REVIEW

On the importance of peer influence for adolescent drug use: commonly neglected considerations

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Abstract

Peer influence is generally believed to be a major cause of adolescent drug behavior. This paper reviews research findings on friend selection and projection to suggest that the magnitude of friend influence may be overestimated. This paper also observes that, although adolescent drug use is assumed to begin in response to peer group influence, peer groups have rarely been measured in studies of drug behavior. Social network analysis is identified as a promising method for measuring peer groups. The implications of this review for research and programs are considered.

Introduction

The accumulated wisdom of more than two decades of research on adolescent drug use is that peer influence is a prominent cause, if not the most important determinant, among a complicated set of circumstances and risk factors. The following sampling of quotes, although only a small portion of the many in the research and practice literature on adolescent drug use, shows the importance commonly awarded to peer influence.

...the potential adolescent user of drugs has many peers who take various substances, and the formation of friendship circles with such individuals appears to be a strong causal influence in drug taking.

The best predictors of adolescents' substance use are the proportion of friends who are users and their friends' tolerance of use. Adolescent alcohol and drug use appears to conform to the behavioral and value structure of the peer group.

A wide range of influences on initial involvement in substance use has been identified. Nevertheless, peer influences (modeling use, provision of substances, and encouraging use) are the most consistent and strongest of all factors.
It appears that 'indirect' influence or pressure is the primary factor in smoking behavior among adolescents. By associating with friends who smoke, the adolescent acquires attitudes favorable to smoking. Thus, it may be more beneficial for research and health promotion programs directed toward the prevention of adolescent cigarette smoking to emphasize the centrality of the peer group.11

Many young people use drugs because their friends use drugs.12

The influence of peers has been posited as the single most important factor in determining when and how cigarettes are first tried.13

As the quotes illustrate, peers are believed to contribute to adolescent drug use both directly and indirectly through several complex mechanisms: by modeling drug use; by shaping norms, attitudes, and values; and by providing opportunities and support for drug use.14-17 The assumption that peers are central to adolescent drug use is reflected in the social influence paradigm underlying many drug prevention programs. These programs are founded in part on the assumed need to buffer peer pressure to use drugs.9, 18-25

This paper examines critically the importance attributed to peer influence for adolescent substance use by reviewing contrary evidence. Specifically, the roles of friendship selection and behavioral projection are examined. Our review suggests that peer influence may be less important than commonly believed, although it may have some limited consequence for adolescent drug use. Some of the contrary evidence we consider has been discussed elsewhere,26, 27 but that has been rare. The only comprehensive consideration given to this paper's central issues was a brief comment that referred to little of the relevant research.28 Indeed, whether peer influence might be overestimated has rarely been mentioned in the research literature16, 29, 30 and none of the reports quoted above acknowledged any of the points that are the focus of this paper.

A related purpose of this paper is to show that although studies of peer influence typically invoke considerations of peer groups, peer groups have rarely been measured in this research area. The implications of not measuring peer groups, and the potential of social network analysis for this purpose, are discussed.

To simplify our task we confine our attention to the initiation of drug use and we exclude other behaviors, such as cessation of use by regular, habitual or addicted users. We proceed by presenting the main evidence often offered for the thesis that peer influence is a strong determinant of adolescent drug use. We then present evidence that suggests peer influence for adolescent drug use may not be as strong as commonly believed. We next discuss peer groups in the context of social network analysis. We also identify and evaluate other types of evidence that have been used to document peer influence. Finally, we consider the implications of our analysis for theory, research and drug prevention programs.

Main empirical support offered for the peer influence axiom

A primary foundation for the belief that peer influence is a major determinant of adolescent drug behavior is the strong and consistent correlation between drug use by adolescents and the drug use that adolescents attribute to their friends. Research on adolescent drinking and smoking illustrates this correlation.31 Seventh graders who said their friends drank alcohol were much more likely themselves to drink beer ($r = 0.48$, $p < 0.001$, $n = 1330$) and hard liquor ($r = 0.38$, $p < 0.001$, $n = 1330$) than adolescents who said their friends did not drink. In a sample of ninth graders, the correlation between smoking by friends was 0.56 ($p < 0.001$, $n = 1324$). These correlations are strong by behavioral science standards, are replicated in many studies, and are found across all drugs considered. Moreover, the statistically significant relationship between the drug behavior of friends is maintained when other variables are controlled, and friend behavior typically is stronger than other predictors such as parental behaviors, demographic characteristics, attitudes and personality attributes.10, 32-44 The inference typically drawn from this evidence is that it reflects friend influence on adolescent drug use initiation.

Qualification of the peer influence axiom

Two types of evidence suggest that peer influence might be a less important determinant of adolescent drug behavior than suggested above: (a) that friendships are determined in large part by drug use (selection) and (b) that
adolescents attribute their own behavior to friends (projection).

Selection
Friends have similar drug behavior when their friendships are formed on the basis of common drug behavior. In these cases, selection rather than influence produces the association between friend and adolescent drug use. Selection has multiple mechanisms: (a) drug users choose other users to be friends, (b) non-users choose other non-users to be friends, (c) friendships dissolve when the drug behavior of friends becomes dissimilar (deselection), and (d) peer groups restrict membership to people with drug behaviors like their own. Each mechanism produces an association between the drug behavior of friends and the adolescent, but it is incorrect to attribute it to peer influence.

The selection model posits that drug behavior causes friendships, whereas the influence model posits that friendships cause drug behavior. These models assume opposite causal directions, and knowing which is true or relatively important is fundamental to understanding the etiology of drug behavior.

Simultaneous examination of selection and influence effects requires longitudinal data, the ability to link data provided by friends and adequate numbers of stable and changed friendships and drug behaviors. Given these data requirements, it is not surprising that few studies have had the data necessary to determine how much of the observed association between the drug behavior of friends is due to peer influence and how much is due to friend selection.

Five samples of adolescents have been studied in which peer influence and selection effects were simultaneously examined. The findings suggest that selection contributes substantially to friend similarity in drug behavior, and therefore that friend influence is overestimated when selection is not controlled.

Cohen studied 49 friendship groups in a white, working-class high school during the 1958–59 school year to determine the relative contributions of influence, selection and deselection to group homogeneity according to 18 individual characteristics. The characteristics studied included smoking, liquor use and beer drinking. Cohen found that much of the homogeneity of peer group members in these behaviors was due to initial selection on the basis of the behaviors. The contributions of selection to the homogeneity of boy peer groups were 44%, 55% and 40% for hard liquor drinking, smoking frequency and beer drinking frequency, respectively. The contributions for girls were 69%, 52% and 79%, respectively.

Kandel studied similarity of marijuana use in best friend dyads in New York State high schools at the beginning and end of the 1971–72 school year. The \( \phi \) coefficients calculated to express the strengths of influence and selection effects were 0.43 and 0.45 \( (n = 783) \), respectively, suggesting that they contributed equally to the similarity of marijuana use by friends. One commentator on Kandel's findings wrote that attributing "...the similarity of marijuana use between friends to the mutual influence of friends on each other overestimates influence of friends by approximately 100 percent by failing to take into account the process of friend selection."

Fisher & Bauman studied beer drinking and cigarette smoking in two separate studies of seventh and ninth graders, respectively. The subjects were enrolled in North Carolina schools specifically chosen to be typical of most other schools. Subjects completed questionnaires in their homes in 1980 and again 1 year later in 1981. Information was collected that enabled linkage of data provided by friends. For both smoking and alcohol, selection effects were stronger than influence effects. Across all drug behaviors, \( \phi \) coefficients computed to estimate friend influence for initiation were \( \leq 0.16 \), whereas four of six \( \phi \) coefficients calculated to express friend selection based on drug behaviors were \( \geq 0.35 \). Ennett & Bauman reanalysed these data after creating peer groups with social network techniques. They concluded that selection and influence make equal contributions to drug behavior homogeneity of peer groups.

Aseltine studied marijuana use by 435 friendship pairs enrolled in public high schools in three Boston area communities. Data were collected from the predominantly white and Catholic subjects in three waves from 1988–90. Reciprocal associations between marijuana use by friends were examined using the panel feature of the research design and structural modeling. The findings suggested that failure to control for selection effects when examining the association between drug behaviors of friends may overestimate peer influence by nearly 60%. 
These studies suggest that selection plays a substantial role in creating similar drug behaviors among friends. Nevertheless, once friendships are formed they may reinforce common behaviors and, in that sense, operate as an influence among users. Dealing with influence for users extends beyond our focus on drug use initiation, but it is an important topic for future research.

We conclude from the studies that have been able to consider both influence and selection effects that selection may make a substantial contribution to the association between drug behaviors of friends and that failure to control for selection may overestimate the contribution of influence.

Projection

In nearly all studies of adolescent drug behavior, the behavior of friends is measured by asking adolescents to describe the behavior of their friends rather than by asking the friends to report their own behavior. We refer to these two measures of friend behavior as 'perceived and actual reports', respectively. If perceived and actual reports of friend behavior are strongly correlated, and if they are equally correlated with adolescent drug behavior, then the distinction between them would be unimportant. However, in the few studies in which both measures were used, perceived reports were much more strongly related than actual reports to adolescent drug use.

The North Carolina study of alcohol use described above obtained both perceived and actual reports of friend behavior. The correlation between perceived reports of friend beer drinking and the adolescents’ own beer drinking was \( r = 0.48 \); the correlation of 0.07, when substituting actual for perceived reports, was significantly different and much smaller (\( p < 0.001, n = 1330 \)).\(^{31}\) The corresponding correlations for hard liquor drinking in that study were 0.38 for perceived reports and 0.11 for actual reports (\( p < 0.001, n = 1321 \)). In the North Carolina study of cigarette smoking, the correlation of 0.56 between perceived reports of friend behavior and adolescents’ own behaviors was significantly larger (\( p < 0.001, n = 1324 \)) than the correlation of 0.42 between actual reports of friend behavior and adolescents’ own behaviors.\(^{31}\)

The above findings were replicated by Urberg and her colleagues in their study of 2334 suburban adolescents in grades 8 and 11 in a large metropolitan area.\(^{51}\) Perceived reports of friend smoking were more strongly associated with the adolescents’ reports of their own smoking (kappa = 0.49) than were actual reports of friend smoking (kappa = 0.24). Similarly, Iannotti & Bush surveyed 3160 fourth and fifth graders about their use of alcohol, cigarettes, marijuana and crack cocaine.\(^{52}\) For each drug behavior, perceived reports were more strongly correlated than actual reports with adolescent drug use.

It might be argued that perceived reports are more valid indicators of friend behavior than actual reports. However, the opposite was suggested by two studies that used biochemical indicators of friend cigarette smoking and found the indicators to be more strongly correlated with actual than with perceived reports.\(^{31,51}\)

A possible problem with the use of perceived reports to study peer influence derives from the well-established principle that people project their own attributes, including their own behaviors, to others.\(^{53-55}\) This principle can be extended to the present concern: when asked to describe the drug behavior of friends, some adolescents may project their own behavior to their friends. When projection occurs and the behaviors of the friend and adolescent actually differ, a misclassification of friend behavior always increases the positive association between the behavior of friends. In every such case, friend and subject behavior are considered to be the same when they actually differ. Moreover, in contradiction to the peer influence model, which posits friends as a cause of adolescent behavior, when projection occurs the behavior considered to be the friend’s is the consequence rather the cause of the adolescent’s behavior. The assumed contribution of peer influence to adolescent drug behavior, therefore, may be artificially inflated when perceived reports of friend behavior are used.\(^{15}\) That adolescents overestimate drug use prevalence, and that this is most pronounced among users, may reflect and magnify this source of bias.\(^{56}\)

Adolescents do appear to attribute their own cigarette smoking to the behavior of their friends. We reanalysed data from the study of smoking among North Carolina ninth graders discussed earlier in this review.\(^{31,48}\) These analyses are limited to the \( \geq 843 \) friendship pairs with information for all of the necessary measures. Subjects were classified as current cigarette smokers.
who said they were current smokers and had smoked at least a pack of cigarettes in their lifetime or who said they were not current smokers but had carbon monoxide levels ≥ 9 parts per million (p.p.m.) in their alveolar breath. All other subjects were classified as non-smokers. The findings were consistent with the conclusion that there may be a strong tendency for adolescents to use their own smoking behavior to describe the smoking behavior of their friends. Specifically, when the best friend was not a smoker 22.2% of the adolescents who smoked said their best friend smoked, whereas 2.3% of the adolescents who did not smoke said their best friend smoked ($\chi^2 = 60.9$, contingency coefficient = 0.267, $p = 0.000$, $n = 791$). Among adolescents whose best friends were current smokers, 88.7% of adolescents who were smokers said their best friend was a smoker, whereas 37.5% of the non-smokers said that their best friend was a smoker ($\chi^2 = 31.8$, contingency coefficient = 0.462, $p = 0.000$, $n = 117$). The same strong patterns were observed when considering second and third best friends.

The findings in the preceding paragraph could be attributable to factors other than projection. They could reflect a tendency of friends to give the impression to others that they are more like them than they really are, and it is the false impression by friends rather than smoking behavior that is being reported by the adolescent. In this case, however, the association between perceived reports of friend behavior and adolescent behavior is not due to the influence of the friend's smoking behavior. Another possibility could be that adolescents smoked in the presence of friends, subsequently quit smoking, and accurately reported themselves as non-smokers while their friends continued to think of them as smokers. Because smokers are likely to smoke with other smokers, our data could make it appear that behavior is overestimated when it is not. Or adolescents who try smoking (i.e. experiment with the substance) could consider themselves to be non-smokers but be considered smokers because of the experimentation by their smoking friends. There has been no research on how projection might influence reports of friend behavior, perhaps because the possibility is seldom recognized. These alternative explanations, therefore, are offered as suggestions for consideration by future research and not as evidence.

The use of perceived reports of friend behavior is sometimes justified by the reasoning that what adolescents think their friends do is more influential than what the friends actually do. Note that in this reasoning the cause of adolescent behavior is assigned to the adolescent and not to the friend; the peer influence model assigns cause to the friend. Another reason for the use of perceived reports is that they are much less expensive to obtain because they do not require data collection from the friends. Regardless of the reason, friend influence will be overestimated by any part of the association between adolescent behavior and perceived reports that is due to inaccurate projection of adolescent behavior to the friend.

We conclude that in studies relying on adolescent reports of friend behavior, the association between the drug behavior of friends may exaggerate the role of peer influence.

Control for selection and projection effects
With a cross-sectional research design, data are gathered once. It is the design used most often to study adolescent drug use, but it is inadequate for studying peer influence because selection effects cannot be controlled. Studies with a panel research design, in which data are collected from the same subjects more than once and the data are linked by subject, may potentially remove selection effects because prior adolescent behavior can be analytically controlled when examining the association between friend behavior and subsequent adolescent behavior. Moreover, when a panel design is used and prior adolescent behavior is controlled, the effects of projection of adolescent behavior to friend behavior is reduced or eliminated because adolescent behavior is the source of projection.

It follows that when a panel design is used and prior adolescent behavior is controlled, the correlation between perceived reports of friend behavior and adolescent behavior should be substantially smaller than the correlation obtained with a cross-sectional design. That is the case. In the North Carolina studies referred to above, the cross-sectional bivariate correlations between adolescent reports of their own and their friends' drinking and smoking were reduced to a range of 0.07–0.12 from 0.38–0.56 when panel data were used and initial drug behavior was introduced as a covariate in the association between friend behavior at the first
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Although the reduced strength of relationships in longitudinal data might be in part attributable to other factors, such as the lag between data collection points, it is likely due in large part to the removal of selection and projection effects.

Despite the reduction in the relationship, it is noteworthy in the North Carolina studies and in other panel research that the statistically significant associations between friend behavior and subject use onset do not disappear completely with control for prior subject use. This supports the existence of at least a moderate peer influence effect.  

Social networks

The assumption that drug use begins and is nourished in peer groups is summarized by Oetting & Beauvais:  

...adolescent drug use is very strongly linked to membership in small groups of people, including pairs such as best friends and boyfriend-girlfriend. These small groups are peer clusters, in which (a) drugs are made available; (b) the youth learns to use them; (c) there is a sharing of beliefs, attitudes, values, and rationales for drug use; and (d) drug use plays an important role in group membership and identification (p. 19).

This image of why adolescents begin to use drugs is based on the premise that peer groups cause adolescents to use drugs through peer group influence. It has been suggested that adolescents isolated from peer groups may be protected from using drugs because that potent source of influence is eliminated.  

However, few studies of adolescent drug use have either measured peer groups as groups or compared the drug use of peer group members and non-members. As such, there is little evidence that adolescent drug use is strongly linked to membership in ‘peer clusters’, ‘friendship circles’, or ‘social groups’. The closest that researchers have typically come to directly examining drug use patterns in peer social units is in the context of friendship pairs or crowds of adolescents; however, these are not the friendship circles that typify adolescent peer groups.

Clearly, friendship groups must be identified before drug use within them, outside them and between them can be considered. The most direct approach to identifying friendship groups is by application of social network analysis. Network analysis uses aggregated data on the relationships among individuals in a social system (e.g. the friendship links among adolescents who go to the same school) to identify groups. Network analysis identifies friendship groups by analysing present and absent friendship links between adolescents. Friendship links are identified by asking adolescents to name their friends; overlapping links are then used to detect groups and other friendship patterns. Note that this approach to group identification is completely different from inferring group membership from the behavior that adolescents attribute to friends.

The use of social network analysis requires data from both adolescents and friends, and it must be possible to link their data. Few studies have obtained the necessary data.

The identification of peer groups and assessment of drug use by peer group members and non-members have been done in only two samples. As described above, Cohen examined determinants of peer group homogeneity in high school friendship groups. The results showed that homogeneity was higher among peer groups than among non-peer group members for a variety of individual characteristics, including cigarette smoking, liquor use and beer drinking. The results did not show, however, whether peer group homogeneity resulted from members being users or non-users, nor did the study compare use and non-use among peer group members and non-members.

More recently, Ennett & Bauman conducted social network analyses of adolescents in five junior high schools and investigated whether adolescents who were group members or non-members differed in smoking. Ninety per cent of adolescents who were peer group members were non-smokers; in fact, 68% of the peer groups were composed entirely of non-smokers. In contrast, only 28% of smokers were group members. This finding, which was consistent across the school samples, is in contrast to the belief that smoking is a peer group phenomenon, or that social isolation is protective.

The implication of the findings is that to the
extent that influence occurs in peer groups, for nearly all adolescents it favors non-smoking rather than smoking. Because most groups were composed of non-smokers, the influence for most adolescents could not have been smokers influencing non-smokers to smoke. Furthermore, because smokers were most likely to be isolates, they were immune from the influence associated with being a member of a peer group. However, as other researchers have suggested, adolescents may be influenced by a peer group they aspire to join and model the typical behavior of that group.11 The prototypical behavior of most peer groups in this study was non-smoking, however, suggesting that even for isolates, peer group influence must have been in the direction of non-smoking rather than smoking.

We conclude that regardless of the importance to adolescent drug use that has been ascribed to peer groups, few studies have examined peer groups directly. Social network analysis is a direct method to identify peer groups and to examine drug use in the context of peer groups.

Additional considerations

Evaluation of other ways to assess peer influence

At the beginning of this paper, we noted that the evidence usually offered for a strong peer influence effect is the strong cross-sectional correlation that has been found between adolescent drug behavior and the drug behavior that adolescents attribute to their friends. We briefly evaluate here other approaches that have been used to assess peer influence.

Adolescents have been asked why they began to use drugs, and references to friends are taken as indicative of friend influence. This retrospective method relies on adolescents' ability to know why they behave the way they do; many psychological theories and studies suggest that direct questioning of individuals frequently fails to identify the correct etiology.69-72 Moreover, because teachers and the media inform young people that they use drugs because of their friends, perhaps that is why adolescents give that as a reason for using drugs. Another approach is to ask adolescents whether they were with friends when they first used drugs, or whether their friends gave them drugs, or if their friends pressured them to use drugs.73-75 This method is limited by its failure to provide comparable information from subjects who did not use drugs, thereby precluding the ability to identify an association, the most elementary information required for inferring causality.76

Another approach to the study of peer influence is to have adolescents describe the different types of groups at their schools. The four or five groups identified in this way then are given labels, such as 'dirts', 'hot-shots', 'jocks' and 'regulars'. The variation in smoking behavior across these groups is attributed in part to peer group influence.62, 65, 77, 78 However, this approach does not measure peer groups. The aggregates formed might most appropriately be considered 'crowds' because they consist of collectives of stereotyped individuals who may not have intimate ties rather than the smaller and closer knit primary groups typically considered in the adolescent drug use literature.79 Comparing the four or five aggregates identified in studies of crowds with the much larger number of peer groups identified in studies of dyads and peer groups makes it clear that adolescents have many more friendship pairs and small groups that are commonly considered to be most influential on behavior.57 Moreover, subjects may use the drug behavior of crowds to define and differentiate crowds in a school, yielding a measurement redundancy when correlating crowd membership and drug behavior.77 Finally, studies of crowds have yet to separate influence and selection effects, and projection may misleadingly inflate associations between friend and subject drug behavior. The net effect is that studies of crowds may substantially overestimate the impact of peer influence on adolescent drug behavior.

Other studies have considered normative expectations to be evidence of peer influence. Normative expectations are the estimates of drug use prevalence that adolescents assign to general reference groups, such as to 'your peers' and to 'others your own age'. Researchers have noted that normative expectations substantially exceed drug prevalence in populations, and that adolescents with high normative expectations are more likely to use drugs than adolescents with low normative expectations.22, 80, 81 The association between normative expectations and drug use has been offered as evidence of peer influence and used to justify focusing on reducing normative expectation in drug prevention programs.22 However, if adolescents use their beliefs about the behavior of their friends to gauge the behav-
ior of their more generalized reference groups, and if the behavior they ascribe to their friends is largely projected from their own behavior, then peer influence is overestimated by the correlation between normative expectations and individual drug behavior. Moreover, if adolescents select friends with similar drug behavior, and if drug behavior is a cause of normative expectations, then the correlation between normative expectations and drug behavior could be explained as readily by selection as by influence.

Studies of the assumed mediators of the association between friend and adolescent drug behavior also offer evidence that peer influence may be overestimated. Brown & Clasen found that when directly measuring pressure for drug use and other misconduct, there was little peer pressure and it explained only a small portion of variance in misconduct. These findings are consistent with those of Urberg and her colleagues who found that when peer pressure is examined empirically, it does not account for the relationship between friend and adolescent smoking. Findings such as these reduce our confidence that peer influence is such a strong determinant of adolescent drug behavior.

**Theory**

Many theories specific to the use of drugs or related behaviors and more general behavioral and social theories include social influence as a component. Although these theories recognize peer influence as a determinant of behavior, some do not assign it the prominence that now exists in the research literature on adolescent drug use. Peers sometimes are included among a constellation of significant others, including parents, who influence adolescent behavior. Our review is consistent with these theoretical perspectives in suggesting that the centrality often awarded to peer influence on adolescent drug behavior should be tempered by integrating it with other causal factors and recognizing that the importance frequently ascribed to peer influence may have been in part due to the other factors emphasized in this review. Astel's consideration of selection effects and the use of perceived reports of friend behavior in the context of the relative worth of socialization and social control theories to understanding marijuana use is particularly instructive in this regard.

Our conclusion that peer influence for drug use initiation might be overestimated has substantial additional implications. One is that the contribution of other predictive variables may be underestimated. Peer influence is considered a major determinant of adolescent drug behavior in large part because variables that describe friends usually are more strongly related to adolescent drug use than other variables. In studies that do not adjust for projection and selection effects, the contribution of other variables to the explanation of drug use is automatically underestimated relative to peer influence. Another implication of the overestimation of peer influence is that when the major determinant of a behavior is believed to be known then there can be a hesitancy to examine critically the favored determinant and a bias against seeking other causes. This can, of course, delay progress toward understanding behavior. The influence of families, for example, may be substantially underestimated because the importance of peer influence is exaggerated.

**Prevention programs**

If peer influence is not as important a determinant of drug use as is commonly assumed, then the promise of prevention programs and policies focused on peer influence might not be realized. Hawkins and his colleagues, in an extensive review of etiological research on adolescent drug use and drug prevention programs, provide a detailed portrayal of the common wisdom that adolescent drug use will be substantially reduced by peer resistance interventions. The US Surgeon General's report on cigarette smoking by youth provides another detailed consideration of programs based on the assumption that peer influence is a major factor in smoking onset. Descriptions of programs based on other prevention strategies also assume that peer influence is a major factor in adolescent drug use.

The review we present in this paper suggests that such programs will be less effective than hoped because peer influence on drug use may be substantially less than commonly assumed. Perhaps this explains why drug abuse prevention curricula that emphasize peer influences have only moderate and short-lived behavioral effects. Whereas the 'Just Say No' campaign to reduce drug use in the United States discourages friend influence, the findings of re-
search on social networks suggests that most adolescents are in peer groups without smokers. Therefore, 'Just Say Yes' to friends may yield the more favourable public health response.

**Applicability across drugs and other variables**

Much of the research on peer influence has been conducted with alcohol, tobacco or marijuana as the drug of interest, but our findings may generalize to other drugs such as to cocaine and heroin. On the other hand, the principles discussed in this paper also may vary by many factors, including the type of drug used. Similarly, we recognize that the relative influence of peers and other variables on drug use may vary by stage of use, such as whether progressing to experimentation or to problem use. We do not elaborate on these possibilities, and in this sense our analysis is incomplete.

In addition, peer effects may vary across categories of additional variables. For example, no peer effect was found in the predominantly African-American sample studied longitudinally by Farrell & Danish, and other studies suggest that associations between drug behaviors of friends are weakest for African Americans. Moreover, we confined our review to research on adolescents and recognize that it might not apply to younger children and adults. Influence and selection effects, projection and social networks may vary by gender, and we have ignored that possibility here. More recognition of the evidence that peer influence might be overestimated is a prerequisite to the more refined analyses suggested by these caveats.

**Other sources of spuriousness**

There are ways in addition to those emphasized in this paper in which peer influence might be spuriously increased. For example, the association between friend and adolescent behavior might be spurious because of a common association with environmental and background variables. We have not considered that possibility in detail here because many environmental and background variables have been controlled in longitudinal studies and a correlation between friend and adolescent drug behavior has remained. Future research needs to continue to determine whether the association is produced spuriously by such variables.

**Selection and projection effects for other friend characteristics**

Other friend-related variables associated with drug use, such as friend attitudes toward drugs and peer group norms pertaining to drug use, have been studied as correlates of adolescent drug use with cross-sectional designs and with reliance on perceived rather than actual measures of these predictor variables. Findings from such studies may be limited in ways similar to those in which perceived friend behavior is the primary independent variable. For example, friendships may be formed on the basis of common attitudes, and the extent to which this selection is not separated from influence when studying the impact of friend attitudes on behavior could yield an overestimation of influence effects. Moreover, adolescents' perceptions of the attitudes of their friends and the norms of their peer group may result at least in part from the adolescents' projection of attitudes and norms to friends; therefore, the association of perceived friend attitudes and norms with adolescent behavior may reflect things other than influence. Investigators are advised either to control for such factors or to provide the caveat that what they consider to be influence may be partially or entirely spurious because of the effects of selection and projection.

**Behaviors other than drugs**

Peer influence is considered to be fundamental to many more behaviors than those involving drugs. It is beyond our scope to consider in detail here how the arguments in the present review might generalize to behaviors other than those with drugs. We do note, however, that friend homogeneity in adolescent sexual behavior has been attributed to peer influence, whereas research suggests that it may be due to friend selection and that perceived reports of friend sexual behavior could reflect projection. Moreover, that influence can be confused for selection has been suggested for political orientation, delinquency, educational aspiration, value similarity and a host of other variables. We leave to others the challenge of extending more fully this consideration of the magnitude of peer influence to other adolescent behaviors.
International considerations
The studies we identified that separated influence and selection effects, measured perceived and actual reports of friend behavior or used social network analysis to form peer groups were based on adolescents living in the United States. The extent to which our review can be generalized to other countries must await research in those countries. Only a few studies of adolescent drug use have compared adolescents across countries, and they found both similarities and differences in prevalence and correlates. Given the importance generally ascribed to peer influence and the qualifications we describe, such research appears to be needed.

Conclusion
The evidence identified here suggests that peer influence may be a less important determinant of the initiation of drug behavior than commonly assumed because selection and projection may increase the association between friend and adolescent behavior. This qualification is rarely mentioned in the literature. The evidence also suggests that peer influence plays a limited role in adolescent drug use, however, and in this regard we recommend a more critical look at the power of peer influence rather than declare that further consideration of peer influence is unnecessary. We also suggest that social network analysis be considered for resolving the problem that peer groups rarely have been measured in research on adolescent drug use.

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