>Network condition only</i> Mean substance use		
	Peer leaders (std. error)	Non-peer leaders (std. error)	Significance*	Peer leaders (std. error)	Non-peer leaders (std. error)	Significance*
Use at Baseline						
Alcohol	2.58 (0.19)	2.30 (0.08)	0.13	2.40 (0.26)	2.20 (0.12)	0.46
Marijuana	2.77 (0.24)	2.59 (0.10)	0.43	2.53 (0.33)	2.55 (0.17)	0.97
Cigarette	2.51 (0.21)	2.35 (0.10)	0.49	2.49 (0.30)	2.42 (0.17)	0.86
Hard drug	1.10 (0.02)	1.19 (0.03)	0.15	1.07 (0.02)	1.18 (0.05)	0.23
All drug	1.52 (0.05)	1.54 (0.04)	0.83	1.47 (0.07)	1.51 (0.05)	0.75
Use at post-test						
Alcohol	2.52 (0.23)	2.51 (0.10)	0.96	2.29 (0.28)	2.52 (0.16)	0.49
Marijuana	2.89 (0.28)	2.74 (0.12)	0.59	2.57 (0.37)	2.61 (0.18)	0.92
Cigarette	2.28 (0.23)	2.50 (0.13)	0.44	2.73 (0.42)	2.45 (0.20)	0.53
Hard drug	1.24 (0.08)	1.27 (0.05)	0.75	1.34 (0.19)	1.19 (0.06)	0.30
All drug	1.60 (0.10)	1.64 (0.05)	0.74	1.67 (0.20)	1.56 (0.07)	0.51

Note: Significance is set at  $p < .05$ .

this sample, regardless of peer-leadership status, had similar substance use behaviors. Peer leaders were not heavier substance users than the other students in this sample.

### Logistic Regression

Table 3 displays the results of the mixed model logistic regression with individual substance use at post-test as the outcome of interest. The first section of this table reports the results of the combined male and female group. As expected, individual substance use at baseline for all drug categories was statistically significantly associated with post-test individual substance use ( $p < .001$ ). Students who were users at baseline will continue to be substance users at post-test, a time difference of about three to four weeks. Among the same group, being in the standard TND study condition increased the odds of hard drug use (OR = 2.71, 95% CI 1.17–6.30). Peer leader substance use at baseline and post-test was not associated with individual substance use among the combined male and female group.

When stratified by gender, substance use behaviors were very different between male and female students as expected. Among male students only, baseline substance use was associated with increased odds of post-test substance use for alcohol, marijuana, cigarette, hard drugs, and all drugs ( $p < .01$ ). The interaction term between network condition and peer leader use of alcohol at baseline was positively associated with individual alcohol use at post-test (OR = 1.56, 95% CI 1.06–2.29). In addition, the interaction term between network condition and peer leader use of hard drugs at post-test was positively associated with individual hard drug use at post-test (OR = 5.13, 95% CI 1.39–18.94). This means that among male students in the network condition, peer leader hard drug use increased the odds of a group member's hard drug use at post-test by 5.13 times.

Among female students only, individual baseline substance use was again significantly associated with individual post-test substance use ( $p < .001$ ). However among fe-

males, peer leader use of marijuana at baseline was negatively associated with individual marijuana use at post-test (OR = 0.78, 95% CI 0.60–1.00). Peer leader use of cigarettes at post-test increased the odds of cigarette use at post-test (OR = 4.02, 95% CI 1.86–8.67). In addition, the interaction term between network condition and peer leader use of marijuana and cigarettes at post-test was negatively associated with individual use at post-test (OR = 0.66, 95% CI 0.44–0.99 and OR = 0.31, 95% CI 0.14–0.69, respectively). These last results indicate that peer leader use of marijuana and cigarette at post-test was associated with a decreased odd of marijuana and cigarette use at post-test among female students in the network condition. What can be concluded from these results is that females were more likely to choose peer leaders who they truly liked and were true influential people in their lives. Whether it was based on popularity, achievement in class or drug use, females just picked leaders who had more impact on their behavior, regardless of the peer leader's substance use behavior. Thus, after being led by these peer leaders in the network classrooms, females tend to react more positively to the program's effects. The network condition moderated use of marijuana and cigarettes use at post-test among female students.

### DISCUSSION

Peer leader substance use and being in the TND-network study condition played an important role in substance use among male and female adolescents in this sample. Although peer leader use and the network condition are associated with an increase odd of hard drug use among male students, the opposite effect was seen among female students. It turns out that among female students, peer leader substance use and being in the network study condition decreased the odds of cigarette and marijuana use. Female students in the network study condition that had peer leaders who used cigarette and marijuana at post-test, had a

TABLE 3. Odds ratios for individual substance use by gender

	Males and females ( <i>n</i> = 525)					Males only ( <i>n</i> = 310)					Females only ( <i>n</i> = 215)				
	Alc	Mar	Cig	Hard drugs	All drugs	Alc	Mar	Cig	Hard drugs	All drugs	Alc	Mar	Cig	Hard drugs	All drugs
TND	1.55	1.47	1.43	2.71*	1.65	1.02	1.72	2.33	1.99	1.41	2.27	0.75	0.50	4.36	1.22
Net	1.29	1.71	1.00	4.74	2.36	0.83	1.94	1.36	2.39	2.52	1.27	1.12	2.58	6.78	0.90
Use at baseline	2.30‡	2.76‡	1.59‡	10.60‡	35.08‡	1.93‡	2.04‡	1.50‡	4.00‡	15.70‡	4.08‡	9.96‡	2.08‡	693.34‡	648.51‡
Peer leader use at baseline	0.90	1.00	0.93	2.89	1.15	0.79	1.07	0.94	3.99	1.59	0.92	0.78*	1.13	1.61	0.47
Peer leader use at post-test	1.08	1.08	1.24	1.20	1.09	1.09	1.01	1.06	0.59	0.72	1.09	1.38	4.02‡	4.44	2.63
Net * PL use at baseline	1.16	1.02	1.18	0.43	0.82	1.56*	0.92	1.18	0.26	0.67	0.91	1.29	0.84	0.92	0.80
Net * PL use at post-test	1.06	0.96	0.90	1.01	1.06	0.98	1.11	1.00	5.13*	1.44	1.37	0.66*	0.31‡	0.23	1.28

Note: TND = standard condition; Net = network condition; PL = peer leaders; \* =  $p < .05$ , † =  $p < .01$ , ‡ =  $p < .001$ ; All models were adjusted for age at baseline, SES, and ethnicity. Gender (male) was adjusted for in the combined male and female model.

decreased odds of using cigarette and marijuana themselves. Why is this so?

Male and female adolescents react differently to group norms and they also behave differently in their peer network groups. In early teenage years, peer social groups became more segregated and girls tend to have larger groups than boys (Feiring & Lewis, 2004). Girls also have more exclusive friendships than boys and usually keep their friendship groups the same size while boys tend to expand their friendship groups (Eder & Hallinan, 1978). Interviews of fourth and fifth grade boys and girls found that position in the group was associated with peer acceptance among the boys and that boys were more concerned with their status in the networks while girls cared more for attributes that were important to the relationships within the networks (Benenson, 1990). Both male and female adolescents want to conform to the norms of their groups. Conformity is desirable especially in adolescent social networks since many do not yet know what they truly want and are yet to establish their own sets of core values and beliefs. Since male adolescents are influenced by their peer culture of drug use and risky behaviors, it is likely that they will follow the acceptable peer norm for them as opposed to female adolescents. Males tend to be more concerned with attributes that promote their status in the network while females are more concerned with quality of the relationship (Benenson, 1990). Males have a tendency for deviancy and may elevate their status within the peer group by behaving mischievously or in the case of high-risk adolescent males, using hard drugs. However, among females, there is no need to feel accepted and important in the peer group through misconduct and thus their use did not increase with peer leader use. The act of being in a network condition, working interactively with peers and having peer leaders who they selected help lead the curriculum increased their positive reaction to the curriculum and thus influenced female students to decrease their own substance use.

### Limitations and Conclusion

There are several limitations to this study that must be mentioned. First, in interpreting the results of Table 3, it is important to note that this analysis uses post-test data, which were collected immediately after the curriculum and asked about past 30 day drug use. Interpretations of the results cannot include observations about the effectiveness of the curriculum since a time overlap exists between the curriculum and the past-30 day drug use measure (i.e., substance use at post-test could have measured behavior both before and during the TND sessions). We also noted that the odds ratio for baseline hard drugs and all drug use in Table 3 for the combined male and female group and the separate male and female groups are very high, especially among the female only group. We suggest that this high odds ratio occurred because female use of hard drugs at baseline was highly predictive of use at post-test and because the all drug use variable include use of hard drugs as well, the same effect occurred for the all drug

use variable. Second, there are high correlations between baseline substance use and post-test substance use among all students in this sample, indicating that there is very little variation to be explained by the other variables. Third, this study looks particularly at peer leader influence by asking subjects to name people in their class who they feel are the best leaders. It does not ask who they liked the most or who they would most likely follow or imitate. The study did ask about best friends and people in the class who students wanted to work with in a group. However, these questions might not have been able to capture the most influential students in the class. Peer leaders might have influence on adolescent drug use but maybe the influences would be more prominent and hence the curriculum more impactful, if students were asked to nominate the most influential peers to them. Another related point to mention is that students were asked to nominate people in their classroom and not within the school. There is a chance that students have closer friends outside the classroom or felt that there were students in another classroom that would make a better leader. Continuation high school students may get sent to the school mid-year and do not necessarily know other students well. Chances do exist that the students' best friends or best leaders are not even in the school. Lastly, unlike traditional schools where students continue in the same cohort and thus develop very close social networks and hence, strong levels of peer influence, continuation high school students are not part of a cohort and come into the schools at different times. One classroom may consist of students at varying grade levels who do not necessarily learn together. This limits the degree of peer influence and thus we did not see a very strong relationship between peer leader use and individual drug use.

### Implications and Future Directions

The results of this study reiterate the importance of substance abuse prevention and cessation programs among high-risk adolescents. More importantly, it points to the importance of peer influences and how it may have different effects on male and female adolescents. Existing research studies have told us that male adolescents are influenced by their peers in the realms of deviant and risky behaviors. Newer studies have found that female adolescents are just as much influenced by their peers as their male counterparts. Future substance abuse prevention or risk reduction interventions should keep in mind the power of peer influence and how this effect can differ by gender. Perhaps an intervention tailored specifically to the two genders might be a more successful.

### Declaration of Interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the article.

## THE AUTHORS



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**Steve Sussman, Ph.D., FAAHB, FAPA**, received his doctorate in social-clinical psychology from the University of Illinois at Chicago in 1984. He is a Professor of Preventive Medicine, Psychology, and Social Work at the University of Southern California (USC), and he has been at USC for 30 years. He studies etiology, prevention, and cessation within the addictions arena, broadly

defined. He has over 447 publications. His programs include Project Towards No Tobacco Use, Project Towards No Drug Abuse, and Project EX, which are considered model programs at numerous agencies (i.e., CDC, NIDA, NCI, OJJDP, SAMSHA, CSAP, Colorado and Maryland Blueprints, Health Canada, U.S. DOE, and various State Departments of Education). He received the honor of Research Laureate for the American Academy of Health Behavior in 2005, and he was President there (2007–2008). Also, as of 2007, he received the honor of Fellow of the American Psychological Association (Division 50, Addictions). He was one of the contributing editors of the recently published Surgeon General's Report on "Preventing Tobacco Use Among Youth and Young Adults." Also, he is the current Editor of *Evaluation & the Health Professions* (SAGE Publications).



**Thomas W. Valente, Ph.D.**, is a Professor in the Department of Preventive Medicine, Institute for Prevention Research, Keck School of Medicine, at the University of Southern California. He is author of *Social Networks and Health: Models, Methods, and Applications* (2010, Oxford University Press); *Evaluating Health Promotion Programs* (2002, Oxford University Press); *Network*

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and over 125 articles and chapters on social networks, behavior change, and program evaluation. Valente uses social network analysis, health communication, and mathematical models to implement and evaluate health promotion programs designed to prevent tobacco and substance abuse, unintended fertility, and STD/HIV infections. He is also engaged in mapping community coalitions and collaborations to improve health care delivery and reduce healthcare disparities. He is well known for his pioneering work on network interventions. Valente is on the editorial boards of *Social Networks*; *Network Science*; and the *Journal of Health Communication*. Valente received the Everett M Rogers Public Health Communication Award from the Public Health Education and Health Promotion (PHEHP) Section of the American Public Health Association; and the USC Melon mentoring award in 2013. Valente received his BS in Mathematics from the University of Mary Washington, his MS in Mass Communication from San Diego State University, and his Ph.D. from the Annenberg School for Communication at USC. In 2008, he was a visiting senior scientist at NIH (NHGRI) for 6 months; and in 2010–2011 he was a visiting Professor at the École des Haute Études en Santé Publique (Paris/Rennes).

## GLOSSARY

**Adolescents:** individuals normally between the ages of 13–18 but can range up to 21 years old

**High risk:** having a high level of risk for certain behaviors; in drug abuse, high risk refers to being at high risk for taking or abusing drugs. This is usually based on the proportion of people within the social circle who are abusing drugs themselves. A person who is at high risk for abusing drugs is usually in a group or community where drug use is high.

**Peer culture:** beliefs, attitudes, values, or other norms shared by individuals of the same peer group or community

**Peer influence:** influence by peers of the same age; mostly on knowledge, attitudes, behavioral norms, and values

**Peer leaders:** same age or slightly older peers who serve as leaders

**Substance use:** use of drugs or other types of licit or illicit substances

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