

Long-term Effects of Universal Preventive Interventions on Methamphetamine Use Among Adolescents

ARCHIVES EXPRESS

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Objective: To examine the long-term effects of universal preventive interventions on methamphetamine use by adolescents in the general population during their late high school years.

Design: Two randomized, controlled prevention trials.

Setting: Public schools in the Midwest from 1993 to 2004.

Participants: Study 1 began with 667 sixth grade students from 33 rural public schools; the follow-up included 457 students. Study 2 began with 679 seventh grade students from 36 rural public schools; the follow-up assessment included 597 students.

Interventions: In study 1, schools were assigned to the Iowa Strengthening Families Program (ISFP), Preparing for the Drug Free Years, or a control condition. In study 2, schools were assigned to a revised ISFP (SFP 10-

14) plus Life Skills Training (SPF 10-14 + LST), LST alone, or a control condition.

Results: Self-reports of lifetime and past-year methamphetamine use were collected at 6½ years past baseline (study 1) and at 4½ and 5½ years past baseline (study 2). In study 1, the ISFP past-year rate was 0.0% compared with 3.2% in the control condition ($P = .04$). In study 2, SFP 10-14 + LST showed significant effects on lifetime and past-year use at the 4½ year follow-up (eg, 0.5% lifetime use in the intervention condition vs 5.2% in the control condition, $P = .006$); both SFP 10-14 + LST and LST alone had significant lifetime use effects at the 5½ year follow-up.

Conclusion: Brief universal interventions have potential for public health impact by reducing methamphetamine use among adolescents.

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METHAMPHETAMINE USE has been characterized as having reached epidemic proportions in the United States by the mid 1990s,^{1,2} posing a substantial threat to public health. The unique characteristics of the methamphetamine problem—including its widespread use, its ready production, and its low cost—suggest a pernicious, long-term public health problem.³

Methamphetamine use among adolescents increased dramatically during the 1990s; although the rates have decreased since that time, the 2004 lifetime prevalence of use for seniors was more than 6%.⁴⁻⁶ The unique and substantial social and health consequences of methamphetamine addiction, including social dysfunction and a wide range of medical problems, underscore the importance of preventing early use.² Adolescents in smaller towns and rural areas are particularly vulnerable, given potentially powerful peer influences in rural environ-

ments and the historical appeal of stimulants to rural youth.² The threat to adolescents in the rural Midwest has been particularly acute since methamphetamines spread to this region in the 1980s with surges in methamphetamine-related problems by the 1990s.^{3,7,8} The 2 randomized studies reported in this article both involve adolescent high school students residing in a rural midwestern state.

Researchers summarizing the case for the likely persistence of the methamphetamine problem have argued strongly in favor of a preventive approach.³ Guided by etiological research, a number of preventive interventions have been designed to modify the 2 primary socializing environments of youth, family and school, or to build youth competencies in the school setting.⁹⁻¹³ Although these preventive interventions have shown effects on reduced adolescent alcohol, tobacco, and marijuana use, no studies could be found that examined effects of any kind of preven-

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tive interventions on methamphetamine use; only randomized, controlled studies of treatment outcomes were found in the published literature.¹⁴

A key feature of the tested preventive interventions is that they were implemented via community-university partnerships. Positive outcomes of universal interventions are strongly associated with high-quality implementation; earlier reports have described the importance of these partnerships in achieving such high-quality implementation and have demonstrated their value in this connection.^{12,15-20}

To summarize, the persistent public health problem of methamphetamine use warrants more emphasis on evidence-based prevention among adolescents in the general population, particularly in rural areas. In consideration of reports of increasing prevalence of adolescent methamphetamine use and the need to examine the role of preventive interventions, items specific to methamphetamine use were added to annual assessments in our ongoing prevention trials (see <http://www.ppsi.iastate.edu>). Results for alcohol-related outcomes, including drunkenness, and cigarette, marijuana, and other illicit drug use were reported earlier,^{12,13} but not the results of the methamphetamine items that were added following the pretest. The objective of the present article is to report findings of 2 randomized, controlled studies of the longitudinal effects on methamphetamine use of partnership-based preventive interventions for adolescents in the general population and their families residing in a rural midwestern state.

METHODS

Both studies reported were randomized, controlled studies of the outcomes of universal preventive interventions designed to reduce substance use and other problem behaviors with a focus on delaying substance use onset. Both were implemented in rural communities. A key difference in the studies is that study 1 tested 2 different family-focused interventions whereas study 2 examined a multicomponent family-focused and school-based intervention along with a school-based intervention alone. Institutional review board approval for human subject procedures in both studies was obtained from Iowa State University, Ames.

STUDY 1

Sample

Families of all sixth-graders enrolled in 33 rural schools in 19 contiguous counties in a midwestern state were recruited for participation in a family-focused preventive intervention evaluation project. School selection was based on school lunch program eligibility (greater than 15%) and community size (population less than 8500) prior to randomization. After blocking on school size and the proportion of lower-income families, the schools were randomly assigned to either a minimal contact control group or 1 of 2 experimental groups, the latter of which entailed either implementation of the 7-session Iowa Strengthening Families Program (ISFP) or the 5-session Preparing for the Drug Free Years (PDFY). Of 1309 families recruited from the 33 schools, 667 (51%) completed pretesting. This level of participation is relatively high for multisession interventions requiring both parent and youth involvement.¹² Among the 667 families completing pretesting were 238 ISFP, 221 PDFY, and 208 control group families. The 12th-grade follow-up (6½ years

past baseline) was completed by 457 families (151 ISFP, 149 PDFY, 157 control) (**Figure 1**).

Among the families who completed the pretest, there was an average of 3.1 children per family. Representative of the study region, 86% of the families were dual-parent. Nearly all participants (98%) were white. Data from a prospective telephone survey conducted in the region supported the representativeness of the study sample.²¹

Procedures

Families willing to participate were interviewed in their homes by a project staff member. During the in-home visit, a household composition interview was conducted, followed by the administration of confidentially and independently completed written questionnaires for the parent(s) and participating young adolescent (60-80 minutes to complete).

Intervention Implementation

Preparing for the Drug Free Years is a family competency training program based on the social development model.^{22,23} Its primary objectives are to enhance protective parent-child interactions and to reduce children's risk for early substance use initiation. Preparing for the Drug Free Years is a 5-session program with an average session length of 2 hours. One session requires the child's attendance; the other 4 sessions are solely for parents. A detailed description of PDFY is provided in earlier reports.^{12,13}

The ISFP is based on empirically supported family risk and protective factor models.²⁴ With these conceptual underpinnings, ISFP targets the enhancement of family protective factors and the reduction of family risk processes.²⁴ The ISFP includes seven 2-hour sessions. Each of the first 6 sessions includes separate, concurrent youth and parent skills-building curricula (1 hour) followed by a conjoint family curriculum (1 hour). The seventh session includes only the 1-hour family interaction session. See earlier reports for a detailed ISFP program description.^{13,24}

STUDY 2

Sample

Study 2 participants included seventh-graders enrolled in 36 rural schools in a different region of the same midwestern state in which study 1 was conducted. Criteria for selection of the schools were eligibility for the free and reduced-cost school lunch program (approximately 20% or more); community size/school district enrollment (fewer than 1200 students); and middle school structure (grades 6-8 taught at only 1 location).

Schools were matched on several factors to form 12 blocks of 3 schools each.²⁵ The 3 schools in each block were then randomly assigned to the 3 experimental groups: the Strengthening Families Program: For Parents and Youth 10-14 combined with the Life Skills Training (LST) program (SFP 10-14 + LST), the LST only, or a minimal-contact control group.

Randomly selected families with seventh-grade students in participating schools were recruited for participation. Of the 1017 eligible families contacted for recruitment for the in-home assessment, 679 (67%) completed pretesting (226 SFP 10-14 + LST group families, 231 LST-only group families, and 222 control group families) (**Figure 2**). Although a total of 691 families completed the pretest assessments, 12 families moved from a school in one condition to a school in another condition and were dropped from the sample. At the 11th grade follow-up (4½ years past baseline), a total of 588 families participated. Those included 190 SFP 10-14 + LST group families, 202 LST-only fami-

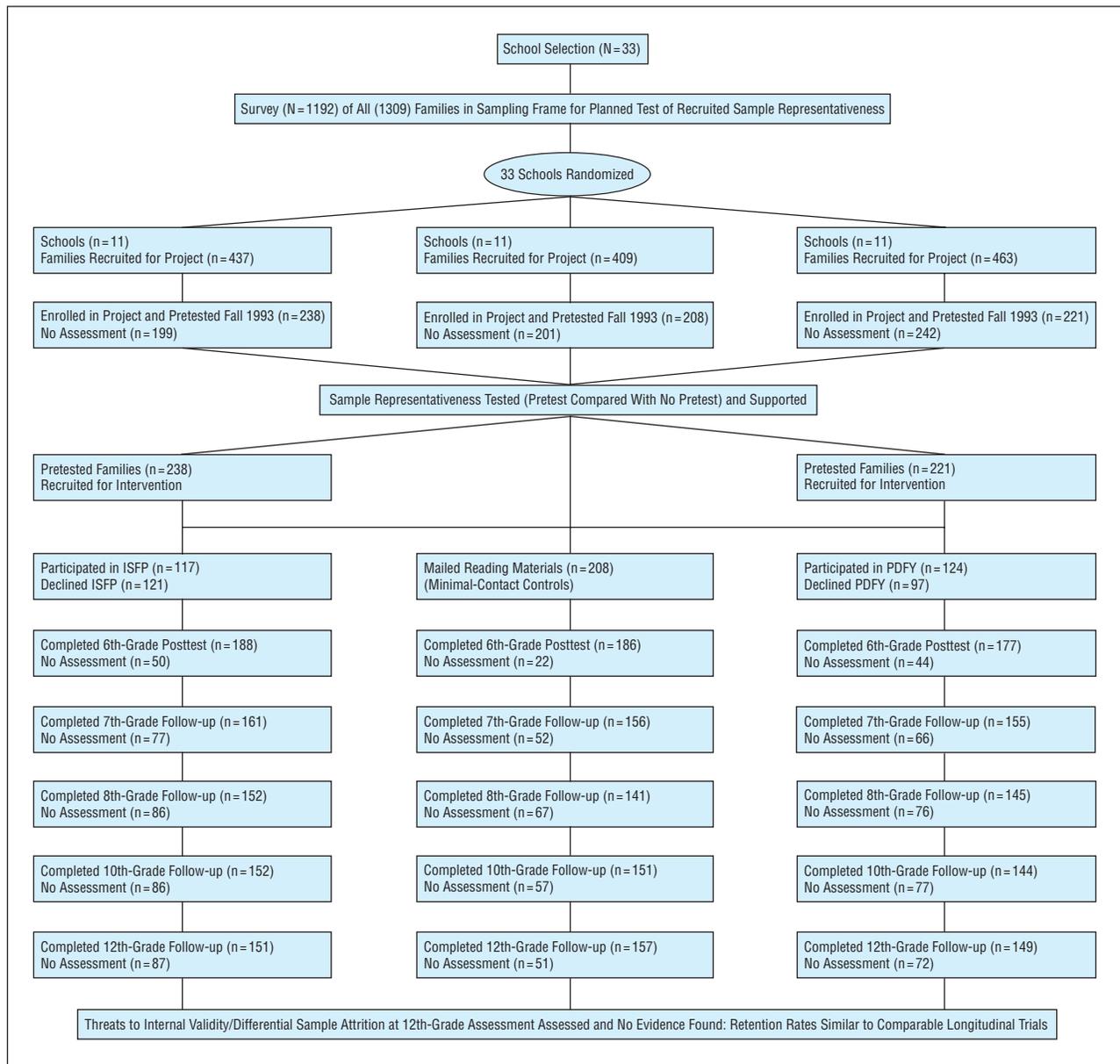


Figure 1. Study 1 participation summary. ISFP indicates Iowa Strengthening Families Program; PDFY, Preparing for the Drug Free Years.

lies, and 196 control group families. At the 12th-grade follow-up (5½ years past baseline), a total of 597 families participated. Those included 191 SFP 10-14 + LST group families, 209 LST-only families, and 197 control group families.

Among families who completed the pretest, there was an average of 3.2 children. The majority of families (87%) were dual-parent families. Of these dual-parent families, 83% included both of the target child's biological parents. Virtually all participants were white (99%).

Procedures

Eligible families were contacted to schedule an in-home recruitment visit from a staff member. Those who accepted the visit and indicated a willingness to participate in the project pretest were scheduled for the in-home assessment visit. Approximately 60 to 80 minutes were required to complete the questionnaires. The same data collection procedures were employed across all data collection points.

Intervention Implementation

The multicomponent intervention in this study entailed the LST program and a revision of the ISFP (previously described for study 1, now called the Strengthening Families Program: For Parents and Youth 10-14) that includes the same essential content as in the original program.²⁴ Theoretical underpinnings of the LST program are described elsewhere.^{26,27} The LST program consists of 15 sessions taught during regular classroom periods and 5 booster sessions taught 1 year later. Each session includes a major goal along with corresponding, measurable student objectives.

STUDY 1 AND STUDY 2 MEASURES AND ANALYSES

Adolescent past-year methamphetamine use was assessed with a single item. In study 1, the question read, "For each sub-

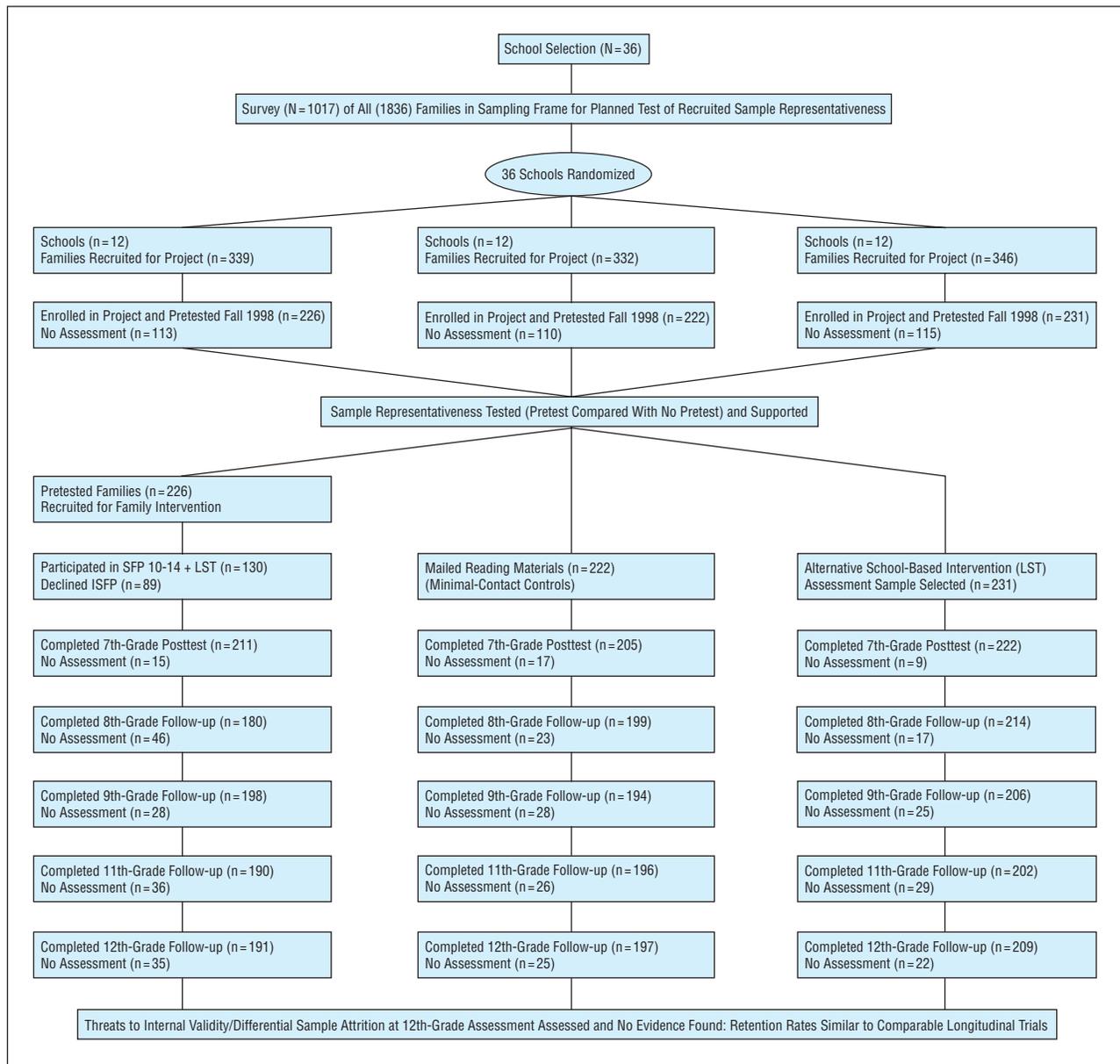


Figure 2. Study 2 participation summary. ISFP indicates Iowa Strengthening Families Program; LST, Life Skills Training; SFP 10-14 + LST, Strengthening Families Program: For Parents and Youth 10-14 plus Life Skills Training.

stance listed below, please write down the number of times you used it during the past 12 months . . . took methamphetamines (meth).” For study 2, the question read: “In the past 12 months, how many times have you used methamphetamines (meth)?” In addition, study 2 included a separate item on lifetime use of methamphetamines (“Have you ever used methamphetamine [meth]?”). These items were then dichotomized and recoded into 0 for respondents who did not use methamphetamines and 1 for those who did. These items were not included in the pretest surveys of either of the 2 studies but were added at later waves in consideration of epidemiological reports of increasing methamphetamine use. Specifically, among the waves of data collected during the middle and high school years for study 1, only data on use in the past year was collected at the 12th-grade assessment. In study 2, both past-year and lifetime use items were included at the seventh-grade spring semester data collection point (posttest) and all subsequent waves of middle and high school data collection. Because methamphetamine use rates at the seventh-, eighth-, and ninth-

grade assessment points in study 2 were all less than 0.5% across conditions, analyses of intervention effects at those waves were precluded. Statistical significance testing was conducted only for those waves in which at least 5 participants reported methamphetamine use in at least 1 of the 3 conditions.

Analyses for the current article used intent-to-treat analyses. Because of the small cell sizes, the Fisher exact test²⁸ was used to assess differences in methamphetamine use between the intervention and control conditions in each study. In addition, given the small numbers of methamphetamine users, a multilevel analysis to address the nested structure of the data was not feasible. An examination of methamphetamine user frequencies by school, however, showed minimal evidence of within-school dependence of user rates and thus little need for multilevel analyses. For example, the 25 respondents reporting lifetime use at the 12th-grade assessment in study 2 were distributed across 18 schools; at the 11th-grade assessment, the 16 lifetime users were distributed across 13 schools.

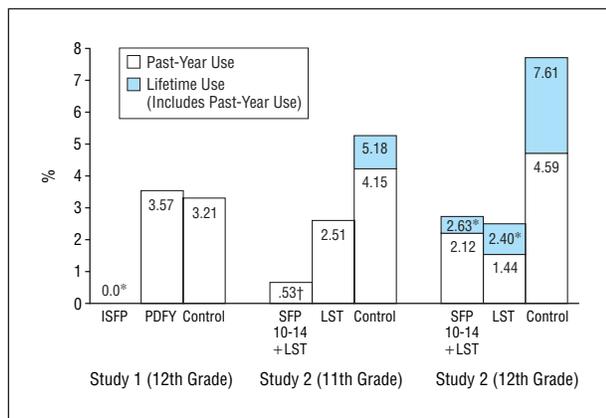


Figure 3. Lifetime and past-year methamphetamine use 4½ to 6½ years past baseline. No lifetime use data were available from study 1; in study 2 at 11th grade, lifetime use is equal to past-year use for both intervention conditions. For study 2, the 12th-grade sample size differs from 11th grade because of sample attrition. ISFP indicates Iowa Strengthening Families Program; LST, Life Skills Training; PDFY, Preparing for the Drug Free Years; SFP 10-14 + LST, Strengthening Families Program: For Parents and Youth 10-14 plus Life Skills Training. *, $P \leq .05$. †, $P \leq .01$.

RESULTS

REPRESENTATIVENESS AND ATTRITION OF SAMPLE

Earlier reports provide detailed descriptions of tests conducted to establish sample representativeness and pretest equivalence, as well as to rule out differential attrition.^{13,21,25,29} To summarize these findings, no significant condition \times attrition interaction effects were found for any sociodemographic or substance use variables between the pretest and 12th-grade follow-ups. There was some evidence of increased attrition among alcohol-using adolescents in study 1¹³; however, the effects were consistent across all conditions. Because there was no methamphetamine-specific measure at pretest for either study, a proxy measure—marijuana use in the past year—was used to examine differential attrition; this particular substance use measure was significantly, strongly correlated with methamphetamine use in the past year. Pretest equivalence was found for this proxy measure and there was no evidence of differential attrition.

CONTROL COMPARISON WITH NATIONAL RATES

The control groups in the current sample reported methamphetamine use rates roughly comparable with those found in national surveys. For example, the Monitoring the Future study reported annual use rates of methamphetamines by 12th-graders of 4.3% in 2000 and 3.4% in 2004 and lifetime use of methamphetamines by 6.2% of 12th-graders in 2004.⁵

EXPERIMENTAL DIFFERENCES IN METHAMPHETAMINE USE

Concerning past-year use in study 1, none of the 148 participants in the ISFP intervention condition with valid

data at the 12th-grade assessment reported using methamphetamines in the past year; among the 156 participants in the control condition, 5 (3.21%) reported use, resulting in a statistically significant difference ($P = .04$). Among the 140 PDFY condition participants, 5 (3.57%) reported using methamphetamines in the past 12 months—a rate similar to that in the control group.

For study 2 at the 11th-grade assessment, of the 187 SFP 10-14 + LST intervention condition participants, 1 (0.53%) reported using methamphetamines in the past year; among the 193 participants in the control condition, 8 (4.15%) reported use, a statistically significant difference ($P = .02$). Of the 199 LST-only condition participants, 5 (2.51%) reported using methamphetamines in the past year, not significantly different from the control condition. At the study 2 12th-grade assessment, 4 (2.12%) of the 189 SFP 10-14 + LST intervention condition participants reported using methamphetamines in the past year; among the 196 participants in the control condition, 9 (4.59%) reported using methamphetamines, a difference that was not statistically significant. Of the 208 LST-only condition participants, 3 (1.44%) reported using methamphetamines in the past year—a difference from the control condition that approached statistical significance ($P = .06$) (**Figure 3**).

Concerning lifetime methamphetamine use in the 11th grade as assessed in study 2, of the 187 SFP 10-14 + LST intervention condition participants, 1 (0.53%) reported use; among the 193 participants in the control condition, 10 (5.18%) reported use, a statistically significant difference ($P = .006$). Of the 199 LST-only condition participants, 5 (2.51%) reported ever using methamphetamines; this was not significantly different from the control group rate. At the 12th grade assessment, 5 (2.63%) of the 190 SFP 10-14 + LST intervention condition participants reported use; among the 197 participants in the control condition, 15 (7.61%) reported it, a significant difference ($P = .02$). Of the 208 LST-only condition participants, 5 (2.40%) reported ever using methamphetamines; this also was significantly different from the control group rate ($P = .01$) (Figure 3).

COMMENT

As the problem of methamphetamine use has persisted, the need to identify effective universal prevention efforts to counter this problem has become clearer. In preparing the current article we were not able to identify any previously documented long-term effects for general population preventive interventions. The current studies extend earlier reports on these universal preventive intervention studies that showed positive longitudinal effects on other drug and alcohol outcomes.^{12,13,25} Given the lack of previous preventive intervention outcome research on methamphetamine use, the results of the current study are welcome, indicating the effectiveness of 3 of 4 universal interventions on lifetime or annual methamphetamine use across 2 randomized studies. It is noteworthy in this context that none of the interventions had content specific to the prevention of methamphetamine use; the observed intervention effects were obtained by ad-

dressing general risk and protective factors for drug use associated with family and school environments.

Differential outcomes from the ISFP and PDFY interventions in study 1 are noteworthy. Earlier findings do indicate positive PDFY results for other types of substance use.¹³ In cases where ISFP has shown stronger effects, the relative differences in effects have been attributed to the higher number of ISFP intervention sessions and the involvement of young adolescents in all of the ISFP sessions, among other factors.¹³ Other differential effects were seen in the SFP 10-14 + LST vs control comparisons in contrast with the LST-alone vs control comparison. It was expected that the combination of the family-focused and school-based universal intervention would produce stronger effects than the school-based intervention alone, as was the case for the study 2 11th-grade assessment. Although the relatively stronger effects for the SFP 10-14 + LST were no longer in evidence at the 12th-grade assessment on either measure, the single point at which the differences are observed and the lack of a statistically significant difference between the 2 intervention conditions render it problematic to draw any conclusions about this pattern of results.

Results from studies 1 and 2 underscore the argument for greater emphasis on preventive interventions, particularly universal ones.³ Epidemiological literature indicates that methamphetamine use has been sustained at the higher levels it attained in the 1990s and that it has been particularly problematic in rural areas, like the settings for the studies reported here. The epidemiology of use in rural midwestern populations suggests it as an important population to target; because no methamphetamine-specific preventive intervention outcome study with rural adolescents was uncovered, the selected samples constitute a strength of the studies reported.

To further address the practical significance of the current findings, it is useful to express those findings in terms of relative reduction of methamphetamine use. Considering lifetime use at the 12th-grade assessment in study 2 for the SFP 10-14 + LST condition as a conservative example, the relative reduction in use was 65%. In practical terms, if such rates held in general population implementation of the intervention in study 2, this relative reduction rate means that for every 100 adolescents in the general population who reported methamphetamine use, there would be only 35 in the intervention population reporting use during that same period. Furthermore, earlier economic analyses of results for study 1, which considered only estimated reductions in costs of alcohol disorders associated with delayed onset of alcohol use among adolescents, estimated a return of \$9.60 for every dollar invested in the intervention in the reference case.³⁰ There is, however, evidence that a substantial percentage of methamphetamine users do not have alcohol disorders.³¹ With additional positive effects on the reduction of other drug use, including methamphetamines, it would be reasonable to expect a comparable or higher rate of return, depending on the degree to which the estimated costs of alcohol disorder-related problems also capture costs of methamphetamine abuse for those who abuse both types of substances. Even with the diminution of effect that occurs when preventive interventions are scaled up to the general population, effects

are sufficiently strong and sufficiently generalizable that the public health potential of such universal interventions warrants further investigation.

The production of positive results from universal family and school preventive intervention requires high-quality implementation of those interventions, the type of implementation that benefits from effective partnerships among families, schools, and communities.^{15,16} As noted earlier, prior reports have demonstrated the key role of partnerships in quality implementation. Moreover, community-based preventive interventions have the advantage of using multifaceted approaches implemented in a manner that are sensitive to local culture and conditions. The community-university partnership-based prevention trials reported here entailed implementation through existing delivery systems, under relatively more "real world" community conditions, in a way that helps overcome barriers to large-scale implementation of evidence-based interventions.^{16-18,32} Thus, they allow for greater confidence in the generalizability of the findings to those conditions; also, partnership process evaluations have provided useful information for scaling up the interventions for greater public health impact.^{12,14,33,34}

Although the study of prevention of methamphetamine use among rural populations is clearly warranted, there may be a limitation in the degree to which findings generalize to nonrural populations, rural populations in other regions of the country, or populations with different ethnic compositions. Another cautionary note concerns the frequency of methamphetamine use in adolescent populations. First, given the relatively small numbers of adolescents per condition who reported methamphetamine use, specific estimates of use rates are sensitive to small changes in numbers of users, although the observed pattern across time and conditions was generally stable. A related caution concerns the nested structure of the data; that is, students were nested within schools. As noted in the data analysis section, a multi-level analysis was not possible because of the limited numbers of methamphetamine users in the sample. However, there also was an indication it was unnecessary, given minimal evidence of within-school dependence of methamphetamine use rates.

Considering additional necessary steps to be taken in the scaling up of universal preventive interventions, a critically important research question concerns whether positive results would occur when sustained implementation of the universal interventions is solely the province of local implementation teams supported by university-based technical assistance. This question will be addressed in a future study.

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