
Effectiveness of School-Based Programs for Reducing Drinking and Driving and Riding with Drinking Drivers

A Systematic Review

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Overview

A systematic review of the literature to assess the effectiveness of school-based programs for reducing drinking and driving and riding with drinking drivers was conducted for *The Guide to Community Preventive Services* (*Community Guide*). Thirteen peer-reviewed papers or technical reports, which met specified quality criteria and included evaluation outcomes of interest, were included in the final review. These papers evaluated three classes of interventions: school-based instructional programs, peer organizations, and social norming campaigns. For instructional programs, the median estimated change measured in the five studies evaluating self-reported drinking and driving was -0.10 standard deviations (SDs) (range: -0.22 to 0.04 SD). The median estimated change in the four studies evaluating the effects of such programs on self-reported riding with drinking drivers was -0.18 SD (range: -0.72 to -0.10 SD). The instructional programs varied widely with respect to several variables identified in previous research as being potentially important to program effectiveness, including exposure time, program content, and degree of interaction with students. Nonetheless, nearly all programs had some interactive component, rather than being purely didactic in their approach. According to the *Community Guide* rules of evidence, there is sufficient evidence to recommend as effective school-based instructional programs for reducing riding with drinking drivers. However, there is insufficient evidence to determine the effectiveness of these programs for reducing drinking and driving. Despite some evidence of beneficial effects

on the outcomes of interest, there is also insufficient evidence to determine the effectiveness of peer organizations and social norming campaigns, due to the small number of available studies.

Introduction

The onset of alcohol use begins for many adolescents well before they reach the legal drinking age of 21 years. In spite of some apparent decreases in alcohol use among high school students in the early 1990s,¹ underage use of alcohol continues to be a problem that often has negative consequences. One such consequence is involvement in alcohol-related motor vehicle crashes and the resulting deaths and injuries. Such events most commonly occur when young people drive after drinking or ride with a driver who has been drinking.

Data from the National Highway Traffic Safety Administration Fatality Analysis Reporting System show the magnitude of the alcohol-related fatal crash problem among youth.² In 2002, 38% (2282 of 6002) of young (aged 16 to 20) vehicle occupant fatalities were from crashes in which one or more drivers had been drinking. Looking solely at drivers, 24% (1834 of 7693) of young drivers involved and 32% (1131 of 3571) of those killed in a fatal crash had blood alcohol concentrations (BACs) above zero. About 80% of these fatally injured young drinking drivers had BACs of ≥ 0.08 g/dL, the illegal level for adult drivers. BACs of ≥ 0.08 g/dL were about twice as prevalent among male drivers as among female drivers. The objective of this series of reviews is to examine the impact of school-based programs for reducing driving after drinking (DD) and riding with drinking drivers (RDD).

The Guide to Community Preventive Services

The systematic reviews in this report represent the work of the independent, nonfederal Task Force on Community Preventive Services (the Task Force). The Task Force is developing *The Guide to Community Preventive*

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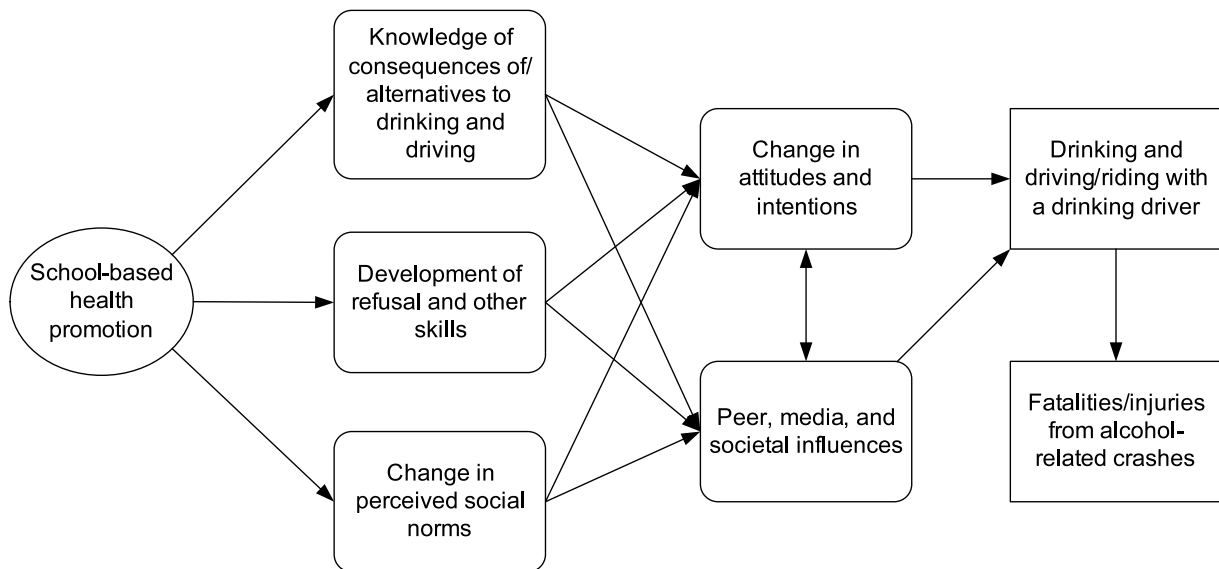


Figure 1. Analytic framework for the effects of school-based health promotion programs.

Services (The Community Guide) with the support of the U.S. Department of Health and Human Services in collaboration with public and private partners. The Centers for Disease Control and Prevention provides staff support to the Task Force for development of the *Community Guide*. A special supplement to the *American Journal of Preventive Medicine*, "Introducing the Guide to Community Preventive Services: Methods, First Recommendations and Expert Commentary," published in January 2000,³ presents the background and the methods used in developing the *Community Guide*.

Healthy People 2010 Goals and Objectives

The interventions reviewed here may be useful in reaching several objectives specified in *Healthy People 2010*.⁴ These include the objectives to:

- Reduce the proportion of adolescents who report that they rode, during the previous 30 days, with a driver who had been drinking alcohol, from 33% (in 1999) to 30% (Objective 26-6).
- Reduce deaths caused by alcohol-related motor vehicle crashes from 5.9 per 100,000 persons (1998 baseline) to 4.0 per 100,000 (Objective 26-1a).
- Reduce injuries caused by alcohol-related motor vehicle crashes from 113 per 100,000 persons (1998 baseline) to 65 per 100,000 (Objective 26-1b).

Methods

This review was conducted according to the methods developed for the *Community Guide*, which have been described in detail elsewhere.^{3,5} To be included in the reviews, a study had to: (1) be primary research published in a peer-reviewed journal, technical report, or government report; (2) be published in English before December 31, 2002; (3) meet

minimum research quality criteria for study design and execution³; and (4) evaluate the effects of a school-based program using as a measurement an outcome related to DD or RDD.

Conceptual Approach

Figure 1 shows the conceptual approach that guided the review process. School-based prevention programs can provide students with information regarding the consequences of alcohol and other drug use, DD, and RDD, and promote awareness of alternative behaviors. Many programs provide an opportunity to develop resistance skills and more general life skills to counter social pressures that lead to these behaviors. These programs may also attempt to influence adolescents' perceptions of social norms regarding alcohol and other drug use, DD, and RDD. These changes in knowledge, skills, and perceptions are expected to result in modified attitudes and intentions and a change in susceptibility to peer, media, and other social influences. Ultimately, these changes should result in reduced DD and RDD and the crashes, deaths, and injuries associated with such behaviors.

Search Strategy

The articles to be reviewed were obtained from systematic searches of multiple databases, reviews of bibliographic reference lists, and consultations with experts in the field. The following databases were searched: Medline, PsycINFO, Social SciSearch, Educational Resources Information Center (ERIC), National Technical Information Services (NTIS), and Transportation Research Information Services (TRIS).

Evaluating and Summarizing the Studies

Each study that met the inclusion criteria was evaluated for the suitability of the study design and study execution by two independent abstractors using the standardized *Community Guide* abstraction form.³ The suitability of each study design was rated as "greatest," "moderate," or "least", depending on

the degree to which the design protects against threats to validity. The execution of each study was rated as “good,” “fair,” or “limited,” based on several predetermined factors that could potentially limit a study’s utility for assessing effectiveness. Only those studies rated “good” or “fair” were included in the review. Differences between the abstractors were resolved by the consensus of a team of experts. For qualifying studies, effect sizes were then calculated for the study outcomes wherever sufficient information was available to do so.

Outcomes Evaluated

The primary outcomes examined in this review included: (1) self-reported driving after drinking^{6–11}; (2) self-reported riding with a drinking driver^{6,8,9,12,13}; (3) combined DD/RDD^{14,15}; (4) self-reported DD intent¹¹; and (5) crash or motor vehicle violation records.^{8,16} Many of the included studies reported other outcome variables such as self-reported alcohol and other drug use, knowledge scores, and refusal skills. Outcomes that were not related to traffic safety were not included in the results of this review.

Calculation of Effect Sizes

The reviewed studies used two methods to collect self-report data: dichotomous reports of whether the respondent engaged in DD or RDD over a given time period, or Likert scales that reflect the frequency of participation in these activities. To facilitate comparison across studies, these results were converted to effect sizes (ES) reflecting standardized differences between groups. These were calculated as group mean differences (e.g., post-intervention minus pre-intervention, and/or intervention minus comparison) relative to the pooled SD of the samples from which the means were derived. For a simple before-and-after comparison, the effect size was calculated as:

$$ES = (I_{\text{post}} - I_{\text{pre}}) / \text{Pooled SD}$$

For a simple intervention-versus-control comparison, the effect size calculation follows:

$$ES = (I - C) / \text{Pooled SD}$$

Finally, for study designs that included pre- and post-intervention outcomes and intervention versus comparison group outcomes, the effect size was calculated as:

$$ES = ([I_{\text{post}} - I_{\text{pre}}] - [C_{\text{post}} - C_{\text{pre}}]) / \text{Pooled SD}$$

For all calculations, I=intervention group; C=comparison group; and the “pre” and “post” subscripts indicate measurements taken before and after intervention implementation. Confidence intervals around effect sizes were also estimated, using number of students as the sample size parameter, and accounting for within-class correlations when possible.

Results: School-Based Interventions to Reduce Driving After Drinking and Riding with Drinking Drivers

The interventions included in this review consist of three different types of programs: (1) instructional programs, generally conducted in the classroom;

(2) peer organization programs, conducted in a variety of school and nonschool settings; and (3) social norming programs, generally conducted on college campuses.

Instructional Programs

School-based instructional programs are a commonly used approach to addressing the problems of DD and RDD. These programs vary widely in their focus, with some targeting a variety of consequences of substance use and others more directly focused on problems related to alcohol-impaired driving. Early reviews by Mann et al.^{17,18} suggested that these DD/RDD prevention programs were very heterogeneous (“scattergun”) in their approach, and that there was little evidence that they were effective in reducing DD or RDD. A decade later, Sheehan et al.¹⁹ suggested that programs to reduce DD and RDD were still far less theory based and less systematically evaluated than similar programs to reduce smoking and alcohol use. They further suggested that the lack of theoretical foundation, along with the “scattergun” approach (as characterized by Mann et al.^{17,18}), made the results of evaluations difficult to interpret. Many of the more recent school-based programs to prevent DD and RDD are either explicitly theory based,^{6,12,19} or incorporate theory-based concepts and methods, such as peer intervention,²⁰ social deviance,¹⁵ educational inoculation,¹⁰ and risk skills training.¹⁴

Content and Delivery of School-Based Instructional Programs

Several recent meta-analytic reviews assess the influence of the content and delivery of school-based instructional programs on their effectiveness. These reviews evaluated a range of substance abuse prevention programs, most of which did not emphasize or evaluate DD or RDD. Nonetheless, their results may generalize to DD and RDD programs due to strong similarities in the approach of these programs across topic areas. Hansen²¹ assessed the influence of program content in a review of the literature from 1980 to 1990. He suggested that **social influence approaches**, involving some combination of normative beliefs, personal commitment, and resistance skills training, were more effective than **affective approaches** (e.g., attempts to improve self-esteem) or **general skills training** (e.g., decision making, stress management, goal setting).

Tobler and Stratton,²² and more recently Ennett et al.,²³ explored the influence of both content and delivery on the effectiveness of substance abuse programs. They categorize content into four domains: knowledge, affect, refusal skills, and general skills. With regard to delivery, they characterize programs on a continuum according to the degree of interaction

involved. They report that programs based on knowledge (of substance effects, media, social influences, and use by peers), in combination with refusal skills (i.e., anticipating and resisting pressures, commitment to abstinence, cognitive behavioral skills, and networking with nonusers), and/or general competency skills (i.e., decision making, communication, coping, social, and assertiveness skills), are more effective than programs focused on knowledge, alone or in combination with efforts focused on affect (i.e., self-esteem, feelings, personal insights, self-awareness, beliefs, and values).

One complication of the evaluation of content effects is that programs with the content combinations that appear to be most effective are also more likely to be delivered interactively; the use of such an interactive approach also appears to be an important component of effective programs. In a recent assessment of school-based substance use programs, Ennett et al.²³ found that two thirds of current program providers deliver effective content but only about one sixth use effective delivery methods. They also found that program leaders with recent training and who feel comfortable with interactive teaching methods are more likely to implement programs with effective content and interactive delivery.

Another meta-analytic review of substance abuse prevention programs provides additional insights regarding school-based prevention programs.²⁴ Consistent with earlier reviews, the meta-analysis points out that effectiveness is associated with programs involving resistance skill training²⁵; normative beliefs^{26,27}; and behavioral or cognitive behavioral interventions.²⁸ Other results of note include evidence that current universal programs may be less effective for high-risk youths than for the general student population, programs delivered to middle or junior high school students may be slightly more effective than those delivered to lower or higher grades, program duration is not significantly correlated with effectiveness, and peer-only program delivery is more effective than peer-with-teacher or teacher-only delivery.

Review of Evidence

Effectiveness. We identified 18 papers reporting on 19 studies or study arms that assessed traffic safety-related outcomes of school-based instructional programs.^{6,7,9-14,29-38} Nine of these studies (reported in eight papers) met the quality criteria for inclusion in this review.^{6,7,9-14} Two additional papers provided follow-up data on identified studies.^{16,19} Appendix 1 provides a summary of content, delivery, evaluation design, and outcomes of each program evaluated.

Study design and implementation characteristics. The evaluations of the instructional programs used a variety of research designs. Most involved before-and-after comparisons or time series designs with a concurrent

comparison group. Such studies were considered to have the "greatest" design suitability. One study was a before-and-after design, without a concurrent comparison group.¹³ Thus, it was considered "least" suitable in terms of design. The total number of students included in the analyses ranged from 60 to more than 4600, with a median size of 853. Follow-up periods ranged from 1 to 84 months, but most studies had follow-up periods of ≤ 6 months. Attrition provided one of the greatest threats to the validity of these studies, particularly those involving relatively long follow-up periods. Attrition ranged from zero for very short-term follow-ups to nearly two thirds of the baseline sample. Some studies attempted to minimize attrition effects by analyzing only those data for which both pre- and post-intervention responses were available.^{10,19}

The content and level of interaction varied considerably across the instructional programs reviewed. Three programs appeared to have primarily informational or affective content,^{11,13,14} and primarily involved didactic presentations. The remaining six programs, in addition to providing information, focused on skills development (e.g., refusal skills, life skills) or reducing risk-taking behavior.^{6,7,9,10,12,14} These programs often involved considerable interactivity with students, including discussion, feedback, role playing, and, in some cases, planning activities. Programs were generally presented in sessions lasting approximately 1 hour each. Program length varied from a single session¹³ to 12 sessions,⁹ with a median of five sessions.

Outcomes related to self-reported DD. Five papers examined six different instructional programs in terms of their effect on self-reported DD or a combination of DD and RDD.^{6,7,10,14,19} Another study used intent to drink before driving as its outcome measure.¹¹ Although several studies reported favorable results on these variables, the effect size estimates we derived using our methods were quite varied (see Figure 2). The median change in the five pure DD outcomes was -0.10 SD (range: -0.22 to 0.04 SD).

Results from the studies with other outcome measures related to DD were also mixed. One study that evaluated two short-term interventions with different content indicated that both had minimal effects on a combined measure of DD and RDD.¹⁴ Another provided evidence that exposure to a series of films and discussion sessions resulted in a decrease in DD intent, although the extent of this change could not be estimated.¹¹

Results from studies with multiple follow-up points do not provide clear evidence regarding changes in effects over time. In their evaluation of a brief risk skills training program (RSTP), a brief program based on the Drug Abuse Resistance Education (DARE) model, and a comparison condition, D'Amico et al.¹⁴ found no evidence of benefits from the DARE program at either

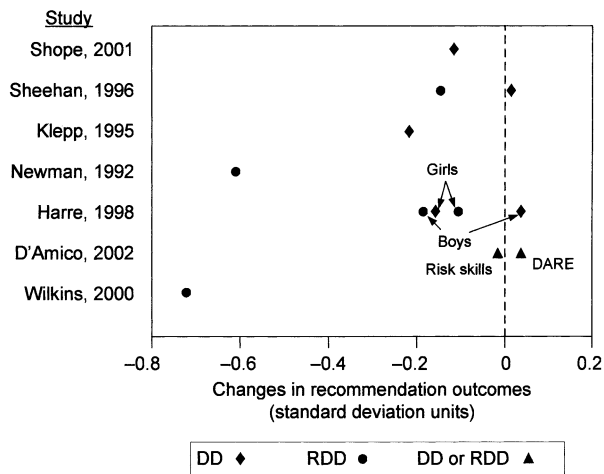


Figure 2. Estimated effects of school-based instructional programs regarding alcohol, driving, or both on self-reported drinking and driving (DD) and riding with drinking drivers (RDD).

a 2- or 6-month follow-up; RSTP showed some evidence of short-term (2-month) effects, but these had disappeared by the 6-month follow-up. Evidence of effect decay over a longer time period was found in the evaluation of a comprehensive social influence program by Klepp et al.,⁷ which indicated consistently diminishing effects on reducing DD over the 4 years of follow-up. On the other hand, the evaluation of the comprehensive program evaluated by Shope et al.¹⁰ indicates greater effectiveness at long-term (24-month) than at short-term (2-month) follow-up, although the confidence intervals for these two results overlap considerably (see Appendix).

The available results with regard to differential program impact on high- versus low-risk behaviors or individuals are also inconsistent and inconclusive. For example, the results of the Klepp et al.⁷ study suggest a larger ES with regard to more severe DD behavior (i.e., driving after five or more drinks), compared with less severe DD behavior (driving after two or more drinks). With regard to higher-risk versus lower-risk youth, both the D'Amico and Fromme¹⁴ and Sheehan et al.¹⁹ studies reported that the school-based programs that they evaluated showed stronger relative effects on DD for students who were already drinking at baseline. In contrast, Shope et al.¹⁶ reported stronger relative effects for students who drank less than once per week than for those who drank more frequently.

Outcomes related to self-reported RDD. Four studies of school-based instructional programs examined the impact of such programs in terms of self-reported RDD.^{6,12,13,19} All of these studies reported changes in the desired direction, with three reporting statistically significant program effects.^{12,13,19} The median change in RDD was -0.18 SD (range: -0.72 SD to -0.10 SD).

For the two studies with multiple follow-up points, effect sizes increased¹² or remained stable¹⁹ over time.

One study¹⁹ reported a reduction in RDD among both intervention and control groups at the 3-year follow-up. This reduction in reported RDD over time differs from the results of most other studies, in which reported RDD increases through the high school years. One potential explanatory factor for these differing patterns may be that, during this study, Queensland introduced laws and law enforcement efforts (e.g., random breath testing) that substantially decreased overall rates of drinking and driving. The students exposed to the intervention reported a greater reduction in RDD than those in the control group, and the subgroup with the largest reduction relative to controls were those who reported RDD at baseline.

Outcomes related to moving violations and crashes.

Only one study evaluated the effects of an instructional program on moving violations and crashes.¹⁶ This study examined traffic offenses and crash data for the period from 1986 to 1997. At the end of this period, students exposed to the intervention and a control group of students not exposed to the intervention had been licensed for an average 7.6 years. After the first year of driving, the intervention group's relative risk (RR) for "serious" violations (i.e., those involving alcohol, drugs, or three or more license demerit points) was 0.80 (confidence interval [CI]=0.63–1.01). During the same period, the RR for crashes was 0.93 (CI=0.74–1.16). For the next 6 years of follow-up, RRs for both outcomes fluctuated around a null effect (range: 0.92 to 1.14).

Applicability. Nearly all of the programs reviewed targeted junior or senior high school students. Five included multiple grades: 8 to 12,¹¹ 9 to 12, or 10 to 12.¹⁴ Single grades targeted were grades 9,^{7,12} 10,^{9,10} and 12.⁶ The median grade targeted was the 10th.

All programs identified for this review were applied universally to students rather than being tailored and targeted to high-risk individuals, as was advocated in a recent paper.²⁴ Because some of the reviewed studies presented stratified analyses by subject risk levels, they provide at least some information relevant to the issue of whether interventions need to be targeted in order to influence the behavior of high-risk individuals. As was found with other interventions to prevent DD, such as 0.08% BAC laws,^{39,40} some of the universal programs reviewed here appeared to be as effective or even more effective for high-risk individuals than for lower-risk individuals, although others reported the opposite pattern. Nonetheless, without compelling evidence that targeted programs are superior to universal programs at changing the behavior of high-risk individuals, it may be premature to replace universal with targeted programs. As the target group becomes more limited, much larger effects on behavior are necessary to have a

population-wide impact on DD. Furthermore, a universal approach offers greater potential to positively influence the school social environment and ultimately societal norms in a way that more targeted programs could not.

Other positive or negative effects. Potential harms of school-based DD and RDD instructional programs are mentioned by various authors. Some have suggested that educational approaches that are too nonjudgmental⁶ or otherwise inappropriately targeted or delivered¹⁶ could lead to a reactive increase in alcohol use and other undesirable behavior. The studies reviewed do not provide adequate information to address these concerns. Although the data in this review generally indicate that these programs tend to have small beneficial effects on behavior (particularly RDD behavior), future studies should assess whether certain subgroups might be negatively affected, and if so, what program variables might be responsible for or might alleviate harmful outcomes.

Economics. No economic analyses were found that met the requirements for inclusion in a *Community Guide* review.³

Barriers to intervention implementation. No specific barriers to implementation of school-based instructional programs to prevent DD and RDD were noted. A recent survey indicates that 97% of schools already implement substance abuse prevention curricula that may or may not address DD and RDD.²³ However, only about one third of these curricula are evidence based.

Summary and discussion of effectiveness of instructional programs. Reported changes in RDD constitute some of the more important findings of this review due to the fact that this behavior is relevant to students with or without access to a car. The studies reviewed provide evidence that school-based instructional programs can result in a reduction in self-reported RDD. Further, there is some limited evidence of impact for both short- and longer-term follow-up periods. There are some anomalies in the results, however. First, the largest effect size (-0.72 SD) resulted from an evaluation of a program with primarily informational and affective content.¹³ This finding is not consistent with expectations based on the current literature on effective program content and delivery. However, the design of this particular evaluation was a simple before-and-after design, without a concurrent comparison group, involving a relatively small sample of students ($n=60$), with a single follow-up only 1 month after the intervention. The studies by Newman et al.¹² and by Sheehan et al.¹⁹ provided the most credible evidence of positive impact on RDD behavior. Each study involved the random assignment of approximately 1600 to 1800 students to treatment and control groups. The instructional programs evaluated in these studies were theoretically

based, and involved multiple sessions and considerable interaction.

This review provides inconsistent evidence on the effectiveness of instructional programs for decreasing self-reported DD. Furthermore, results suggested that any initial effects tended to dissipate over time. A similar pattern was observed for serious traffic violations as well.¹⁶ More well-controlled studies with multiple follow-up points will be required to more definitively assess the effectiveness of instructional programs on DD.

In many respects, the instructional programs reviewed here that address DD and RDD have similar content and delivery to those implemented to reduce substance abuse. Thus, the accumulated evidence with regard to more general substance use interventions may prove useful for the interpretation of these studies and the design of future ones. The results of this review are similar to those of meta-analyses of substance abuse interventions, which generally indicate small beneficial program effects.^{22,28} Furthermore, the content domains and modes of delivery used in the interventions reviewed here were similar to those that these meta-analyses indicate are associated with relative improvements in effectiveness. The content was generally quite comprehensive, with the majority of programs seeking to develop skills to resist peer, media, and other influences to drink, in addition to conveying information regarding alcohol use and its consequences. Descriptions of the evaluated programs also suggest that most were interactive in their delivery, although their levels of interaction varied considerably.

Conclusion

According to the *Community Guide's* rules of evidence, there is sufficient evidence that school-based instructional programs are effective in reducing RDD among students. However, there is insufficient evidence to determine the effectiveness of these programs on DD outcomes. Based on the broader literature evaluating school-based programs to prevent substance abuse, it appears that instructional programs that include resistance and other skill training and which require interaction on the part of students are likely to be most effective in reducing RDD, as well as other relevant outcomes.

Peer Organization Programs

School-based peer organizations are groups of students, often with faculty advisors, who encourage other students to refrain from drinking, DD, and RDD. The most widespread peer organization in the United States is Students Against Destructive Decisions (SADD), formerly called Students Against Drunk Driving. SADD organizations generally engage students in a variety of

activities, including assembly presentations, a curriculum with as many as 15 sessions, various school and community events, and a “Contract for Life” in which a student agrees to call a parent if he or she has been drinking or if the person responsible for driving has been drinking. SADD programs and curricula include activities aimed at providing information, influencing attitudes, and changing social norms. They include both didactic and interactive delivery, usually involving peer-to-peer delivery, but frequently involving outside experts as well.

Reviews of Evidence

Effectiveness. Two studies of the effectiveness of peer organization programs were identified and included in the evidence base.^{8,15} Details of these studies are provided in the Appendix. Both evaluated the effectiveness of SADD programs.

The first study¹⁵ consisted of a quasi-experimental time series (i.e., pre/post1/post2) design, with a concurrent comparison group. This design was considered to be of “greatest” design quality, but the study execution was compromised by implementation problems. SADD programs were planned in two selected schools, and two schools with similar urban location and demographic makeup were selected where no such programs were planned. Students in the SADD schools were compared with those in the non-SADD schools regarding a variety of outcomes, including a combined measure of self-reported DD/RDD. This study found no significant differences between the students exposed or unexposed to SADD. Interpretation of these results, however, is complicated by the fact that the SADD programs were not fully implemented in either of the intervention schools and other events with potential relevance to DD and RDD occurred in the comparison schools and their communities, including the formation of a small SADD chapter. Thus, it is difficult to determine whether the lack of program effect reflects on the SADD model in general, or only on the very limited way in which the SADD model was implemented in this study.

The second study⁸ addressed the problem of fidelity to the intended SADD model by comparing six schools with exemplary SADD programs to nearby schools of similar size and demographic that did not have SADD programs. Given that the schools were specifically selected based on the strength of their already implemented SADD programs, no baseline data could be collected. Thus, the study was considered to be of “least suitable” design quality. This study examined outcomes such as self-reported DD, self-reported RDD, moving violations (total and alcohol related), and crashes (total and alcohol related). These results generally favored the SADD schools. Due to the low power of the between-school comparisons conducted, however, most

of them failed to reach statistical significance. Thus, despite consistent results favoring the SADD schools, this study’s post-only design and low power limit the conclusions that can be drawn from its results.

Other positive or negative effects. Results of one study⁸ indicate that peer organizations devoted to preventing DD and RDD confer a wide range of benefits to both their members and to other students in the schools in which they are active. Benefits to members include personal growth, social support, and a sense of citizenship in the school community. Benefits to the broader school community include stronger attitudes against DD and RDD, increased knowledge of alternatives to DD and RDD, and increased access to alcohol-free events.

Conclusion

According to the *Community Guide’s* rules of evidence, there was insufficient evidence to determine the effectiveness of peer organizations for reducing DD and RDD due to an insufficient number of studies. Due to the grassroots nature of such organizations, it is also difficult to design studies that have both strong research designs and good intervention fidelity, although suggestions for designing such studies have been offered.¹⁵

Social Norming Programs

Social norming programs generally consist of ongoing, multiyear public information programs conducted on college campuses to reduce alcohol use, although they can also be conducted in other settings and for other target behaviors. The premise underlying the social norming approach is that students overestimate the amount and frequency of alcohol use among other students, and that this misperception influences them to drink more than they would otherwise. The key objective is to provide students with more objective normative information regarding student alcohol consumption, thus reducing their misperceptions and ultimately changing their behavior. Often this information is gathered via campus surveys, and then conveyed to students via campus media programs. In addition to such media programs, some social norming programs implement more instructional activities involving peer-to-peer interaction.

Reviews of Evidence

Effectiveness. Two evaluations of social norming programs that met the inclusion criteria were identified and included in the evidence base for this review.^{41,42} Both of the programs examined in these studies involved campus media efforts to reduce alcohol use. One of them also involved a peer-to-peer theater com-

ponent that was presented in conjunction with the campuswide media effort and which was the focus of the evaluation.⁴¹ Both studies measured changes in several alcohol-related outcomes, including DD.

One study⁴² used face-to-face surveys and breath alcohol tests to measure outcomes before and after a campuswide social norming campaign was launched. For the baseline measure, 1786 students at the University of North Carolina were surveyed as they returned home between 10:00 pm and 3:00 am. Self-reported drinking and blood alcohol concentrations (BACs) were collected at baseline and at follow-up (2 years after baseline). The program appeared to reduce alcohol consumption, as the percentage of students with a BAC >0.08 g/dL declined by 22%, from 10.7% in the pre-intervention survey to 8.3% in the post-intervention survey ($p < 0.05$). Similarly, the percentage of drivers surveyed who had positive BACs declined by 25%, from 13.0% to 9.7% ($p = 0.18$).

The second study⁴¹ was conducted at the State University of New York at Albany, where a similar campuswide awareness effort was implemented. Information on which to base the awareness campaign was gathered from a pre-program telephone survey. In addition to the implementation of the campuswide media program, approximately 160 first-year students in eight sections of a freshman seminar were randomly assigned to an interactive peer theater intervention or to a standard lecture on alcohol. Outcome data were collected immediately prior to these instructional interventions and approximately 6 weeks after they were completed. Thus, this study was designed to examine whether the peer theater intervention effectively complemented the campuswide social norming campaign. Results indicated that the group exposed to the peer theater intervention had more accurate perceptions of campus drinking norms. They also reported more frequent use of designated drivers ($F = 7.79$, $p < 0.01$) and a decrease in DD ($F = 9.47$, $p < 0.01$) relative to students in the comparison group. However, no specific data were provided for these outcomes, so no effect estimates could be calculated.

Other positive or negative effects. The social norming programs evaluated in the two studies reviewed were associated with a range of positive effects related to reduced alcohol consumption. Similar beneficial effects on alcohol-related outcomes have been found in other studies evaluating social norming programs.⁴³ However, these studies generally used relatively weak before-and-after designs from which it is difficult to draw firm conclusions. An alternative analysis with different methodologic limitations indicates that such programs do not appear to reduce alcohol consumption.⁴⁴ The authors of this study argued that social norming programs may, in fact, be counterproductive

if they are used instead of other interventions known to be effective.

Conclusion

According to the *Community Guide's* rules of evidence, there is insufficient evidence to determine the effectiveness of social norming programs for reducing DD or RDD, because there were too few studies in our evidence base. The results of the two studies reviewed suggest that such programs reduced DD among the college students exposed to them. However, more studies with stronger research design and execution are needed to clarify the effects of this intervention on DD and on other alcohol-related outcomes.

Future Directions

Despite considerable progress over the past decade in the development of school-based programs to reduce DD and RDD, further refinement is needed to improve their effectiveness and to develop sound principles to guide program development. Future studies should strive to improve our understanding of the extent to which outcomes of school-based education programs are dependent on content, delivery method, and the perceived status of the person delivering the intervention. To address the potential for lack of effectiveness or potential harms in some subpopulations, such efforts should also evaluate the extent to which effectiveness varies by recipient characteristics. Future studies should also be designed with the goal of evaluating evidence on alcohol-related traffic violations and crashes. Finally, programs should compile and publish cost data so that the cost-effectiveness of various approaches can be assessed.

Several common problems among evaluations of school-based programs need to be addressed in future studies. First, the majority of such evaluations have relied on self-report information to assess effectiveness. Although questionnaires regarding alcohol use, driving after drinking, and riding with alcohol-impaired drivers can provide valuable information, they may be subject to systematic biases that could distort the results of outcome evaluations. Thus, to the extent possible, subjective data should be supplemented with objective information to safeguard against potential biases. Attrition from pre-test to post-test to follow-up measurement periods has also been a consistent problem in the studies reviewed. Depending on the length of the follow-up period, half or more of the original subjects can be lost to attrition, reducing the power and potentially the validity of studies. Such problems should be anticipated and addressed to the extent possible in designing studies to address the gaps identified in these reviews.

Several authors concluded that, to maximize the effectiveness of school-based interventions, they must be part of a larger community effort.^{45,46} Howat et al.⁴⁷ recommend that such community efforts adopt a comprehensive health promotion approach which incorporates organizational, economic, and policy changes in addition to community-wide education.⁴⁷ The success of comprehensive programs such as Project Northland provide evidence of the synergistic effects that can result from implementing school-based educational interventions to reduce alcohol-related problems in conjunction with complementary community activities.⁴⁸ Similar complementary approaches have also been successful in other public health areas, such as improving cardiovascular health⁷ and preventing tobacco use.⁴⁹

Points of view are those of the Task Force on Community Preventive Services, and do not necessarily reflect those of the Centers for Disease Control and Prevention.

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Appendix. Effectiveness of school-based programs for reducing drinking and driving and riding with drinking drivers

Author (year) ^{ref} (follow-up period) Design (suitability) Quality of execution Evaluation setting	Intervention Comparison	Length of intervention Grade(s) Interaction level Sample size (<i>n</i>)	Outcomes and results	Estimated effect sizes (confidence interval)
Instructional programs conducted in the classroom				
D'Amico, (2002) ¹⁴ (2–6 months) Randomized (greatest) Fair Evaluation setting not specified	Intervention 1, RSTP: Taught risk-reduction skills and encouraged commitment to change behavior. Subjects were presented with and discussed feedback regarding their behavior, perceived behavior of peers, and actual peer norms Intervention 2: Abbreviated DARE program: Single 50-minute informational presentation regarding drug abuse and the law Comparison: Pre- and post-testing; and with untreated control group	50 minutes Grades 10–12 Interactive <i>n</i> =75 (RSTP) 50 minutes Grades 10–12 Not interactive <i>n</i> =75 (DARE) <i>n</i> =150 control	On a Likert scale assessing DD or RDD: RSTP group mean decreased from 1.25 to 0.52 at 2-month follow-up and 0.95 at 6-month follow-up DARE group mean decreased from 0.75 to 0.72 at 2-month follow-up and 0.67 at 6-month follow-up Control group mean decreased from 1.58 to 1.34 at 2-month follow-up and 1.32 at 6-month follow-up RSTP group also reported decreased risky drinking (e.g., playing drinking games) at both post-tests (<i>p</i> <0.05)	Self-reported DD or RDD: RSTP: 2 mo: -0.12 SD (-0.51 to 0.27) 6 mo: -0.01 SD (-0.40 to 0.38) DARE: 2 mo: 0.05 SD (-0.34 to 0.45) 6 mo: 0.04 SD (-0.35 to 0.44)
Shope (2001) ¹⁶ Shope (1996) ¹⁰ (2 months–7 years) Group randomized trial (greatest) Fair Southeastern Michigan: 254 classes	Intervention, Alcohol Misuse Prevention Study: Focused on information, inoculation against peer pressure, and building of refusal skills (through role playing). Program administered by trained teachers on the project staff to ensure fidelity Comparison: Pre- and post-testing; and untreated control group	5 sessions, 45 minutes Grade 10 Interactive <i>n</i> =1041	RR for crashes (at fault, single vehicle, or alcohol involved) was 0.93 in the first year following intervention and approximately 1.00 over the subsequent 6 years RR for serious motor vehicle offenses was 0.80 (95% CI: 0.63–1.01) in the first year following intervention and ranged from 0.92 to 1.14 over the subsequent 6 years At 2-year follow-up on a Likert scale assessing DD, increased from 0.09 to 0.60 in the intervention group, and from 0.10 to 0.69 in the control group (<i>p</i> =0.12)	Crashes: 1 yr: 0.93 RR (0.74 to 1.16) Self-reported DD: 2 mo: 0.08 SD (-0.09 to 0.25) 24 mo: -0.10 SD (-0.27 to 0.07)

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Author (year) ^{ref} (follow-up period) Design (suitability) Quality of execution Evaluation setting	Intervention Comparison	Length of intervention Grade(s) Interaction level Sample size (<i>n</i>)	Outcomes and results	Estimated effect sizes (confidence interval)
Wilkins (2000) ¹³ (1 month) Before and after; no comparison (least) Fair Florida	Intervention, SAFE program: Presented by emergency medical service personnel to highlight the dangers posed by alcohol impaired driving and failure to wear seatbelts; lecture, supplemented with graphic photos of crash victims and demonstration of the experience of a crash victim receiving emergency trauma care using student volunteer Comparison: Pre-test data only	1 session, 1 hour High school Interactive <i>n</i> =60	Self-reported RDD on Likert scale decreased from 3.45 (0.62) at pre-test to 3.83 (0.42) at post- test (<i>p</i> <0.01) At post-test, 81% of students reported "never" riding with a drinking driver versus 50% at pre-test At post-test, 87% of students reported "always" wearing seatbelts in the front seat versus 53% at pre-test	Self-reported RDD: 1 mo: -0.72 SD (-1.06 to -0.38)
Harre (1998) ⁶ (4 months) Before and after with concurrent comparison (greatest) Fair Auckland, New Zealand: six high schools	Intervention, Based on Bandura's social learning theory and concept of self- efficacy; taught knowledge, attitudes, and judgments related to safe driving using a "reasoned argument" approach that minimized fear appeals; focus was on building self- efficacy with interactive sessions and role playing Comparison: Pre-test data; and students at untreated comparison high schools	10 sessions, 1 hour each Grade 12 Interactive <i>n</i> =322	On a Likert scale assessing DD: Mean scores for males increased from 1.30 to 1.31 in the intervention group, and decreased from 1.14 to 1.13 in the comparison group Mean scores for females increased from 1.22 to 1.23 in the intervention group, and from 1.00 to 1.08 in the comparison group On a Likert scale assessing RDD (with unequal time periods at pre- and post-test): Mean scores for males decreased from 2.55 to 1.49 in the intervention group, and from 2.46 to 1.57 in the comparison group Mean scores for females decreased from 2.68 to 1.71 in the intervention group, and from 2.62 to 1.74 in the comparison group No significant program effects were found for knowledge, attitudes, or behavior	Self-reported DD: Males: 0.04 SD (-0.62 to 0.69) Females: -0.17 SD (-0.83 to 0.48) Self-reported RDD: Males: -0.18 SD (-0.62 to 0.26) Females: -0.10 SD (-0.54 to 0.34)

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Author (year) ^{ref} (follow-up period) Design (suitability) Quality of execution Evaluation setting	Intervention Comparison	Length of intervention Grade(s) Interaction level Sample size (<i>n</i>)	Outcomes and results	Estimated effect sizes (confidence interval)
Sheehan (1996) ¹⁹ Sheehan (1990) ⁹ (3 months to 3 years) Group randomized trial (greatest) Fair Queensland, Australia: 41 high schools	Intervention, PASS: Program was based on “theory of planned behavior” aimed at modifying students’ beliefs, attitudes, and perceived social norms about drinking and driving; also sought to increase self- efficacy through role playing Comparison: Pre-test data; and students at untreated control high schools	12 lessons Grade 10 Interactive <i>n</i> (final)=1774	At 3-year follow-up, percent of students reporting DD: Increased from 3.1% to 7.4% in the intervention group Increased from 4.7% to 8.8% in the control group At 3-year follow-up, percent reporting RDD: Decreased from 47.7% to 21.3% in intervention group Decreased from 46.3% to 26.8% in control group	Self-reported DD: 36 mo: 0.01 SD (−0.12 to 0.14) Self-reported RDD: 3 mo: −0.12 SD (−0.33 to 0.09) 36 mo: −0.15 SD (−0.28 to −0.02)
Klepp (1995) ⁷ (4 years) Time series with concurrent comparison (greatest) Fair Moorhead MN and Fargo ND	Intervention, Shifting Gears: A school-based education component addressed smoking, alcohol, marijuana use, and drinking and driving. Program was incorporated into the Minnesota Heart Health Program (a multifaceted community- based program to change eating habits, smoking, and activity levels) during the 1985–1986 school year. Program was based on social learning theory, incorporating role playing of refusal skills, social norming, media awareness, and increasing knowledge of alternative behaviors Comparison: Pre-test data; and students in control community (Sioux Falls SD)	6 sessions Grade 9 Interactive <i>n</i> =2376 (at 9th grade evaluation)	Percent intervention vs control students reporting driving after two drinks (DD): in first-year post-test: 9th grade (13% vs 21%, <i>p</i> =0.01) at 12-month post-test: 10th grade (21% vs 28%, <i>p</i> =0.27) at 24-month post-test: 11th grade (31% vs 33%, <i>p</i> =0.63) at 36-month post-test: 12th grade (36% vs 32%, <i>p</i> =0.66) Similar patterns observed for alcohol use variables High and likely selective attrition for the 12th grade sample in comparison community	Self-reported DD (2+ drinks) Yr 1: −0.22 SD (−0.38 to −0.06) Yr 2: −0.17 SD (−0.53 to 0.19) Yr 3: −0.05 SD (−0.28 to 0.18) Yr 4: 0.09 SD (−0.40 to 0.59)

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Author (year)^{ref} (follow-up period) Design (suitability) Quality of execution Evaluation setting	Intervention Comparison	Length of intervention Grade(s) Interaction level Sample size (n)	Outcomes and results	Estimated effect sizes (confidence interval)
Singh (1993) ¹¹ (4 months) Nonrandomized trial (greatest) Fair England: eight schools	Intervention, One for the Road: A series of four films that covered different aspects of the impaired driving problem (in as value free a manner as possible) were provided; teachers were encouraged to follow each film with discussions, and use role playing or dramatic presentations if possible. Teaching guides were provided Comparison: Pre-test data; and students in unmatched control schools	>4 hours (requested) High school Encouraged interaction n=664	Intent to drink and drive or ride with a drinking driver was assessed using 18 hypothetical scenarios. Scores for intervention group improved from 71 at pre-test to 79 at post-test; those for the control group changed from 71 to 72. No variability indices or inferential statistics were provided Knowledge gains for the intervention group were reportedly maintained at 4-month follow-up	N/A
Newman (1992) ¹² (1 year) Group randomized trial (greatest) Fair Nebraska (urban): nine schools	Intervention, Resisting Pressures to Drink and Drive: Integrating videotaped examples of refusal skills with role playing and small group discussion; presented by social studies teachers (English teachers in replication study); teachers trained in 6-hour, 1-day session Comparison: Pre-test data; and classes in control schools; control group received traditional alcohol education program	8–10 lessons Grade 9 Interactive n=87 classes	Self-reported number of RDD occasions in last 30 days increased from 1.01 to 1.48 in intervention group, and from 1.01 to 1.98 in comparison group (<i>p</i> <0.05). Similar results were reported for replication using English teachers the following year	Self-reported RDD: 1–2 mo: –0.12 SD (–0.73 to 0.48) 12 mo: –0.61 SD (–1.21 to 0.01)

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Author (year) ^{ref} (follow-up period) Design (suitability) Quality of execution Evaluation setting	Intervention Comparison	Length of intervention Grade(s) Interaction level Sample size (<i>n</i>)	Outcomes and results	Estimated effect sizes (confidence interval)
Peer organization programs				
Leaf (1995) ⁸ (retrospective) Post-only with concurrent comparison (least) Fair Ohio and Wisconsin: four schools	Intervention, SADD: Schools with highly active and exemplary SADD chapters were identified. The SADD programs in these schools involved a variety of activities including assembly presentations, a standard 15-session curriculum, demonstrations, and various instructional and extra-curricular activities Comparison: Post hoc comparison with matched schools with no SADD program	Ongoing, multiyear High school Interactive <i>n</i> =17,187	Self-reported DD, RDD, moving violations, total crashes, and alcohol-related crashes. Results reported included the following (intervention vs comparison): DD: 24.5% vs 27.1% (<i>p</i> >0.05) RDD: 35.1% vs. 35.5% (<i>p</i> >0.05) Moving violations: 11.8% vs 16.8% (<i>p</i> <0.05) Total crashes: 14.4% vs 18.4% (<i>p</i> >0.05) Alcohol-related crashes: 1.1% vs 1.2% (<i>p</i> >0.05)	Self-reported: DD: -2.06 SD RDD: -0.01 SD Crashes: -0.11 SD Alcohol-related crashes: -0.01 SD
Klitzner (1994) ¹⁵ (2 years) Time series with concurrent comparison (greatest) Fair California (urban) and New Mexico (rural)	Intervention, SADD programs: Implemented in two schools: primary elements included: (1) a kick-off assembly, at which the Contract for Life was distributed (but not strongly promoted); and (2) establishment of a SADD student chapter. In New Mexico, SADD chapter was inactive during the second year Comparison: Pre- and post- testing with control schools where SADD programs were not to be implemented (but where SADD and other programs were implemented in some cases)	Ongoing, multiyear High school Interactive <i>n</i> =4 schools	Surveys indicated a decrease in DWI-related curricular activity following implementation of SADD chapters Analyses revealed a greater willingness to address DD/RDD among SADD students at the first post-test but not at the second post-test; no overall differences between groups with regard to normative perceptions regarding DD/RDD; no initial difference between groups with regard to discussions of DD/ RDD at home but control discussed more at home over time; and no significant difference between groups with regard to self-reported DD/RDD	No effect sizes estimated

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Author (year) ^{ref} (follow-up period) Design (suitability) Quality of execution Evaluation setting	Intervention Comparison	Length of intervention Grade(s) Interaction level Sample size (n)	Outcomes and results	Estimated effect sizes (confidence interval)
Social norming programs Foss (2001) ⁴² (2 years) Before-and-after with no comparison group (least) Fair UNC–Chapel Hill	Intervention, “2 out of 3” Program: A campuswide public awareness program to provide objective information regarding student use of alcohol. The phrase “whether it’s Thursday, Friday or Saturday night, 2 out of 3 UNC students return home with a 0.00 BAC” provided the primary message. It was conveyed via student awareness sessions, poster incentive campaign, sticker incentive campaign, news conference, newspaper ads Comparison: Pre- and post- intervention responses to nighttime surveys including breath alcohol measurement	Year-long campaign University campus (freshman emphasis) Not interactive n=1786 surveyed (pre) n=2451 surveyed (post)	Percentage of drivers (observed or self-reported) with positive BACs decreased from 13% to 9.7% Percentage of drivers (observed or self-reported) with BACs >0.08% decreased from 2.6% to 1.3% Percentage of respondents with positive BACs decreased from 23.7% to 21.5%	DD: 0.00 BAC: –0.10 SD p=0.18 0.08 BAC: –0.09 SD (p=0.21)

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Author (year)^{ref} (follow-up period) Design (suitability) Quality of execution Evaluation setting	Intervention Comparison	Length of intervention Grade(s) Interaction level Sample size (n)	Outcomes and results	Estimated effect sizes (confidence interval)
Cimini (2002) ⁴¹ (6 weeks) Group randomized trial (greatest) Fair University of Albany	Intervention, Background was a campuswide public awareness program that was developed and implemented to provide objective information regarding student use of alcohol. The phrase “74% of University of Albany students drink once a week or less” provided the primary message. Key intervention was a 1-hour peer theater session, using trained peer “actors” and involving the audience in discussions regarding topical scenarios that were acted out Comparison: Pre- and post-testing with control group of students exposed to a 1-hour lecture on alcohol and its effects	Media campaign ongoing/peer theater 1 session University campus (freshman emphasis) Interactive n=8 groups of 20 students each	Relative to controls, intervention group reported: Significant decrease in DD ($F=9.47, p<0.01$) Significant increase in designated driver use ($F=9.47, p<0.01$) High-risk drinkers exposed to the intervention reported a 9% decrease in frequency of alcohol consumption, relative to a 9% increase among controls	N/A

BAC, blood alcohol content; DARE, Drug Abuse Resistance Education; DD, driving and drinking; DWI, driving while intoxicated; N/A, not available; PASS, Plan a Safe Strategy; RDD, riding with a drinking driver; RR, relative risk; RSTP, Risk Skills Training Program; SADD, Students Against Destructive Decisions; SAFE, Stay Alive from Education; SD, standard deviation; UNC, University of North Carolina.