

Randomized Trial of Brief Family Interventions for General Populations: Adolescent Substance Use Outcomes 4 Years Following Baseline

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This study examined the long-term substance use outcomes of 2 brief interventions designed for general population families of young adolescents. Thirty-three public schools were randomly assigned to 3 conditions: the 5-session Preparing for the Drug Free Years Program, the 7-session Iowa Strengthening Families Program, and a minimal contact control condition. The pretest involved 667 6th graders and their families. Assessments included multiple measures of initiation and current use of alcohol, tobacco, and marijuana. Pretest data were collected in the 6th grade and the reported follow-up data were collected in the 10th grade. Significant intervention-control differences in initiation and current use were found for both interventions. It is concluded that brief family skills-training interventions designed for general populations have the potential to reduce adolescent substance use and thus have important public health implications.

Epidemiologic studies document that there is substantial use of alcohol and tobacco among young adolescents in this country (Carnegie Council of Adolescent Development, 1995; Johnston, O'Malley, & Bachman, 1998). For example, 54% of eighth graders report that they have already tried alcohol and 25% report at least one episode of drunkenness (Johnston et al., 1998). Further, use of alcohol and tobacco is associated with use of illicit substances such as marijuana, as well as a range of other antisocial behaviors (Hays, Widaman, DiMatteo, & Stacy, 1987; Jessor, 1993; Jessor & Jessor, 1977; Kandel & Faust, 1975; Maddahian, Newcomb, & Bentler, 1985; Martin, Velicer, & Fava, 1996).

Epidemiological research also provides several indications of the critically important need to address the early initial use of substances among young adolescents. A key indication is the increased probability of costly substance dependence in adolescence and young adulthood associated with early initiation. As an example, the National Longitudinal Epidemiological Survey ($N = 27,616$) shows that lifetime alcohol dependence rates of those who initiate alcohol use by age 14 are four times as high as those who start at age 20 (Grant & Dawson, 1997). Moreover, this study demonstrates that the odds of lifetime dependence decreased by 14% with each additional year of delayed initiation, after adjusting for potentially confounding variables. A number of other epidemiological studies have previously shown that early initiation

of alcohol and other substances predicts substance-related problems in later adolescence and adulthood (Fleming, Kellam, & Brown, 1982; Kandel & Yamaguchi, 1993; Robins & Przybeck, 1985). Such substance-related problems incur staggering costs associated with lost productivity, health care expenditures, and increased crime rates (Harwood, Fountain, & Livermore, 1999; Spoth, Day, & Gyll, 2000); the 1995 economic cost of alcohol and other substance abuse in the United States was estimated to be \$276 billion (National Institute on Drug Abuse, 1997).

One potentially important contribution to the reduction of costly public health and social problems associated with youth substance use is the widespread application of family-focused competency-training interventions that are empirically supported (Biglan & Metzler, 1999; Carnegie Council on Adolescent Development, 1995; Spoth, 1999). As summarized in an earlier article (Spoth, Reyes, Redmond, & Shin, 1999), researchers have suggested that brief, family-focused preventive interventions can be effective in the reduction of substance use when they follow scientific principles of prevention (e.g., National Institute on Drug Abuse, 1997). First and foremost, these interventions must be theory-based, addressing well-established risk and protective factors originating in the family (Brook, Brook, Gordon, Whiteman, & Cohen, 1990; Conger & Elder, 1994; Dishion, Patterson, Stoolmiller, & Skinner, 1991; Hawkins, Catalano, & Miller, 1992). Epidemiological study of influences of risk and protective factors originating in the family have clearly indicated the potential public health benefits of family-based risk reduction and protection enhancement. For example, a national study of over 12,000 general population adolescents (Resnick et al., 1997) showed that "child-family connectedness" figured prominently in adolescent alcohol outcomes. In that study, family context factors accounted more fully for the frequency of alcohol use among seventh and eighth graders than either school context or individual factors.

A second important principle for efficacious general population family interventions is that they must be developmentally well-timed. The intent of the interventions tested in this study was to address young¹ adolescent risk and protective factors during the

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critical developmental stage of transition into middle adolescence, when young persons typically have a greater opportunity to engage in deviant behavior and may be inclined to do so through peer encouragement or as part of young adolescent exploration and rebellion (Lerner, 1993; Simmons & Blyth, 1987). A large body of epidemiological data supports statements that the optimal timing for preventive interventions is in early adolescence (Dryfoos, 1990; Iowa Department of Education, 1997; Swisher, 1993). To strengthen the effects of the tested interventions, they were offered at a point (first semester, sixth grade) when most students in the sample were likely to begin experimentation with substance use—associated with young adolescent exploration and rebellion, substance-use opportunities, or peer encouragement to use—but before they were likely to progress to more frequent and more varied use. By targeting this developmental stage, the interventions were designed to enhance youths' ability to meet substance-related challenges in transitioning to middle adolescence.

In addition, both interventions teach skills that reduce risk and increase protective factors through research-based interactive skills-training techniques (e.g., modeling, behavioral rehearsal, feedback, home practice). Finally, strategies to ensure both active engagement of the families and quality implementation of the intervention components were used. For example, implementation strategies were refined with guidance from consumer-research studies on family engagement factors (e.g., preferred scheduling options) and procedures were used to assume implementation consistent with intervention manuals (e.g., essential content was placed on videotapes; Spoth & Redmond, 1993a, 1993b, 2000).

Unfortunately, the literature suggests that general population family interventions rarely follow the aforementioned principles to enhance efficacy and that credible evidence of efficacy is even rarer. A large number of family-focused interventions for general populations have been developed and disseminated, but few have been rigorously evaluated (Center for Substance Abuse Prevention, 1998; Dielman, Laetz, Leech, & Loveland-Cherry, 1994; Kazdin, 1993; Kumpfer, 1992; Moskowitz, 1989; Small, 1990; Spoth, 1999; Spoth, Redmond, & Lepper, 1999). Furthermore, although a number of randomized, controlled studies of school- and community-based interventions have incorporated family intervention components, the effects of the family components could not be readily disentangled from those of other intervention components because the study designs were intended to yield results concerning the comprehensive intervention. The family components were not freestanding or independently tested. A recent literature review by the authors failed to reveal any longitudinal, randomized controlled studies of freestanding family-focused interventions for general populations. Moreover, among studies of general population preventive interventions, a number of methodological deficits are frequently observed, including a lack of randomized, controlled designs with representative samples; interventions that are not grounded in relevant theoretical or empirical literature; failure to assess the fidelity of intervention implementation; differential attrition; lack of consideration of assumptions of statistical models (e.g., when analyzing multilevel data structures); and no long-term follow-up.

This study was designed to address both the substantive and methodological gaps in the literature described above. It reports longitudinal outcomes of a randomized, controlled trial evaluating two theory-based, family-focused interventions for general popu-

lations, Preparing for the Drug Free Years (PDFY) and the Iowa Strengthening Families Program (ISFP). Prior work by the authors, including reports on an earlier controlled outcome study, focused on short-term parenting or parent-child interactional outcomes (Kosterman, Hawkins, Spoth, Haggerty, & Zhu, 1997; Redmond, Spoth, Shin, & Lepper, 1999; Spoth, Redmond, Haggerty, & Ward, 1995; Spoth, Redmond, & Shin, 1998) and on models of family processes influencing shorter term young adolescent outcomes, particularly alcohol refusal skills (Spoth, Yoo, Kahn, & Redmond, 1996) and propensity to use alcohol (Redmond, Spoth, & Shin, 1998). Earlier 7th- and 8th-grade follow-up data from the current study also were used to examine transition probabilities of a latent substance-use variable (Spoth, Reyes, et al., 1999) and ISFP effects on reported frequencies of alcohol use (Spoth, Redmond, & Lepper, 1999). This article extends prior work on evaluation of family intervention outcomes by examining intervention effects on initiation and current use of substances at a 10th-grade follow-up, 4 years following baseline (3½ years following the interventions).

This study examines intervention versus control differences in initiation levels of alcohol, tobacco, and marijuana use. It also evaluates effects on several indicators of current use (e.g., past month use of alcohol, frequency of alcohol use in the past month) and on a composite index of initiation and current use. Specific hypotheses tested are as follows: Tenth-grade adolescents in intervention-group families will demonstrate (a) delayed initiation of alcohol, tobacco, and marijuana use, and (b) lower levels of current use, including frequency of use, relative to those in the control group. Because the ISFP and PDFY program evaluations were separately funded by two different agencies, there were no intervention comparison hypotheses in the study proposals. Thus, only supplemental analyses testing for differences in outcomes across the two interventions are reported.¹

Method

Sample

Participants in the study were families of sixth graders enrolled in 33 rural schools in 19 contiguous counties in a Midwestern state. Schools included in the study were selected on the basis of school lunch program eligibility (15% or more of district families eligible for free or reduced-cost lunches) and community size (populations of 8,500 or fewer). A randomized block design guided the assignment of the 33 schools. Schools were blocked on the proportion of students who resided in lower income households and on school size. Within blocks, each school was randomly assigned to one of three experimental conditions: the seven-session ISFP, the five-session PDFY, or a minimal-contact control condition. Random

¹ Originally, we received funding for two 2-phased projects, where the second phase in both was a randomized controlled trial. Though not by design, the second phases of both projects coincided, at the same time there was a budgetary shortfall. Combining the studies eliminated the need for two separate control groups, allowing a larger *n* in each of the intervention conditions while addressing budgetary issues. Approval for combining studies was sought and received on the basis of its practicality. Thus, beyond the original intervention-control difference hypotheses, additional hypothesizing was post hoc. In addition, it was expected that statistical power would be limited to detect likely small differences between the two interventions.

assignment was computer-generated by a data analyst, and assignment information was then provided to program implementation staff who, in turn, sent letters to the schools informing them of their assignment.

All families of sixth graders in participating schools were recruited for participation. Of the 1,309 eligible families recruited for this study from the 33 schools, 667 (51%) completed pretesting (238 ISFP group families, 221 PDFY group families, and 208 control group families). Prior reviews of the literature on prevention trial recruitment rates indicate that this compared favorably with, or exceeded, those commonly reported for prevention trials addressing child problem behaviors with similar evaluation components at the time this trial was undertaken (see Spoth & Redmond, 1994). At the time of pretesting, participating families did not know the experimental condition to which their child's school had been assigned, although they had been informed that the project included an intervention component in some schools. Refusal rates were similar across conditions. After pretesting, intervention-school families who participated in pretest assessments were recruited for the two programs; intervention-school families not successfully recruited for pretesting were allowed to enroll in the interventions but were not actively recruited.

Among families that provided data used in the analyses, there was an average of 3.0 children. In slightly more than half of these families (55%) the target child was a girl. The majority of families (86%) consisted of dual-parent families, which is representative of families of sixth graders in the study region. Of these dual-parent families, 85% included both of the target child's biological parents. The mean ages of mothers and fathers were 37.3 years and 40.1 years, respectively. The large majority of both mothers and fathers (97% and 96%, respectively) completed high school. In addition, 59% of mothers and 54% of fathers reported some post-high-school education. The median annual household income in the analyzed sample was \$34,000. Virtually all participants were Caucasian (99%).

Sample Quality: Representativeness, Pretest Equivalence, and Attrition

Approximately 6 months before the pretest recruitment began, a prospective participation factor survey was conducted by telephone to subsequently assess the representativeness of the families successfully recruited for the study. The completion rate among all eligible families was 90% ($N = 1,192$). To determine whether families subsequently recruited for participation were representative of the target population, data were analyzed for a range of family sociodemographic characteristics (parent education, household income, target child gender, parent marital status, number of children), child conduct problems, and social-emotional distress. A multivariate analysis showed parent education to be the only significant predictor of trial participation (Spoth, Redmond, Kahn, & Shin, 1997); the mean levels of education between randomized trial participants and non-participants differed by less than one year (0.7 years), with participants showing the higher level (Spoth et al., 1997). Because the recruited sample was generally representative of the eligible population on measured risk-related characteristics, the risk level of the sample was expected to reflect that of the targeted population.

Next, pretest equivalence of the intervention (both PDFY and ISFP) and control groups was assessed. Family sociodemographic characteristics (household income, parent education, parent age, target child age, target child gender, parent marital status, number of children in the household) were examined. School and community characteristics (e.g., school enrollment, number of classrooms, student achievement ranks, student attendance, school lunch program eligibility rates, and community population) also were assessed. Pretest equivalence across the intervention and control groups was established; there was no significant PDFY-control or ISFP-control differences for any of the variables examined. Table 1 presents condition-specific characteristics of families, schools/students, and communities prior to the study.

In addition, condition pretest equivalence on all outcome measures was assessed. Pretest equivalence was found for all but one measure. Tobacco

initiation scores at pretest for PDFY students were higher than they were for control condition students: pretest differences for all outcomes (significant or not) were controlled in all analyses of intervention effects.

Attrition rates also were examined. At the 10th-grade follow-up, 67% ($n = 447$) of the sample was retained; this rate is comparable with mean rates reported in a review of 85 longitudinal substance-abuse prevention studies (Hansen, Tobler, & Graham, 1990). More important, across waves of data collection, attrition decreased and leveled off, demonstrating an improvement in wave-specific retention rates over the course of the study. The total sample loss between the 7th- and 10th-grade follow-up assessments amounted to approximately 4% of the pretest sample. Families who were known to have moved out of state ($n = 19$) were offered the option of completing all but the videotaped portion of the assessments; however, all of them declined.

To evaluate differential attrition across experimental conditions from pretest to the 10th-grade follow-up assessment, two-factor analyses of variance were conducted for both PDFY-control and ISFP-control comparisons for each outcome measure and for each family sociodemographic factor, following procedures similar to those in earlier studies (Spoth, Redmond, & Lepper, 1999; Spoth et al., 1998). No significant Condition \times Attrition interaction effects were found for any of the variables between pretest and the 10th-grade follow-up. Likewise, no evidence of differential attrition across conditions was found for any family sociodemographic factor. One experimental condition main effect was found, corresponding to the previously noted pretest difference in tobacco initiation scores. In addition, attrition main effects were found for parent education, parent age, and the alcohol initiation index. These effects indicated that lower parental education, younger parental age, and higher child alcohol-initiation scores (as assessed at pretest) were each associated with a higher likelihood of attrition between the 6th-grade pretests and the 10th-grade follow-up assessments (though equally so across the three experimental conditions).

Figure 1 provides a profile of the preventive intervention trial sample across time.

Intervention Implementation and Fidelity

Parents and children participating in both interventions were instructed in skills demonstrated to be associated with the delayed onset or reduction of substance use (e.g., Hawkins et al., 1992; Mrazek & Haggerty, 1994; Spoth, 1999; Taylor & Biglan, 1998; Weissberg & Greenberg, 1998).

The design of PDFY was informed by the social development model (Catalano & Hawkins, 1996; Hawkins & Weis, 1985), an integration of social control theory (Hirschi, 1969) and social learning theory (Akers, 1977). Guided by social control theory, the social development model posits bonding to prosocial others as a key protective factor that diminishes the likelihood of adolescent substance use and other problem behaviors. The social learning theory component of the social development model specifies processes predicting conditions under which bonding to prosocial others develops. The primary locus of prosocial bonding is the family; bonding with school and prosocial peers is facilitated by the family (Kosterman, Hawkins, Haggerty, Spoth, & Redmond, 2001). Three primary change goals are targeted by PDFY to develop prosocial family bonding: (a) increasing the frequency of opportunities for prosocial involvement in the family, (b) strengthening the child's skills for prosocial involvements (e.g., participating in family activities and governance) and resisting antisocial influences, and (c) increasing recognitions and rewards for child behaviors that conform to family rules and expectations, as well as application of appropriate consequences for violations. Toward this end, PDFY emphasizes parent or parent-child skills training in five areas: (a) creating opportunities for, and rewarding of, positive family involvement and interaction; (b) effective child management, including establishment of child expectations, careful monitoring, and appropriate discipline; (c) establishing mechanisms for parent instruction and assistance with training peer resistance and other child skills; (d) reducing and appropriately

Table 1
Pretest Equivalence of Experimental Conditions on Participant Background, School/Student, and Community Characteristics

Variable	Experimental condition					
	ISFP		PDFY		Control	
	<i>M</i>	<i>SE</i>	<i>M</i>	<i>SE</i>	<i>M</i>	<i>SE</i>
Family characteristics						
Household income (\$1,000)	42.3	2.17	37.5	3.09	38.7	2.20
Parent education (years)	13.3	0.11	13.5	0.14	13.4	0.11
Parent age (years)	38.2	0.36	37.8	0.38	38.2	0.34
Target child age (years)	11.3	0.03	11.4	0.03	11.3	0.03
Number of children in family	3.2	0.09	2.9	0.09	3.0	0.12
Parent marital status (% dual parent families)	88.7	2.05	86.0	2.33	83.7	2.56
Target gender (% female)	51.9	3.23	51.1	3.36	52.4	3.46
School and student characteristics						
6th grade class enrollment	46.5	9.7	45.5	11.3	43.8	9.5
School enrollment	263.1	38.4	228.3	34.3	201.6	32.6
Number of 6th grade classrooms	2.1	0.3	2.3	0.4	2.2	0.4
Aggregate 6th grade state achievement rank (percentile)	32.1	6.4	44.3	8.1	35.7	6.6
Average daily attendance rate (% of 6th graders at school each day)	96.7	0.6	96.0	0.4	96.4	0.4
Proportion of district families eligible for school lunch program	26.3	2.3	26.9	1.4	23.6	1.6
Community characteristics						
Community population	1,407.5	358.3	928.1	216.1	1,487.6	664.9
Distance (in miles) to nearest city of 50,000 or more	75.6	7.0	67.8	3.9	71.9	6.1

Note. ISFP = Iowa Strengthening Families Program; PDFY = Preparing for the Drug Free Years Program. Values reported are means except where otherwise indicated (marital status and target child gender). There were no statistically significant differences between PDFY and control or between ISFP and control conditions at the .05 level.

managing family conflict; and (e) expressing positive feelings to enhance bonding (see Kosterman et al., 2001).

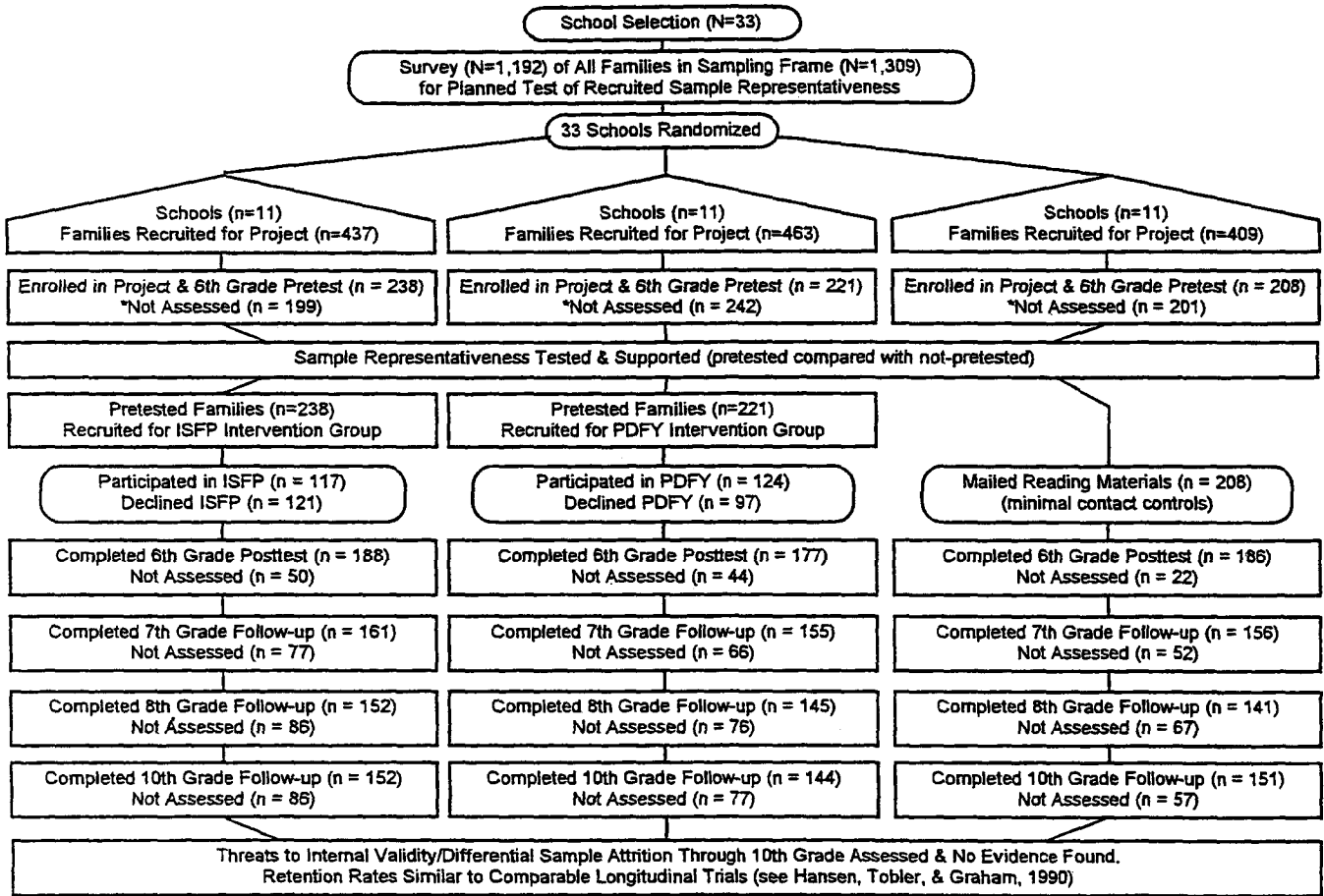
The PDFY intervention is delivered in five training sessions with an average session length of 2 hr. Sessions are scheduled once per week for five consecutive weeks, held on weekday evenings, typically at schools. Four of the sessions are attended by parents only; children attend one session with their parents, focusing on peer resistance skills. Essential program content is included on videotapes to ensure standardized delivery of program content and to enhance the learning process by visually demonstrating competent parent-child and family interactions. A summary description of key characteristics and primary content of PDFY is provided in the Appendix. Parallel descriptive information is provided for ISFP, in order to facilitate an examination of the similarities and differences between the two interventions.

A PDFY intervention delivery mechanism was developed that entailed a cooperative arrangement between the Cooperative Extension network and local schools (Kumpfer, Molgaard, & Spoth, 1996; Spoth & Redmond, 1996). Fifteen 2-person group leader teams conducted a total of 19 groups in the 11 schools assigned to the PDFY condition. The average number of families per group was 10, and the average number of individual participants per session was 16 (25 for the session including children). Trained observers monitored the fidelity of intervention implementation, with a focus on group leader coverage of the program content. Each team of group leaders was observed for two of five sessions. Results from the fidelity observations showed that there was some variability in group leaders' delivery, but also demonstrated that all teams covered all of the key program concepts. Observations of detailed group activities described in the group leader's manual, broken into small component tasks, showed an

average coverage of 69% by the 15 group leader teams. Approximately 50% of the observations were conducted by two observers to allow for reliability checks. Agreement among raters was generally high; ratings of detailed group activities differed between paired observers by an average of approximately 6%.

Of the 220 pretested families in the PDFY condition, 124 participated in the intervention. Although 44% of the pretested families declined to participate in the intervention, program attendance was high among those who did participate. Approximately 94% of attending families were represented by a family member in three or more sessions, 93% attended at least four sessions, and 61% attended all five sessions. Pretested PDFY-condition families who attended the intervention were compared with those who did not on a range of sociodemographic and other family-member characteristics (parent education, household income, child gender, parent marital status, number of children, child conduct problems, and child social-emotional distress). The mean level of parent education among intervention attenders was 0.9 years higher than among those not participating in the intervention. No other significant attender-nonattender differences were found.

The ISFP is based on the biopsychosocial model (DeMarsh & Kumpfer, 1986) and other empirically based family risk and protective factor models (Kumpfer et al., 1996). These models include the resiliency model (Richardson, Neiger, Jensen, & Kumpfer, 1990) and the social ecology model of adolescent substance use (Kumpfer & Turner, 1990-1991). These models articulate categories of empirically based risk and protective factors that influence substance use and other problem behaviors. Targeted risk factors include, for example, poor discipline skills (Baumrind, 1985) and poor quality of parent-child relationships (Brook et al., 1990); protective factors



*"Not Assessed" includes refusals, families who could not be contacted, and those who became ineligible (e.g., student no longer residing in the home). Number not assessed at pretest is based on the number recruited; number not assessed at subsequent waves is based on the number pretested.

Figure 1. Profile of longitudinal preventive intervention evaluation study. ISFP = Iowa Strengthening Families Program; PDFY = Preparing for the Drug-Free Years Program.

targeted by the ISFP focus on resiliency characteristics in youth, including empathy, as well as parent-child bonding (Kumpfer, 1996; Richardson et al., 1990). In part, resilience-related characteristics in youth are hypothesized to reduce substance use and other problem behaviors through their positive influence on youth coping skills (e.g., management of strong emotions, problem solving). See Kumpfer et al. (1996) for a more complete description of empirically based risk and protective factors addressed through the program design.

The ISFP requires seven sets of sessions conducted once per week for seven consecutive weeks; like PDFY, sessions were held on weekday evenings, typically at schools. It includes separate parent and child skills-building curricula and a family curriculum. Weekly sessions consist of separate, concurrent training sessions for parents and children, followed by a family session in which parents and children jointly participate. During the family session, parents and children practice skills learned in their separate sessions. The concurrent parent and child sessions last 1 hr and are followed by the family session, which also lasts 1 hr. The seventh meeting consists of a 1-hr family interaction session without the concurrent training sessions for parents and children; thus, the total number of intervention hours is 13. The primary content of the ISFP parent, child, and family sessions is summarized in the Appendix. Essential program content for the parent and child skills-training sessions is contained on videotapes that include family interactions illustrating key concepts.

Twenty-one 3-person leader teams conducted 21 ISFP groups in the 11 participating schools. A total of 161 families participated in the 21 groups, including 117 families who had completed the in-home pretest assessment. Group sizes ranged from 3 to 15 families, with an average size of 8 families and an average of 20 individuals per weekly session. Approximately 94% of attending, pretested families were represented by a family member in five or more weekly sessions, 88% attended six or seven sessions, and 62% attended all seven sessions. As was the case with PDFY, intervention group families who actually attended the intervention were compared with those who did not on the same variables used in the PDFY analyses. There were no significant differences found between the two groups.

Each team of ISFP group leaders was observed two or three times. These observations confirmed that the teams covered all of the key program concepts. Coverage of the component tasks for activities described in the group leader's manual showed an average coverage of 87% in the family sessions, 83% in the parent sessions, and 89% in the youth sessions. Reliability checks were conducted on approximately 50% of the family session observations, 25% of the parent session observations, and 30% of the youth session observations; paired observers' assessments of coverage of detailed group activities varied by an average of 10% across the three types of sessions.

Families participating in the control group were mailed four leaflets describing different aspects of adolescent development (e.g., physical and

emotional changes, as well as parent-child relationships), at the same time families in the other two experimental groups were participating in the interventions. To preserve random assignment, we conducted analyses that included all assessed intervention-group students, whether or not their families actually attended an intervention. In other words, the study used "intent-to-treat" analyses to avoid a self-selection bias in the results and to avert possible overestimation of the magnitudes of intervention effects associated with such a bias.

Procedure

All eligible families in the selected schools were first mailed descriptive information summarizing both the assessment and program components of the prevention trial and indicating that a phone contact would soon follow. During the first telephone contact, the interviewer verified receipt of the mailed summary information and reviewed it. Families who indicated that they had not discussed participation were asked to do so, and arrangements were made for follow-up calls to answer questions and solicit participation. Subsequently, families who were successfully recruited were administered pretests.

A project staff member contacted families to schedule the in-home pretest assessment visit at a convenient time for the family. Also, an informational packet was sent that included an initial questionnaire to be completed individually by the parent(s) and the target child before the in-home visit. During the initial portion of the in-home visit, a household composition interview was conducted, followed by administration of written questionnaires to the participating family members. Family members were given written questionnaires that each family member completed independently, in approximately 60 to 80 min. Family members were assured that their responses to these questionnaires would be kept confidential. During and after the administration of the questionnaires, the interviewer videotaped the family members as they engaged in structured interaction tasks. The complete visit averaged about 2.5 hr in length. Each family member was compensated at the rate of approximately \$10/hr for time devoted to the assessments. Family assessment incentives were used to bolster initial recruitment rates, as well as to enhance wave-to-wave sample retention. The time between pretesting and posttesting was approximately 6 months. Families were scheduled for posttesting in a sequence similar to pretesting. All pretested families were recruited for posttesting, including intervention group families not enrolling in the interventions. Families were reassessed approximately 18, 30, and 48 months following the pretest (when students were in the 7th, 8th, and 10th grades).²

Measures

Substance use was evaluated in three ways. First, it was assessed with five measures of specific lifetime use behaviors³ (alcohol, alcohol without parental permission, drunkenness, cigarettes, and marijuana) that were evaluated individually. Second, dichotomous and frequency measures of current use were examined. Finally, composite measures of alcohol and tobacco use were assessed.

There were three dichotomous measures of current use (past month use of alcohol, past month use of cigarettes, and past year use of marijuana) and three frequency measures (past month occasions of alcohol use, past month occasions of cigarette use, and past year occasions of marijuana use). The ranges of observed scores were 0-20 and 0-900 for past month occasions of alcohol use and cigarette use, respectively. The observed scores on the past year occasions of marijuana use ranged from 0 to 60.

The alcohol composite use index consisted of three items concerning lifetime behaviors and one concerning recent use (lifetime use, lifetime use without parental permission, lifetime drunkenness, and past month use—see Spoth et al., 1999). The tobacco composite use index included two items concerning initiation and two concerning current use (lifetime use of cigarettes, lifetime use of chewing tobacco, past month use of cigarettes,

past month use of chewing tobacco). All items in the composite use indices were coded "0" (no use/no recent use) or "1" (use/recent use) and summed to form the index scores. Thus, possible scores on both indices ranged from 0 to 4, as did observed scores. The average alpha reliabilities across the five waves of data collection were .77 and .70 for the alcohol and tobacco indices, respectively. At the 10th-grade data collection point, the alpha reliabilities were .84 and .67, respectively.

Although self-report measures may be susceptible to social desirability biases, previous work has supported the validity of substance use and related problem behavior self-reports (Elliott, Ageton, Huizinga, Knowles, & Canter, 1983; Smith, McCarthy, & Goldman, 1995; Williams et al., 1995). In addition, the authors consider it unlikely that differential biases associated with experimental condition (e.g., experimenter demand effects) would still be operating several years after the intervention.

Data Analyses

Multilevel (mixed model) analyses of covariance (using SAS PROC MIXED with restricted maximum likelihood estimation) were used to test for intervention effects on frequency of past month or past year use of alcohol, tobacco, and marijuana, as well as effects on alcohol and tobacco indices. Because assignment to treatment conditions was made at the school level, school was incorporated as a random effect in these analyses; pretest scores were included as covariates.

For dichotomous outcome measures (not appropriate for examination by means of analysis of covariance; ANCOVA), differences in proportions of intervention and control groups reporting substance-use behaviors (i.e., lifetime use, past year use, and past month use) were evaluated with *z* tests. In addition, to illustrate the development of the substance use outcomes assessed in 10th grade, plots of prevalence rates across all waves of data collection were constructed for each of the experimental conditions: differences in the trajectories between the two intervention groups and the control group were tested, using growth curve analyses conducted with SAS PROC MIXED.

Results

Substance Use Initiation

Initiation rates in 10th grade. The proportions of PDFY and ISFP adolescents reporting initiation of each of the five substance-use behaviors since pretesting (hereinafter described as new user proportions) were compared with those in the control condition

² Because of interruptions in project funding between the fourth and fifth data collection waves, the midpoint of the 10th-grade data collection for the ISFP group was 3 months later than it was for the other two experimental conditions. ISFP group measures were statistically adjusted for the longer time interval between the 8th- and 10th-grade assessments (for each measure, adjustments were based on a linear rate of change from the 8th-grade assessment to the 10th-grade assessment).

³ Inconsistencies in lifetime substance use reports were corrected. In instances in which a participant reported a lifetime use behavior at one data collection point, but failed to report that behavior at a later data collection point, the later report was corrected to reflect the previously reported initiation of that behavior. The pattern of significant intervention-control differences remained unchanged when inconsistent responses were not corrected, with one exception. One nonsignificant PDFY effect, a reduction in the proportion of adolescents reporting having been drunk, became statistically significant when data were reanalyzed without correcting for inconsistencies in reporting.

Table 2
Lifetime Prevalence of Substance-Use Behaviors at the 10th-Grade Follow-Up: New User Proportions by Experimental Condition and Relative Reduction

Lifetime substance use behavior ^a	New user proportion			Relative reduction	
	PDFY	ISFP	Control	PDFY vs. control (%)	ISFP vs. control (%)
Ever drank alcohol	.60 (73/122)	.50 (65/131)	.68 (85/126)	11.3	26.4**
Ever drank without parent permission	.51 (72/140)	.40 (59/148)	.59 (85/145)	12.3	32.0**
Ever been drunk	.36 (50/141)	.26 (39/148)	.44 (66/150)	19.4	40.1**
Ever smoked cigarettes	.44 (50/128)	.33 (46/141)	.50 (71/142)	12.5	34.8**
Ever used marijuana	.11 (15/143)	.07 (11/150)	.17 (25/151)	36.6	55.7*

Note. PDFY = Preparing for the Drug Free Years Program; ISFP = Iowa Strengthening Families Program.

^a Significance levels are from *z* tests of differences in intervention and control group new user proportions.

* *p* < .05. ** *p* < .01.

using *z* tests,⁴ as summarized in Table 2. At the 10th-grade follow-up, results indicated that new user proportions were significantly lower for ISFP condition adolescents than for control group adolescents for all five behaviors. New user proportions also were lower among PDFY adolescents than among control condition adolescents for each of the five behaviors, but these differences only approached statistical significance for lifetime drunkenness and lifetime use of marijuana (*p* < .10, one-tailed test).

Relative reduction rates of new user proportions were calculated. These were calculated to provide an indication of the practical significance of the findings, by comparing the intervention group prevalences with those in the control group, a group that represents the normal or untreated population.⁵ Relative reduction rates for drunkenness and marijuana use are especially noteworthy. At the 10th-grade follow-up, these rates were 19% and 37%, respectively, for those assigned to the relatively less intensive PDFY intervention. Relative reduction rates for ISFP adolescents were 40% and 56% for drunkenness and marijuana use, respectively. New user proportions, corresponding *ns*, and relative reduction rates for the five lifetime substance-use behaviors at the 10th-grade follow-up assessment are presented in Table 2.

Cross-time initiation levels. As previously noted, to illustrate cross-time development of outcomes assessed at 10th grade, new user proportions for each of the three conditions across all waves of data collection were plotted. Figure 2 presents plots of new user proportions for alcohol use, cigarette use, drunkenness, and marijuana use.

To examine the differences in rates of substance use increases across intervention and control groups that were suggested by the data plots, we conducted repeated measure growth curve analyses. These analyses tested for slope differences in new user proportions across study conditions over time. Results confirmed that control group new user proportions had increased at a significantly greater rate than had ISFP new user proportions; tests of the Time \times Condition interaction effect (indicative of a different rate of linear growth across conditions) were significant at the .01 level for each of the four substance use measures, $t(322) = 3.29$, $t(355) = 2.87$, $t(378) = 3.84$, and $t(383) = 2.94$, for alcohol use, cigarette use, drunkenness, and marijuana use, respectively. In addition, in the PDFY-control analyses, significant effects were found for drunkenness and marijuana use, $t(362) = 2.42$, *p* < .05, and $t(368) = 2.68$, *p* < .01, respectively.

Past Month and Past Year Use

An analysis of the proportions of adolescents using alcohol and tobacco during the past month and marijuana during the past year showed that lower proportions of PDFY and ISFP group students (vs. control group students) used each substance at the 10th-grade follow-up. These differences were significant for the PDFY-control group comparison of past month alcohol use (relative reduction = 40.6%, *z* = 2.97), and for the ISFP-control group comparisons of both past month alcohol use (relative reduction = 30%, *z* = 2.19) and past month cigarette use (relative reduction = 46%, *z* = 2.50).

Frequency of Use

Frequency-of-use outcomes for three substances tended to be highly skewed (small numbers of users, some of whom reported high-frequencies of use), seriously violating the assumptions necessary for appropriate application of the multilevel ANCOVA procedure. Thus, a log transformation was applied to these vari-

⁴ Initiation rates in this sample appear comparable to those found in other epidemiologic studies. However, comparisons with available epidemiological data are imprecise. Constraints in comparative analyses between relevant epidemiological studies and ours include differences in sampling design, sample characteristics, and time of the data collection. For example, the lifetime alcohol use rate for rural 10th graders in the Monitoring the Future Study (Johnston, Bachman, O'Malley, & Schulenberg, 1999) was 75% in the same year it was 73% for control-group 10th graders in the sample for the present study. However, in the Monitoring the Future Study, the operational definition of *rural* was different, as was the method of data collection, the exact wording of the lifetime prevalence-use item, and the timing of the data collection during the academic year. Notably, data from the National Household Survey on Drug Abuse (Substance Abuse and Mental Health Services Administration, 1999) for the same year would suggest that the rural lifetime prevalence rate for 15 and 16 year olds (roughly comparable in age to our sample) was 53%.

⁵ The relative reduction rate at the 10th-grade follow-up is the percentage reduction in the intervention group adolescents versus control group adolescents who initiated the substance use behavior between pretesting and the 10th-grade follow-up (i.e., the difference in intervention and control group new user proportions expressed as a percentage of the control group new user proportion).

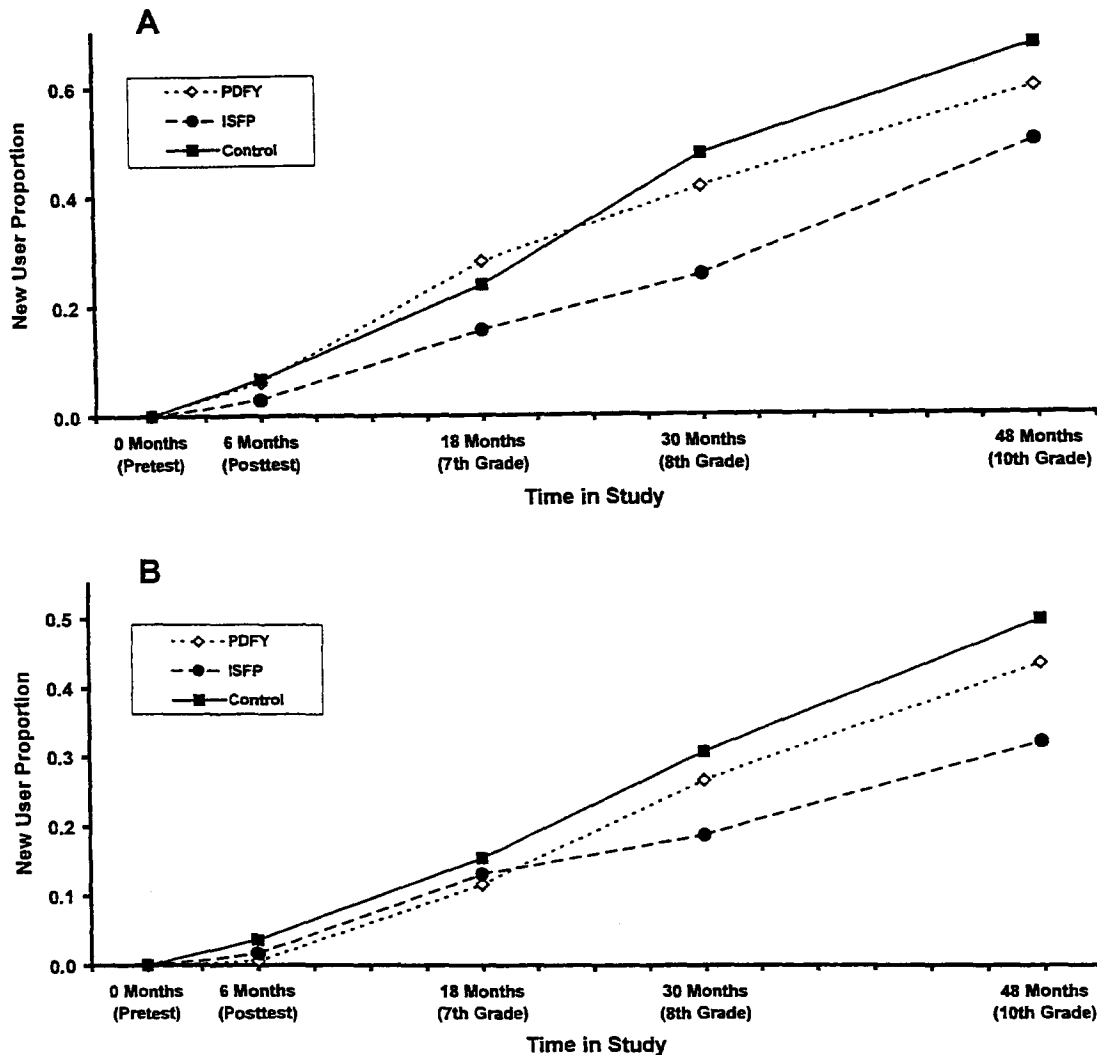


Figure 2. A: New user proportions for alcohol use by experimental condition. B: New user proportions for cigarette use by experimental condition. C: New user proportions for drunkenness by experimental condition. D: New user proportions for marijuana use by experimental condition. PDFY = Preparing for the Drug Free Years Program; ISFP = Iowa Strengthening Families Program.

ables. Nonetheless, even after transformation, the distribution of the past year marijuana use outcome remained too skewed for appropriate ANCOVA analysis. Multilevel ANCOVA results for the other frequency-of-use outcomes at the 10th-grade follow-up showed significantly lower frequencies of alcohol use for both the ISFP and PDFY groups and significantly lower cigarette use for the ISFP group. Multilevel ANCOVA results with transformed data and effects sizes for the alcohol and tobacco outcomes are presented in Table 3.

Mean substance frequencies for alcohol and cigarette use were plotted across data collection waves (see Figure 3). Examination of those plots suggests a pattern of more positive outcomes in the 8th and 10th grades, for both interventions. Results of growth curve analyses of the alcohol and tobacco frequency measures showed significant slope differences in the growth of alcohol use frequency in the PDFY-control group analysis, $t(364) = 2.49, p < .05$, and in the ISFP-control group analysis of cigarette use fre-

quency, $t(379) = 2.49, p < .05$. The ISFP-control group analysis of alcohol use frequency approached significance, $t(379) = 1.86, p = .06$.

Composite Indices of Use

Analyses showed significantly lower alcohol composite-use index scores for both the ISFP and PDFY groups at the 10th-grade assessment, relative to the control group. ISFP effects on the tobacco composite use index also were significant. School-level effects were significant in the analyses of the tobacco composite-use index, in both ISFP- and PDFY-control comparisons, suggesting that there were differences in tobacco use between schools, beyond those accounted for by the interventions. Multilevel analyses were used in the present case in anticipation of such school-level effects, avoiding possible resulting biases in intervention effects tests. Significant school effects were not found in the

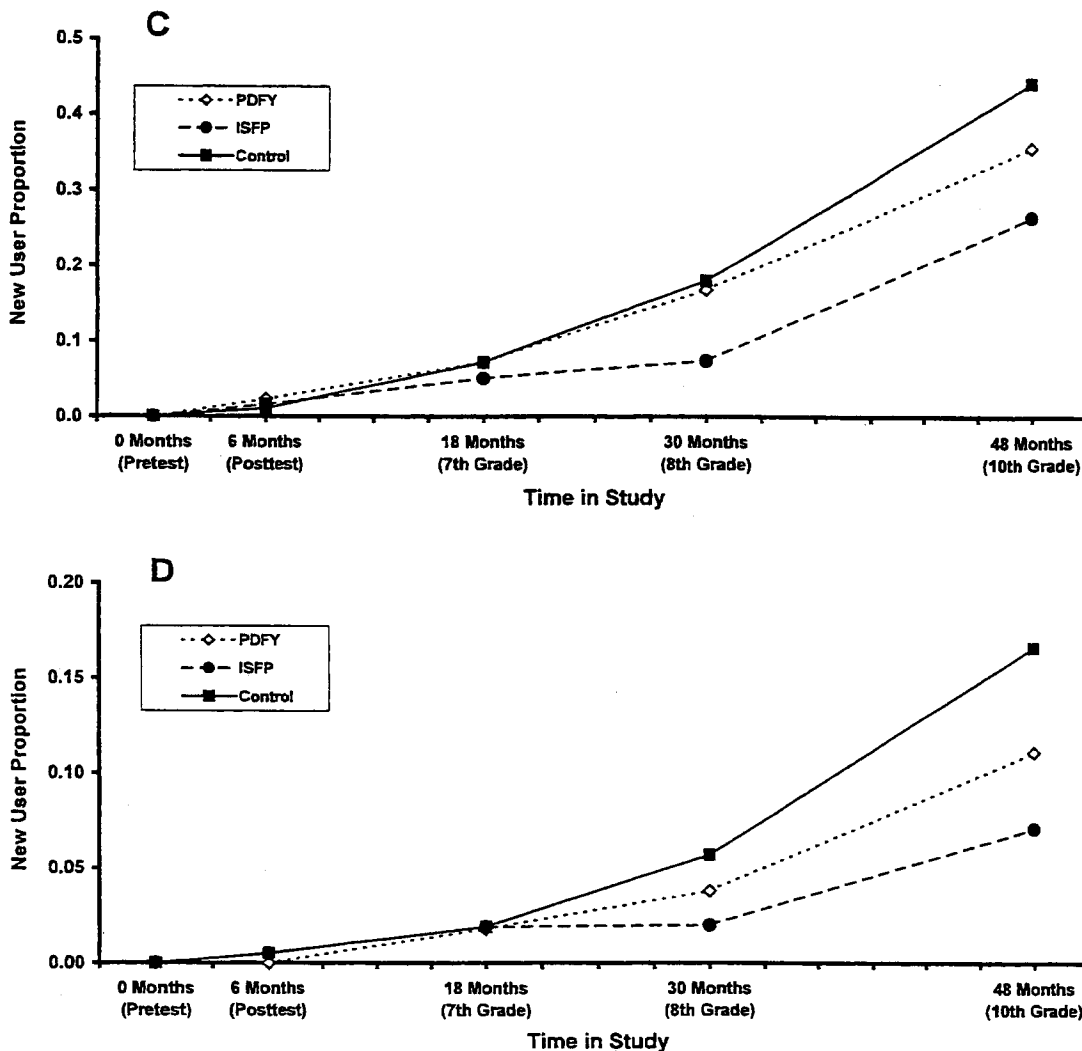


Figure 2. (continued)

analyses of the alcohol composite-use index. Multilevel ANCOVA results and effect sizes for the 10th-grade follow-up assessment are presented in Table 4.

Supplemental Comparisons of ISFP and PDFY Intervention Effects

Mixed-model ANCOVAs of the alcohol and tobacco initiation indices did not show significant ISFP-PDFY differences. Similarly, intervention group differences were nonsignificant for the two frequency-of-use measures examined by means of multilevel ANCOVA (see Table 5), and for z tests of new user proportions of lifetime alcohol use, alcohol use without parental permission, cigarette smoking, and marijuana use.

Supplemental Analyses of Attendance Effects

Additional supplemental analyses were conducted to examine (a) whether there were differences in outcomes for intervention group 10th-grade students whose families actually attended an

intervention, as compared with those who did not attend an intervention and (b) whether results comparing only those actually attending an intervention with the control group were similar to findings from the intent-to-treat analyses that were presented as the primary foci of this report. Multilevel ANCOVAs of continuous measures showed that there were no measures showing significant differences between 10th graders who attended the interventions as 6th graders and those who did not. Z tests of new user proportions (lifetime alcohol use, alcohol use without parental permission, drunkenness, cigarette smoking) also failed to show significant differences. Z tests of lifetime marijuana use were deemed inappropriate because of the small number of users in these subsample analyses.

Multilevel ANCOVA results from comparisons of ISFP intervention attenders with controls produced the same pattern of significant findings as the primary analyses of ISFP-control differences presented earlier. However, in the PDFY analyses, the frequency of alcohol use and composite index-of-alcohol-use were not significant in the multilevel ANCOVAs, likely because of the

Table 3
*Frequency of Alcohol and Tobacco Use at the 10th-Grade Follow-Up:
 Multilevel ANCOVA Results*

Outcome	Intraclass correlation ^a	Adjusted mean ^b				<i>t</i> (20)	Effect size ^c
		Intervention		Control			
		<i>M</i>	<i>SE</i>	<i>M</i>	<i>SE</i>		
ISFP							
Past month frequency of drinking (average drinking occasions; <i>n</i> = 302)	.000	1.00	0.15	1.47	0.15	2.25*	.26
Past month frequency of cigarette use (average number of cigarettes; <i>n</i> = 302)	.002	0.88	0.23	1.78	0.23	2.70*	.31
PDFY							
Past month frequency of drinking (average drinking occasions; <i>n</i> = 293)	.000	0.96	0.15	1.47	0.15	2.39*	.28
Past month frequency of cigarette use (average number of cigarettes; <i>n</i> = 294)	.000	1.45	0.26	1.83	0.25	1.05	.12

Note. ANCOVA = analysis of covariance; ISFP = Iowa Strengthening Families Program; PDFY = Preparing for the Drug Free Years Program.

^a Intraclass correlations associated with school effects; significance levels are from the ANCOVA. ^b Log transformations were applied to substance use measures to correct for nonnormality; values then were adjusted by a constant so that the minimum observed scores were equal to zero. ^c Cohen (1988) suggested that in the case of *t*-test-based effect sizes, a .20 effect size is small, .50 is medium, and .80 is large.

* *p* < .05.

loss of statistical power in the subsample analyses. Finally, *z* tests comparing new user proportions of intervention attenders versus the control group produced the same pattern of significant findings as reported in the primary analysis; new user proportions for the ISFP group were significantly lower for each substance measure, whereas PDFY group proportions were each lower than those of the control group, but not significantly so.

Discussion

This study examined long-term substance use outcomes of two brief interventions designed for general population families of young adolescents. Findings showed evidence of intervention-control differences in delayed initiation, current use, and composite use, at a point when students are in high-risk years for substance-related problem behaviors. Significant effects detectable 4 years past baseline were observed for both interventions, with a greater number of significant effects found for the relatively more intensive ISFP. Where significant, intervention effect sizes were in the small to medium range. More specifically, mean substance use rates among intervention group adolescents were in the range of one quarter to one third of a standard deviation lower than those of the normal population control group.

Although the tested interventions are of short duration, their positive effects are consistent with designs that follow the research-based principles summarized in the introduction. As described earlier, the interventions both have a sound theoretical base and are grounded in the etiological literature on risk and protective factors originating in the family. Also, close attention was paid to strategies for actively engaging participating families. Interactive skills-training methods were used and were implemented with high fidelity. In addition, the interventions were implemented at the developmental point at which the participating students were likely to be experimenting with alcohol and tobacco, but before they

progressed to more frequent or varied use of substances. This developmental timing, when coupled with other considerations, can help to explain the long-term effects observed.

Earlier findings cited in the introduction (e.g., Redmond et al., 1999; Spoth et al., 1998) support hypothesized intervention-mediating mechanisms. That is, they show significant effects on proximal parent and youth skills-training outcomes at earlier waves of data collection (e.g., peer resistance, parent-child affective quality). Further, these proximal outcomes were associated with reduced propensity to use substances (alcohol; Redmond et al., 1998). In combination, the pattern of findings in the earlier and current work suggests the possibility of a positive diffusion effect within intervention communities and schools—one through which positive intervention effects may diffuse in the study's communities and schools by way of intervention parent and youth contact with their nonintervention peers.

Although there is no direct empirical support for a positive diffusion effect, a number of factors support this speculation. To begin, it should be noted that the interventions tested were principally designed to prevent initiation of substance-use behaviors rather than to extinguish behaviors already established. The timing of the interventions with this population (sixth grade) was consistent with that goal; little initiation of substance use had occurred among those in intervention or control groups at the time they were delivered. It also should be noted that roughly one third of all students in the sixth grade and one third of all parents of sixth graders in participating schools and communities received the intervention (only communities having all sixth graders in a single school were included in the study). Given these conditions, it seems likely that improved substance-related skills and an inclination toward delayed initiation among intervention youth (one third of the class) would lead to some reduction in peer pressure to use substances within intervention condition classes, on average.

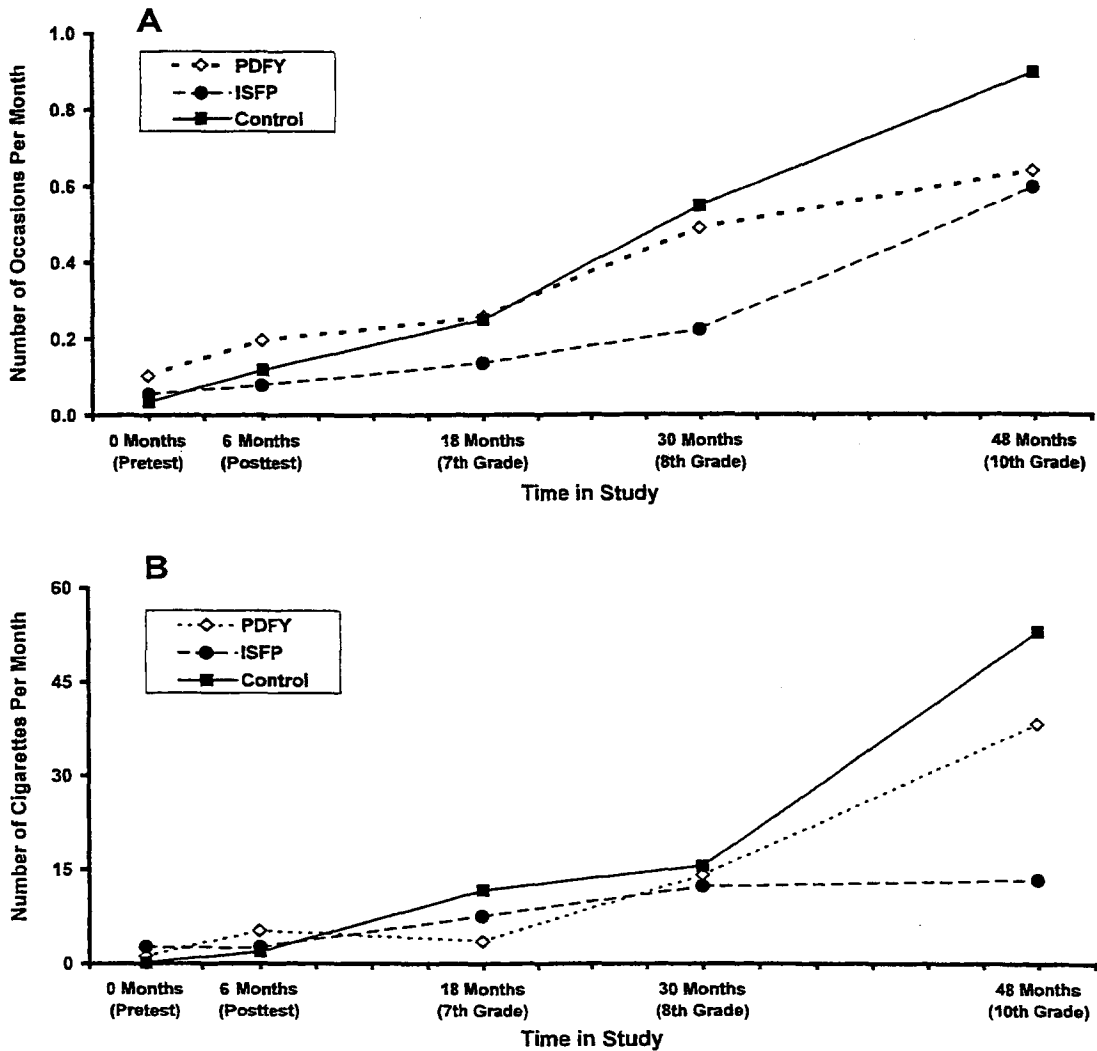


Figure 3. A: Past month frequency of drinking occasions by experimental condition. B: Past month frequency of cigarette use by experimental condition. PDFY = Preparing for the Drug Free Years Program; ISFP = Iowa Strengthening Families Program.

Under these circumstances, differences between the substance use behavior of intervention students and that of their nonintervention peers would be expected to diminish and to be difficult to detect 3.5 years following the intervention. This expectation is consistent with the nonsignificant differences observed between these two groups reported in the supplemental analyses section.

Results suggest that the interventions may have their strongest effects on initiation and current use of alcohol, the "substance of choice" among adolescents in this country. Key alcohol-related outcomes included significantly lower past month alcohol use, lower frequency of alcohol use among adolescents, and lower alcohol index scores in both the PDFY and ISFP conditions at the 10th-grade follow-up assessment, as well as significantly lower proportions of 10th-grade adolescents in the ISFP condition reporting lifetime use of alcohol.

As expected, rates of tobacco and marijuana use were relatively lower than corresponding alcohol use rates. Nonetheless, the ISFP students showed statistically significant positive outcomes at the

10th-grade follow-up in lifetime, past month, and past month frequency of cigarette use. Although supplemental analyses showed that there were no significant differences between PDFY and ISFP, there were more significant differences between the ISFP and control groups than there were in PDFY-control comparisons. Differential findings for the two interventions warrant further comment. Considering the higher number of ISFP sessions (seven) as compared with PDFY sessions (five) and, particularly, the involvement of young adolescents in all of the ISFP sessions, additional peer relations skills content, and interactive parent-child skills training, the greater number of significant ISFP-control group differences is not surprising. Positive results from analyses of ISFP intervention effects on peer and parent relations (Redmond et al., 1998) are consistent with the idea that ISFP influences on child substance use operate through both child and parent skills targeted by the intervention.

The above pattern of ISFP-control comparisons notwithstanding, an examination of substance-use trends across time suggests

Table 4
Alcohol and Tobacco Composite Use at the 10th-Grade Follow-Up: Multilevel ANCOVA Results

Outcome	Intraclass correlation ^a	Adjusted mean				<i>t</i> (20)	Effect size ^b
		Intervention		Control			
		<i>M</i>	<i>SE</i>	<i>M</i>	<i>SE</i>		
ISFP							
Alcohol index (<i>n</i> = 301)	.014	1.51	0.14	2.16	0.14	3.28**	.38
Tobacco index (<i>n</i> = 295)	.024*	0.73	0.11	1.11	0.11	2.53*	.29
PDFY							
Alcohol index (<i>n</i> = 291)	.000	1.78	0.13	2.17	0.13	2.19*	.27
Tobacco index (<i>n</i> = 287)	.030*	0.91	0.11	1.16	0.11	1.59	.19

Note. ANCOVA = analysis of covariance; ISFP = Iowa Strengthening Families Program; PDFY = Preparing for the Drug Free Years Program.

^a Intraclass correlations associated with school effects; significance levels are from the ANCOVA. ^b Cohen (1988) suggested that in the case of *t*-test-based effect sizes, a .20 effect size is small, .50 is medium, and .80 is large.

* *p* < .05. ** *p* < .01.

that in several instances (e.g., past month alcohol use and past month drinking occasions), PDFY-control group differences may still be increasing. Also, PDFY students showed a number of positive trends in lower rates of tobacco and marijuana use, as compared with the control group. For example, although only significant at the .10 level, adolescents in the PDFY group were 37% less likely to have initiated marijuana use over the course of the study than were control group adolescents. In addition, a prior study showed that PDFY students were significantly less likely than controls to progress to a more advanced substance use status (e.g., marijuana use or regular tobacco use or other more serious types of use) from the seventh- to the eighth-grade follow-up (Spoth, Reyes, et al., 1999). In the final analysis, more thorough comparisons of PDFY and ISFP intervention effects are needed to develop a better understanding of their respective outcomes and change processes. Differences in intervention effects on mediating peer influence factors will be examined in future research, as will

differences in intervention effects on transitions to progressed use of substances.

From a public health perspective, the results of this study are noteworthy for several reasons. First, the epidemiological research cited in the introduction clearly demonstrates high prevalence rates of alcohol, tobacco, and marijuana use among young adolescents. Second, epidemiological studies (Grant & Dawson, 1997) provide clear empirical indications of the public health benefits of delayed initiation and progressed substance use among adolescents (e.g., odds of lifetime alcohol dependence decreased by 14% with each additional year of delayed initiation). Third, brief interventions, such as those tested, are readily implemented in a number of settings (e.g., schools and community centers—Kumpfer et al., 1996; Spoth & Molgaard, 1999). A larger number of communities across the country have now successfully implemented both of the tested interventions outside of a research project context; in addition, a model has been developed to guide sustained, high-quality

Table 5
Multilevel ANCOVA Results Comparing PDFY and ISFP for Alcohol and Tobacco Outcomes at the 10th-Grade Follow-Up

Outcome	Intraclass correlation ^a	Adjusted mean				<i>t</i> (20)	Effect size ^b
		PDFY		ISFP			
		<i>M</i>	<i>SE</i>	<i>M</i>	<i>SE</i>		
Alcohol index (<i>n</i> = 292)	.012	1.78	0.14	1.51	0.14	1.37	.16
Tobacco index (<i>n</i> = 290)	.000	0.97	0.09	0.82	0.08	1.29	.15
Past month frequency of drinking (<i>n</i> = 295)	.000	0.96	0.15	1.01	0.14	0.21	.02
Past month frequency of cigarette use (<i>n</i> = 294)	.000	1.47	0.22	0.96	0.21	1.68	.20

Note. ANCOVA = analysis of covariance; PDFY = Preparing for the Drug Free Years Program; ISFP = Iowa Strengthening Families Program.

^a Intraclass correlations associated with school effects; significance levels are from the ANCOVA. ^b Cohen (1988) suggested that in the case of *t*-test-based effect sizes, a .20 effect size is small, .50 is medium, and .80 is large.

implementation through prevention program delivery systems (Spoth & Molgaard, 1999; Spoth, Greenberg, & Bierman, 2000). Research suggesting that parent and family skills-training interventions can be cost effective (Greenwood, Model, & Rydell, 1995; Thompson, Ruma, Schuchmann, & Burke, 1996) and cost beneficial (Spoth, Day, et al., 2000) is consistent with the promotion of sustained community implementation.

Results that are noteworthy from a public health perspective highlight the clinical significance of the findings. The recent calls for clinical intervention researchers to pay increased attention to the degree to which intervention-induced change is of sufficient magnitude to return participants outside of the normal range on an outcome variable to within the normal range (see Kendall, 1999; Kendall, Marrs-Garcia, Nath, & Sheldrick, 1999) is similar to a parallel call for universal preventive intervention researchers to report on measures of the magnitude of change from a public health perspective. This latter type of magnitude of change is suggested by effect sizes, but also is indicated by other measures of the degree to which an intervention has improved intervention participants' status relative to the "normal" population in a representative control group sample. In this article, the reported relative reduction rate is an example of such a measure. To take the case of drunkenness as an example, the relative reduction rate of 40% indicates that the rate of drunkenness onset was 40% greater in the control group than in the ISFP intervention group over the course of the study. This rate suggests that for every 100 normal or general population adolescents initiating drunkenness, only 60 intervention group adolescents will likely initiate that behavior over the same period.

Another indication of the practical significance of the findings is provided by calculations required for the benefit-cost analyses cited earlier. That is, an estimate was calculated for the projected number of avoided cases of adult alcohol-use disorder (dependence or abuse or both) produced by the ISFP and PDFY interventions, associated with delay in alcohol use onset. The ISFP produced a case avoidance rate estimated to be 5.52 per 100 participants and the PDFY produced a rate of 2.17 cases per 100 participants (Spoth, Day, et al., 2000). In this connection, the benefit-cost ratios of preventive interventions associated with avoidance of alcohol-use disorders are noteworthy (Spoth, Day, et al., 2000).

As noted in the introduction, this study addressed a number of methodological deficits evident in earlier prevention studies (weak experimental designs and/or experimental group inequivalence, nonrepresentative samples, interventions that are not grounded in the relevant theoretical or empirical literature, failure to assess implementation fidelity, differential attrition, inadequate statistical power, lack of consideration of assumptions of statistical models, no long-term follow-up). Nonetheless, the reader should remain cognizant of several points concerning the study's limitations and the interpretation of the patterns of findings reported.

In addition to self-report measurement issues previously addressed, there are other methodological issues associated with sample attrition, sample representativeness, demand characteristics, and generalizability of study findings. Examination of threats to internal validity through inequivalent experimental groups and differential attrition indicated that these types of threats should have been minimal. In this vein, the overall attrition rate was

comparable with that in other longitudinal prevention studies, as noted earlier.

The reader also should remain cognizant of the possible role of demand characteristics. Although it is not possible to rule out demand characteristics as a contributing factor in the observed intervention effects, the magnitude and nature of differential demands placed on intervention and control group adolescents needs to be considered in this context. Both interventions were modest in intensity—seven meetings for ISFP and five for PDFY (of which 6th graders attended only one). It seems unlikely that this level of involvement would leave a lasting, differential impression on youth, above and beyond that associated with family data collections that were the same as for those in the control group. A related point is that no differential demands were placed on intervention and control group youth and families beyond completion of the interventions, 3.5 years prior to collection of the 10th-grade data analyzed for the present report.

Finally, data collected from approximately 90% of all families eligible for the study were used to verify that participating families were representative of all families in the sampling frame. In addition, follow-up telephone interviews with families refusing to participate in the intervention study also were conducted. Results of that follow-up survey indicated that time and scheduling issues were the primary reasons for nonparticipation, rather than participant characteristics that might otherwise have limited the generalizability of the findings (Spoth, Redmond, Hockaday, & Shin, 1996). However, virtually all of the families of adolescents in the study region were Caucasian and the vast majority of these families included two parents. Although representative of the rural-area families targeted for the intervention evaluation study, the extent to which study findings would generalize to more culturally diverse rural or urban populations remains to be tested.

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(Appendix follows)

Appendix

Key Features of the PDFY and ISFP Competency-Training Preventive Interventions

Program feature	Preparing for the Drug Free Years (PDFY)	Iowa Strengthening Families Program (ISFP)
Theoretical basis	Social Development Model (Catalano & Hawkins, 1996; Catalano et al., 1996).	Biopsychosocial model and related risk/protective factor models (DeMarsh & Kumpfer, 1986; Kumpfer, Molgaard, & Spoth, 1996).
Objectives	To enhance protective parent-child interactions and to reduce family-based risk factors for early substance use initiation.	To enhance family protective and resiliency processes and to reduce family-based risk factors associated with child behavior problems.
Program length	5 sessions conducted once per week for 5 weeks, with an average session length of 2 hr.	7 sessions conducted once per week for 7 weeks. The first 6 sessions include 1 hr of separate parent and child training and one family hour, the 7th session includes only one family hour.
Child involvement	One session requires child attendance; parents attend all sessions.	Children and parents attend each session.
Program content	Parents are instructed on risk factors for substance abuse, developing clear guidelines on substance-related behaviors, enhancing parent-child bonding, monitoring compliance with their guidelines and providing appropriate consequences, managing anger and family conflict, and enhancing positive child involvement in family tasks. Children are instructed on peer resistance skills.	Parents are taught to clarify expectations (based on developmental norms), use appropriate disciplinary practices, manage strong emotions regarding child, and effectively communicate with their child. Children's session content parallels relevant parent session content but also includes peer resistance and peer relationship skills training. During family sessions, members practice conflict resolution and communication skills and engage in activities designed to increase family cohesiveness and positive involvement of the child in the family.
Videotape use	Videotapes to standardize delivery of content.	Videotapes to standardize delivery of content.
Group size	15 two-person teams conducted 19 groups in 11 schools assigned to PDFY. Groups averaged 10 families.	21 three-person teams conducted 21 groups in 11 schools assigned to ISFP. Groups averaged 8 families.
Attendance rates	94% of attending families were represented by a family member in 3 or more sessions, 93% attended 4 or 5 sessions, 61% attended all 5 sessions.	94% of attending families were represented by a family member in 5 or more sessions, 88% attended 6-7 sessions, and 62% completed all 7 sessions.

Note. Adapted from "Assessing a Public Health Approach to Delay Onset and Progression of Adolescent Substance Use: Latent Transition and Loglinear Analyses of Longitudinal Family Preventive Intervention Outcomes," by R. Spoth, M. L. Reyes, C. Redmond, & C. Shin, 1999, *Journal of Consulting and Clinical Psychology*, 67, p. 622. Copyright 1999 by the American Psychological Association.

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