

Results of a Type 2 Translational Research Trial to Prevent Adolescent Drug Use and Delinquency

A Test of Communities That Care

J. David Hawkins, PhD; Sabrina Oesterle, PhD; Eric C. Brown, PhD; Michael W. Arthur, PhD; Robert D. Abbott, PhD; Abigail A. Fagan, PhD; Richard F. Catalano, PhD

Objective: To test whether the Communities That Care (CTC) prevention system reduces adolescent alcohol, tobacco, and other drug use and delinquent behavior communitywide.

Design: The Community Youth Development Study is the first randomized trial of CTC.

Setting: In 2003, 24 small towns in 7 states, matched within state, were randomly assigned to control or CTC conditions.

Participants: A panel of 4407 fifth-grade students was surveyed annually through eighth grade.

Intervention: A coalition of community stakeholders received training and technical assistance to install the CTC prevention system. They used epidemiological data to identify elevated risk factors and depressed protective factors in the community, and chose and implemented tested programs to address their community's specific profile from a menu of effective pro-

grams for families, schools, and youths aged 10 to 14 years.

Main Outcome Measures: Incidence and prevalence of alcohol, tobacco, and other drug use and delinquent behavior by spring of grade 8.

Results: The incidences of alcohol, cigarette and smokeless tobacco initiation, and delinquent behavior were significantly lower in CTC than in control communities for students in grades 5 through 8. In grade 8, the prevalences of alcohol and smokeless tobacco use in the last 30 days, binge drinking in the last 2 weeks, and the number of different delinquent behaviors committed in the last year were significantly lower for students in CTC communities.

Conclusion: Using the CTC system to reduce health-risking behaviors in adolescents can significantly reduce these behaviors communitywide.

Arch Pediatr Adolesc Med. 2009;163(9):789-798

Author Affiliations: Social Development Research Group (Drs Hawkins, Oesterle, Brown, Arthur, and Catalano), and College of Education (Dr Abbott), University of Washington, Seattle; and Department of Criminology and Criminal Justice, University of South Carolina, Columbia (Dr Fagan).

HEALTH-RISKING BEHAVIORS including alcohol use, tobacco use, and delinquent behavior have large costs to society.¹⁻⁴

Their incidence and prevalence increase dramatically during early adolescence, from the ages of 11 through 15 years. The initiation of these behaviors early in adolescence is predictive of greater risk for associated health-related diseases and disorders.⁵⁻⁸ For example, Hingson et al⁹ found that 45% of adults who began drinking by age 14 became dependent on alcohol at some point in their lives vs 9% who began drinking at age 21 or older. Nationally, in 2007, 39% of eighth graders had ever drunk alcohol, 22% had smoked cigarettes, 9% had used smokeless tobacco, and 14% had used marijuana.¹⁰ Delinquency

often precedes drug use initiation in early adolescence^{11,12} and is an important target for prevention. Thirty-eight percent of all deaths in the United States are attributable to alcohol use, smoking, physical

For editorial comment See also page 866

inactivity, and diet.¹ Rather than waiting until alcohol use has turned to abuse or dependence, tobacco use has caused cancer, or delinquency has become chronically offending, leaving a trail of victims, prevention of the use of alcohol, tobacco, and other drugs, and delinquency during early adolescence should be important public health priorities.¹³⁻¹⁵

Advances in prevention science during the last 2 decades have produced a

growing list of tested and effective programs and policies for preventing these behaviors,¹⁶⁻¹⁹ yet widespread dissemination and high-quality implementation of these effective programs and policies in communities has not been achieved.²⁰⁻²³ Woolf²⁴ has urged greater emphasis on the conduct of type-2 translational research to understand how research advances such as these can be translated into widespread practice in communities. He suggests that type-2 translational prevention efforts need to involve multiple sectors in the community and should not be limited to clinical settings, where time to provide preventive services is limited and expensive.²⁵ A community-driven, communitywide effort to reduce health-risking behaviors, coordinated across health, education, and human service sectors, should significantly reduce health-risking behaviors communitywide, although Woolf^{25(p2439)} notes that this hypothesis is "largely untested." With few exceptions,³⁷⁻⁴¹ previous efforts to activate coalitions of community stakeholders to prevent problems such as drug abuse communitywide have not been successful.²⁶

Communities That Care (CTC)^{27,28} is a prevention system created to provide training and materials that mobilize and empower coalitions of diverse community stakeholders to prevent adolescent drug use and delinquency by using the advances of prevention science.²⁹ Communities That Care coalitions use the CTC Youth Survey to assess levels of empirically identified risk and protective factors for these behaviors in the community³⁰⁻³³ and the CTC Prevention Strategies Guide to choose and implement tested preventive interventions to address those risk factors that are high in the community. New programs are put in place in appropriate collaborating organizations in the community after staff are trained to provide the new programs. Implementation of these programs is monitored by the CTC coalition.

Few previous efforts to mobilize communities for the prevention of adolescent health-risking behaviors have been tested and found to have positive effects. Communities That Care differs from these efforts. Unlike the Midwestern Prevention Project³⁴⁻³⁶ and Project Northland,³⁷ CTC does not prescribe that specific programs be implemented in a preset order; rather, it allows the local coalition to choose programs that best address the community's profile of risk and protection from a menu of tested programs. Unlike Project Northland,³⁷ Communities Mobilizing for Change on Alcohol,³⁸ and the Community Trials Intervention to Reduce High-Risk Drinking,^{39,40} CTC does not focus exclusively on the prevention of alcohol use but on reducing risk factors that predict early alcohol initiation and use as well as other health-risking behaviors, including delinquency, in the hope of reducing multiple negative outcomes predicted by common risk factors. Unlike PROSPER (Promoting School-Community-University Partnerships to Enhance Resilience),⁴¹ CTC does not prescribe that the prevention coalition should be headed by a county extension agent and a representative from the school sector but allows stakeholders from a variety of organizations in the community to take leadership in the coalition. The CTC system has been implemented in the United States, the United Kingdom, the Netherlands, Canada, and Australia. It is distributed by the Center for Substance Abuse

Prevention of the federal Substance Abuse and Mental Health Services Administration. All CTC materials are available on the Internet.⁴² Nonrandomized evaluations of CTC indicate that it helps communities to develop more effective prevention service systems⁴³⁻⁴⁶ and can reduce levels of risk exposure and adolescent drug use communitywide.⁴⁷

The Community Youth Development Study (CYDS)⁴⁸ is the first community-randomized trial of CTC. It is designed to determine whether CTC reduces levels of risk, increases levels of protection, and reduces the incidence and prevalence of alcohol, tobacco, and other drug use, and delinquency in children during early adolescence in local communities. The CTC system is expected to produce community-level changes in prevention service system characteristics including greater adoption of science-based prevention, increased collaboration among service providers, and increased use with better implementation of tested and effective prevention programs that address risk and protective factors prioritized by the community. These changes in prevention service systems are expected to produce reductions in the risk factors targeted by the prevention programs chosen by the community. These reductions in risk factors are expected, in turn, to reduce substance use and delinquent behaviors in youth in the community. According to the CTC theory of change, it should take 2 to 5 years to observe community-level changes in targeted risk factors and 5 to 10 years to observe community-level changes in adolescent alcohol use, tobacco use, and delinquency outcomes.⁴⁹

Earlier analyses from the CYDS have found that the CTC system had been successfully implemented with fidelity in intervention communities⁵⁰ and that there are statistically significant between-condition differences that favor the CTC communities in levels of adoption of science-based prevention and in levels of community collaboration.⁵¹ Analyses also have found that tested and effective preventive programs were selected and well implemented in the CTC communities.⁴⁸ Hypothesized effects of CTC on targeted risk factors and on the incidence of delinquent behavior have been observed 3 years after implementation of CTC in communities.⁴⁸ Herein, we report the effects of CTC on the communitywide incidence and prevalence of alcohol, tobacco, and other drug use, and delinquent behavior in eighth-grade students in a panel followed up from grade 5 through grade 8, four years after implementation of CTC in communities and 2 $\frac{2}{3}$ years after CTC communities began implementing prevention programs selected through the CTC process.

METHODS

COMMUNITY SELECTION AND ASSIGNMENT

Communities in the CYDS were selected from 41 communities in Colorado, Illinois, Kansas, Maine, Oregon, Utah, and Washington that participated in an earlier naturalistic study of the diffusion of science-based prevention strategies (the Diffusion Project).⁵² The drug-abuse prevention agencies in these

Table 1. Demographic Characteristics of 24 CYDS Communities

	Control Communities			CTC Communities		
	Mean	Minimum	Maximum	Mean	Minimum	Maximum
Total population ^a	13 996	1921	32 885	15 236	1578	40 787
Race/ethnicity, ^a %						
White	89.5	71.4	98.0	89.3	64.0	98.2
Hispanic	9.2	0.6	42.9	10.1	0.5	64.7
African American, of juvenile population younger than 18 y ^a	2.5	0.0	20.3	2.6	0.0	21.1
Eligible for free or reduced-price school lunch, ^b %	38.2	20.6	63.0	34.9	20.7	65.9

Abbreviations: CTC, Communities That Care; CYDS, Community Youth Development Study.

^aCensus 2000.⁵⁴

^bNational Center for Education Statistics 2002-2003.⁵⁵

states identified 20 of these communities that the agencies thought were trying to implement risk- and protection-focused prevention services. These 20 communities were then matched within state for population size, racial/ethnic diversity, economic indicators, and crime rates with comparison communities that were not thought to be using a risk- and protection-focused approach, and the 20 community pairs were recruited to participate in the Diffusion Project. In 1 instance, 2 comparison communities were identified, resulting in a total of 41 communities. Despite the states' initial assessments of these communities, during the 5 years of the Diffusion Project, neither community in 13 of the 20 pairs of communities advanced in the use of science-based prevention to the point of selecting and using tested and effective preventive interventions to address prioritized community risks.^{43,53} These 13 pairs of communities were deemed eligible for inclusion in the CYDS study. Twelve of these pairs of matched communities were recruited for the CYDS. One community from within each matched pair was assigned randomly by coin toss to either the intervention (CTC) or control condition. Demographic characteristics of the 24 communities are given in **Table 1**. **Figure 1** shows the flow of communities through the type-2 translational research trial.

CTC IMPLEMENTATION

The CTC training and implementation ranged from May through September 2003, depending on community. Intervention communities received 6 CTC training sessions delivered over 6 to 12 months by certified CTC trainers. Community leaders were oriented to the CTC system and identified or created a community coalition of diverse stakeholders to implement CTC. Coalition members were trained to use data from surveys of community students collected in 1998, 2000, and 2002 in the previous study⁵² to prioritize risk factors to be targeted by preventive actions in the community, to choose tested and effective prevention policies and programs that address the community's targeted risk factors, to implement these interventions with fidelity, and to monitor implementation and outcomes of newly installed prevention programs. The CTC communities in CYDS were asked to focus their prevention plans on programs for youths aged 10 to 14 years (grades 5-9) and their families and schools. Community Youth Development Study implementation staff provided technical assistance through weekly telephone calls, e-mails, and site visits to CTC communities at least once a year. By June 2004, coalitions in intervention communities had selected prevention programs to address their prioritized risk factors and had created plans to implement these programs with fidelity. The 12 intervention communities selected 13 different tested and effective prevention programs to

implement during the 2004-2005 school year, 16 programs to implement during the 2005-2006 school year, and 14 programs to implement during the 2006-2007 school year. These included school-based programs (All-Stars, Life Skills Training, Lion's Quest Skills for Adolescence, Project Alert, Olweus Bullying Prevention Program, and Program Development Evaluation Training), community-based youth-focused programs (Participate and Learn Skills, Big Brothers Big Sisters, Stay Smart, and academic tutoring), and family-focused programs (Strengthening Families 10-14, Guiding Good Choices, Parents Who Care, Family Matters, and Parenting Wisely).^{50,56} Each year, community coalitions implemented 1 to 5 of these programs to address their own community profiles. On average, 3 programs were implemented per community annually. The new programs were implemented by local providers including teachers for school programs; health and human service workers for community-based, youth-focused, and family-focused programs; and community volunteers for Big Brothers Big Sisters and tutoring programs.

Programs selected were required to have been found effective in well-controlled trials in preventing alcohol, tobacco, or other drug use or delinquent behavior in youths in grades 5 through 9. Therefore, for this trial, alcohol policy changes (eg, tax increases, social host liability, and keg registration) were not implemented as part of the trial.⁵⁷ However, policies and changes in policies related to alcohol, tobacco, and crime were monitored in both intervention and control communities throughout the study period.

SAMPLE AND DATA COLLECTION

Data on adolescent drug use and delinquent behavior were obtained from annual surveys of a panel of public-school students who were in the fifth grade during the 2003-2004 school year in the 24 CYDS communities. Recruitment for the student panel began in fall 2003 by mailing information packets and making in-person calls to each school district superintendent and each elementary and middle-school principal within the 24 CYDS communities, asking for their commitment to participate in the study and outlining the requirements of involvement in the coming year. As a result, 28 of 29 school districts, comprising 88 schools, agreed to participate. All students in fifth-grade classrooms during the 2003-2004 school year in these schools were eligible to participate in the study. The first wave of data, collected in spring 2004, was a preintervention baseline assessment. Tested prevention programs were implemented in CTC communities beginning in summer and fall 2004. The fourth annual wave of data was collected in spring 2007 when panel students progressing normally were in grade 8, about 2½ years after the prevention

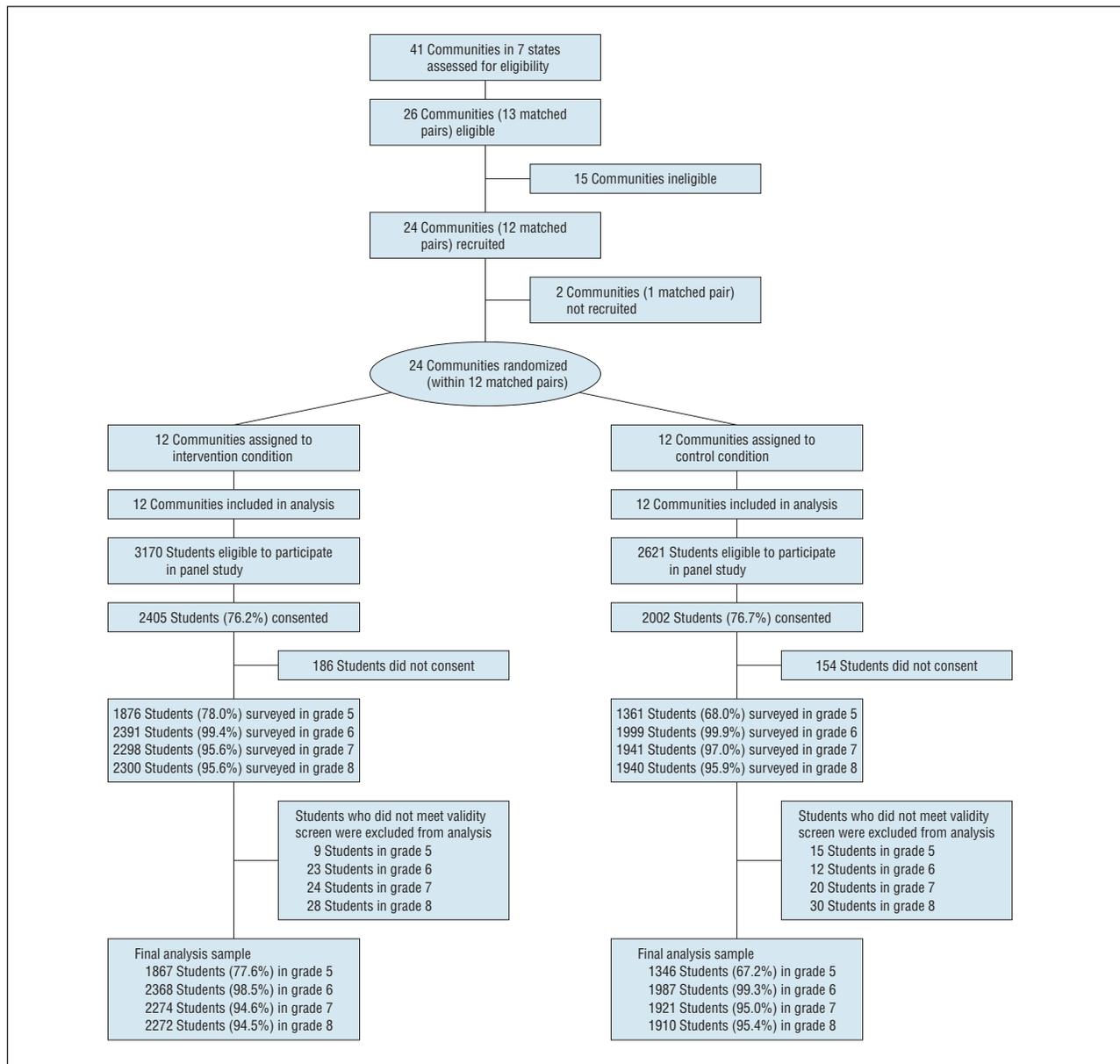


Figure 1. Flow of study communities and participants.

programs chosen by CTC communities were first implemented.

Grade 6 (wave 2) data collection included an effort to recruit students who were not surveyed in grade 5. Eleven percent ($n = 404$) of the students who consented in wave 1 were ineligible for participation in wave 2 because they moved out of the school district before participating in the study for one semester ($n=388$), did not remain in their grade cohort (ie, skipped or were held back a grade; $n=4$), were in foster care and did not have consent from state authorities to participate ($n = 7$), or were unable to complete the survey on their own due to severe learning disabilities ($n=5$). During grades 5 and 6, parents of 4420 students (76.4% of the eligible population) consented to their participation in the study. Thirteen of the 4420 consented students were absent during scheduled dates of data collection and were not available for initial surveying. The final active longitudinal panel consisted of 4407 students (2194 girls, 2213 boys; 55% from intervention communities) in 77 elementary and middle schools in grade 6 (41 schools in

intervention communities and 36 schools in control communities). Final consent rates did not differ significantly by intervention condition. Condition rates were 76.2% for students in intervention communities and 76.7% for students in control communities (Figure 1). Students in the longitudinal panel who remained in intervention or control communities for at least 1 semester have been tracked and surveyed at each of the following waves, even if they left the community. Ninety-six percent of students in the longitudinal panel completed the survey in wave 4 (grade 8).

Students completed the Youth Development Survey,⁵⁸ a self-administered paper and pencil questionnaire designed to be completed in a 50-minute classroom period. To ensure confidentiality, identification numbers but no names or other identifying information were included on the surveys. Parents of panel students provided written informed consent for their child's participation in the study. Students read and signed assent statements indicating that they were informed fully of their rights as research participants and agreed to participate in the study. On

completion of the survey, students received small incentive gifts worth approximately \$5 to \$8. The University of Washington Human Subjects Review Committee approved this protocol.

MEASURES

Drug Use

Items measuring the incidence of drug use consisted of the first student-reported use of alcohol, cigarettes, smokeless tobacco, marijuana, and inhalants between grades 5 and 8 (eg, "Have you ever smoked a cigarette, even just a puff?"). The prevalences (with any use dichotomized as 1 and no use as 0) of binge drinking (consuming ≥ 5 drinks in 1 drinking occasion) during the last 2 weeks and use of alcohol, cigarettes, smokeless tobacco, marijuana, and inhalants in the last month were measured in grades 5 and 8 (eg, "On how many occasions [if any] have you had beer, wine, or hard liquor during the past 30 days?"). Grade 8 measures also included the prevalence of use of prescription drugs and other illicit drugs (ie, psychedelics, methylenedioxymethamphetamine [street name, Ecstasy], stimulants, and cocaine) in the last month.

Delinquent Behavior

The incidence of delinquent behavior was operationalized as the first self-reported occurrence of any of 4 delinquent acts (stealing, property damage, shoplifting, or attacking someone) between grades 5 and 8. More serious delinquent behaviors (carrying a gun to school, beating up someone, stealing a vehicle, selling drugs, or being arrested) were added to the eighth-grade survey as developmentally appropriate. A measure of the variety of delinquent acts committed in the last year ranging from 0 to 9 was constructed from the eighth-grade data. Baseline descriptives for the panel are given in **Table 2**. There were no statistically significant differences in prevalence rates or means for drug use or delinquency between panel participants in intervention communities and those in control communities in grade 5.⁵⁹

Student and Community Characteristics

Variables measuring student characteristics used as covariates in analyses included age at time of the grade 6 survey; sex (coded 0= male, 1= female); race/ethnicity (coded 0= other, 1= white); whether the student was Hispanic (coded 1= yes, 0= no); parental educational achievement (ranging from 1= grade school or less to 6= graduate or professional degree); attendance at religious services during grade 5 (coded 0= never, to 4= about once a week or more); and rebelliousness in grade 5, which consisted of the mean of 3 items ($\alpha = .69$): "I like to see how much I can get away with," "I ignore rules that get in my way," and "I do the opposite of what people tell me, just to get them mad" (coded from 1= very false to 4= very true). Variables measuring community demographic characteristics included the total population of students in the community, percentage increase in the student population of the community between 2001 and 2004, and the percentage of students who were eligible for free or reduced-price school lunch. Intervention condition was coded 0 for CTC communities and 1 for control communities.

ANALYSIS SAMPLE AND MISSING DATA PROCEDURES

Of the 4407 students constituting the consented longitudinal panel, 26.5% were recruited in wave 2 (grade 6 accretion sample)

Table 2. Observed Drug Use Prevalence Rates and Mean Number of Delinquent Behaviors Reported in Grade 5 by Experimental Condition

	Control Communities, 2002 Students	CTC Communities, 2405 Students
Drug use		
Lifetime, %		
Alcohol	23.3	20.1
Cigarettes	9.4	7.4
Smokeless tobacco	2.8	2.0
Inhalants	8.6	8.5
Marijuana	0.8	0.5
Last 30 d, %		
Alcohol	3.3	3.1
Cigarettes	1.0	0.7
Smokeless tobacco	0.7	0.4
Inhalants	3.0	2.5
Marijuana ^a	0.4	0.1
Last 2 wk, %		
Binge drinking	1.3	1.0
Delinquent behavior		
Last year, mean		
No. of delinquent behaviors	0.4	0.3

Abbreviation: CTC, Communities That Care.

^aPrevalence of 30-day marijuana use based on unimputed data (1861 students in CTC communities and 1342 students in control communities). All other figures based on average across 40 imputations. Differences between CTC and control communities were not significant.

and, consequently, did not complete a questionnaire in wave 1 (grade 5). A small percentage of students were unavailable for follow-up interviews (**Table 3**). Overall, 96.7% of panel students participated in at least 3 of 4 waves of data collection. There was no systematic bias from differential accretion or differential attrition in control and intervention conditions (analyses not shown). With regard to both accretion and attrition, the methods for imputing missing data used in this study have been shown in simulations by Collins et al⁶⁰ and extensions by J. W. Graham, PhD (oral and written communications, 2009) to produce estimates of standard errors that differ little from population values. Students were excluded from analysis if they reported being honest only "some of the time" or less on the survey, reported having used a fictitious drug included in the survey as a validity screen, or reported that they had used 2 of 3 drugs (marijuana, inhalants, or other drugs) on 40 occasions or more during the last month (Table 3).

The percentage of students in the analysis sample who did not respond to the delinquency and drug-use questions was small. Item nonresponse ranged from 0.6% (for smokeless tobacco use in grade 5) to 2.7% (for specific delinquency items in grades 7 and 8). Missing data were dealt with via multiple imputation.⁶¹ Using NORM version 2.03,⁶² 40 separate data sets including data from all 4 waves were imputed separately by intervention condition.⁶³ Imputation models included student and community characteristics, drug use and delinquent behavior outcomes, and community membership. Imputed data sets were combined subsequently to include both intervention and control groups for analysis.

DATA ANALYSES

Intervention effects on the incidence and prevalence of delinquency and drug use were assessed using the generalized linear mixed model⁶⁴⁻⁶⁶ with logit or Poisson link functions for

Table 3. Analysis Sample of Students

	No. (%)			
	Wave 1 (Grade 5)	Wave 2 (Grade 6)	Wave 3 (Grade 7)	Wave 4 (Grade 8)
Total Consented Sample	4407 (100)	4407 (100)	4407 (100)	4407 (100)
Not surveyed	1170 (26.5)	17 (0.4)	168 (3.8)	167 (3.8)
Surveyed	3237 (73.5)	4390 (99.6)	4239 (96.2)	4240 (96.2)
Of those surveyed				
Did not meet validity screen because				
Dishonest	13 (0.4)	21 (0.5)	17 (0.4)	18 (0.4)
Use of fictitious drug	8 (0.2)	11 (0.3)	19 (0.4)	18 (0.4)
Extreme drug use	1 (0.0)	1 (0.0)	4 (0.1)	6 (0.1)
Combination	2 (0.1)	2 (0.0)	4 (0.1)	16 (0.4)
Total Excluded	24 (0.7)	35 (0.8)	44 (1.0)	58 (1.4)
Analysis sample	3213 (72.9)	4355 (98.8)	4195 (95.2)	4182 (94.9)

the dichotomously coded (ie, incidence and prevalence of drug use and delinquency) or count-based outcomes (ie, variety of delinquent acts), respectively. Random-intercept models were estimated to account for variation across time within students, among students within communities, and communities within matched pairs of communities.

Analyses were adjusted for the student- and community-level covariates (grand-mean centered) described in "Student and Community Characteristics section." In all analyses, results were averaged across imputed data sets using Rubin's rules.⁶⁷ Approximate degrees of freedom across imputations were calculated using the formulas provided by Raudenbush et al⁶⁸ and by Raudenbush and Bryk.⁶⁹

To account for the fact that communities were matched in pairs before randomization, the intervention effect for the community-level dichotomous indicator of intervention status (0=control community, 1=CTC community) was estimated as the mean difference in adjusted community-level prevalence or incidence rates between intervention and control communities as tested against the average variation among the intervention condition-specific adjusted community-level prevalence or incidence rates, with degrees of freedom equal to the number of community-matched pairs (12) minus the number of community-level covariates and intervention effect (3) minus 1 (ie, $df=8$).⁶⁶

Incidence of Alcohol, Tobacco, and Other Drug Use, and Delinquency in Early Adolescence

The effect of the CTC intervention in preventing the incidence of drug use and delinquency between grades 5 and 8 was examined using multilevel discrete-time survival analysis.^{70,71} The risk of initiating drug use and delinquent behavior was assessed for those students in the sample who had not yet initiated alcohol use (78.5%), cigarette use (91.7%), smokeless tobacco use (97.6%), marijuana use (99.4%), inhalant use (91.4%), or delinquent behavior (78.8%) before the grade 5 survey. The dichotomous outcomes in the multilevel discrete-time survival analysis indicate whether initiation occurred during the preceding annual wave of data collection. In each respective analysis, students initiating use of a specific drug or delinquent behavior in one grade were not eligible for initiation of that behavior in subsequent grades. Students who did not initiate drug use or delinquent behavior during sixth, seventh, or eighth grade were treated as right-censored observations.⁷²

To test whether the effect of the intervention on incidence was proportional across time, we included interaction effects between the intervention condition variable and time indicators. All analyses were estimated with MLwiN version 2.02⁷³

using the second-order penalized quasi-likelihood estimator whenever possible. The second-order penalized quasi-likelihood estimator did not converge for analyses of the onset of smokeless tobacco, marijuana, and inhalant use; the first-order penalized quasi-likelihood estimator was used instead.

Prevalence of Drug Use and Delinquency

The effect of the CTC intervention on reducing the prevalence in grade 8 of binge drinking in the last 2 weeks, drug use in the last month, and delinquency in the last year was assessed using a mixed-model analysis of covariance. In addition to student and community characteristics, respective grade 5 drug use or delinquency measures were included as preintervention covariates to adjust for any potential baseline differences. The mixed-model analysis of covariance was conducted using HLM version 6.⁶⁸ To determine whether CTC had an overall effect on drug use incidence and prevalence by grade 8 and to maintain an effective type I error rate of .05, an omnibus group test statistic⁷⁴ was applied to both the multilevel discrete-time survival analysis and mixed-model analyses of covariance before analyses of effects on specific drugs.

RESULTS

INCIDENCE OF DRUG USE

The omnibus test for overall effects on drug use incidence was statistically significant: $t_7=2.72$; $P=.03$ (2 tailed). Analyses revealed a significant effect of CTC on initiation of the use of alcohol, cigarettes, and smokeless tobacco between seventh and eighth grade. The adjusted odds ratio (AOR) for the effect of CTC on alcohol use incidence was 1.60, indicating that students in control communities were 60% more likely to initiate the use of alcohol between grade 7 and grade 8 than students in CTC communities. The AORs for the effect of CTC on the initiation of cigarette and smokeless tobacco use were 1.79 and 2.34, respectively. **Figure 2** shows the adjusted predicted hazard of initiating alcohol, cigarette, and smokeless tobacco use. Significant intervention effects on the onset of marijuana or inhalant use in the panel were not observed by the spring of eighth grade (odds ratio [95% confidence interval], 0.96 [0.60-1.53] and 1.12 [0.68-1.83], respectively).

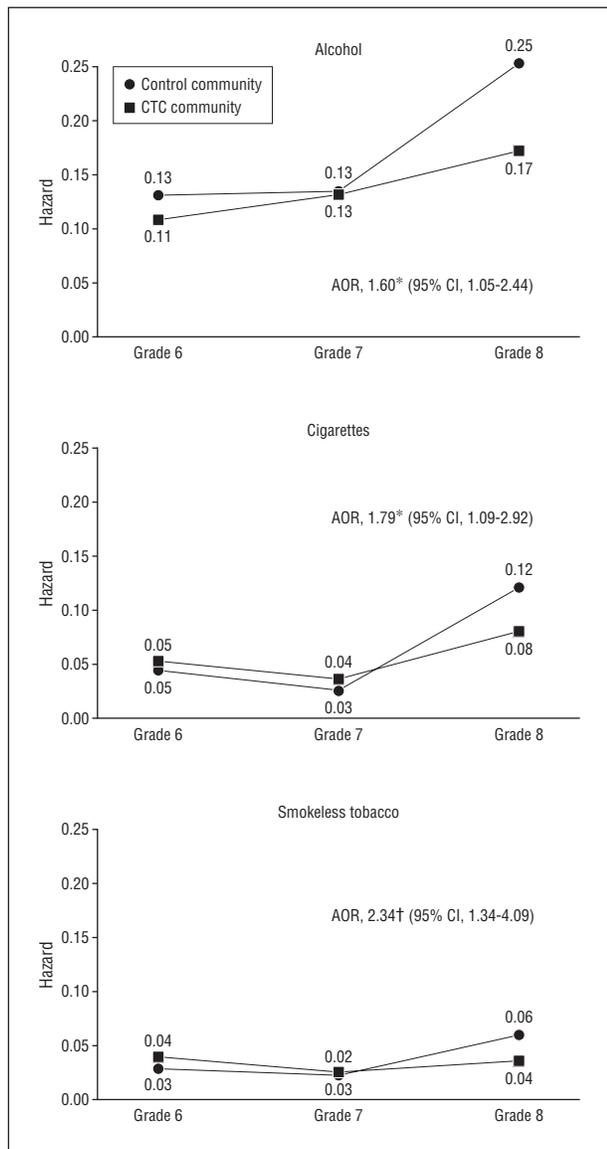


Figure 2. Predicted hazard of initiating the use of alcohol, cigarettes, and smokeless tobacco, adjusted for student age, sex, race/ethnicity, parental educational achievement level, religious attendance, and rebelliousness; student population of the community; percent change in student population, 2001 to 2004; and percentage of students in the community receiving free or reduced-price school lunch. Adjusted odds ratio (AOR) for grade 8 vs grade 7, $P < .05$. †Adjusted odds ratio for grade 8 vs grade 7, $P < .01$. CI indicates confidence interval; CTC, Communities That Care.

INCIDENCE OF DELINQUENT BEHAVIOR

Analyses found a significant intervention effect on the incidence of delinquent behavior between grades 5 and 8. The effect of the intervention on the incidence of delinquency was proportional across time; no significant time \times intervention interactions were found. The AOR for the effect of the CTC intervention on delinquent behavior initiation was 1.41, indicating that students from control communities were 41% more likely to initiate delinquent behavior between grade 5 and grade 8 than were students from CTC communities. **Figure 3** shows that by grade 8, the adjusted predicted hazard of initiating delin-

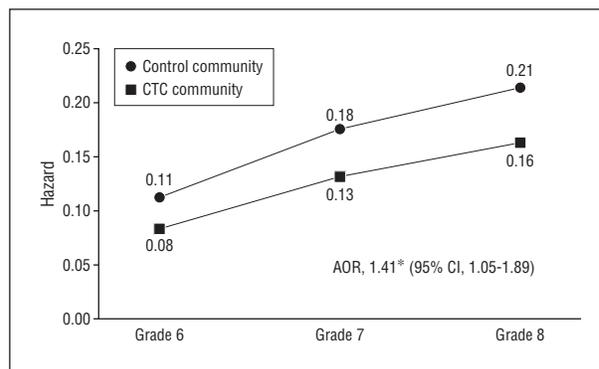


Figure 3. Predicted hazard of initiating delinquent behaviors, adjusted for student age, sex, race/ethnicity, parental educational achievement level, religious attendance, and rebelliousness; student population of the community; percent change in student population, 2001 to 2004; and percentage of students in the community receiving free or reduced-price school lunch. Adjusted odds ratio (AOR) for entire study period, $*P < .05$. CI indicates confidence interval.

linquent behavior was 21% for students in control communities and 16% for students in CTC communities.

PREVALENCE OF DRUG USE IN EIGHTH GRADE

The observed prevalences and AORs of drug use in eighth grade in CTC and control communities are given in **Table 4**. The omnibus test for overall effects on current drug use prevalence was statistically significant ($t_8 = 2.61$; $P = .03$ [2 tailed]). The mixed-model analyses of covariance showed significantly higher prevalences in the eighth grade in control communities compared with CTC communities for alcohol use in the last 30 days ($t_8 = 2.48$; $P = .04$ [2 tailed]; AOR, 1.25), binge drinking in the last 2 weeks ($t_8 = 2.59$; $P = .03$ [2 tailed]; AOR, 1.40), and smokeless tobacco use in the last 30 days ($t_8 = 3.23$; $P = .01$ [2 tailed]; AOR, 1.79). Eighth-grade students in the panel in control and CTC communities did not differ significantly in the prevalence of cigarette, marijuana, inhalant, or prescription or other illicit drug use in the last 30 days ($t_8 = 1.47, 0.86, 0.50, 0.25,$ and 1.38 , respectively).

VARIETY OF DELINQUENT BEHAVIORS IN THE LAST YEAR

Analyses assessing delinquent behaviors found that students in control communities engaged in significantly more delinquent behaviors than did students in CTC communities in the year before the eighth-grade survey ($t_8 = 5.43$; $P = .00$ [2 tailed]; AOR, 1.34) (Table 4).

COMMENT

Woolf²⁵ suggests that the prevention of the early onset of disease is an important strategy for confronting the co-occurring problems in the United States of rapidly increasing health-care spending and the increasing burden of disease as the population ages. He notes that chronic diseases accounting for most health care spend-

Table 4. Observed Prevalence Rates of Current Drug Use and Delinquency in Grade 8 and AORs Comparing Control and CTC Communities

	Control Communities	CTC Communities	AOR (95% CI) ^a
Drug use, %			
Last 30 d			
Alcohol	21.4	16.4	1.25 ^b (1.04-1.52)
Cigarettes	8.0	6.1	1.21 (0.92-1.58)
Smokeless tobacco	4.3	2.2	1.79 ^c (1.23-2.62)
Inhalants	5.0	4.8	1.11 (0.73-1.68)
Marijuana	6.0	4.7	1.15 (0.82-1.60)
Prescription drugs	3.1	3.0	1.05 (0.72-1.52)
Other illicit drugs	3.6	2.2	1.30 (0.88-1.92)
Last 2 wk			
Binge drinking	9.0	5.7	1.40 ^b (1.07-1.84)
Delinquent behavior, mean			
Last year			
No. of delinquent behaviors (0-9)	1.13	0.78	1.34 ^c (1.20-1.49)

Abbreviations: AOR, adjusted odds ratio; CI, confidence interval; CTC, Communities That Care.

^aOdds ratios are adjusted for grade 5 prevalence, student age, sex, race/ethnicity, parental educational achievement level, religious attendance, and rebelliousness; student population of the community; and percentage of students in the community receiving free or reduced-price school lunch. Alcohol use in last 30 days in grade 5 was used to adjust analyses of 8th-grade marijuana, prescription drug, and other illicit drug use.

^b $P < .05$.

^c $P < .01$.

ing are precipitated by modifiable risk factors. Advances in prevention science that identify risk factors for drug use and delinquency, and tested and effective prevention programs and policies have guided the development of the CTC system. The system mobilizes diverse community stakeholders to work together to reduce elevated risk factors in the community. Stakeholder coalitions seek to achieve this goal through high-quality and faithful replication of previously tested effective programs that address these risks. Results of the present study show that within 4 years of adopting the CTC system, community coalitions can reduce the incidence of alcohol, tobacco, and smokeless tobacco use and of delinquent behaviors, and the prevalence of alcohol use, binge drinking, smokeless tobacco use, and delinquent behavior in youth communitywide by the age of 14 years.

This evidence that the early initiation of alcohol use, tobacco use, and delinquency can be prevented by coalition efforts is important. The early initiation of these behaviors has negative consequences. For example, those who initiate drinking before age 15 years are 4 times as likely to develop alcohol dependence compared with those who wait until age 21 years or older; each additional year of delay in drinking reduces the likelihood of dependence by 14%.⁷⁵ Underage drinking also predicts unintentional injuries, motor vehicle crashes, and physical fights after drinking, both during adolescence and in adulthood, and is associated with risky sexual behavior, mental health problems including depression and suicide attempts, and a variety of violent and delinquent behaviors.⁵⁷ Thus, simply delaying the initiation of alcohol use through age 14 years, even among those who will ultimately drink alcohol, may have long-term public health benefits. Contingent on continued funding, this panel will be followed up and interviewed through 1 year after normal high school graduation to determine the long-term effects of preventing the early initiation of alcohol use, tobacco use, and delinquency observed here.

This type-2 translational research study indicates that public health can be promoted and health-risking behaviors in early adolescence can be prevented by coalitions of community stakeholders trained to use the CTC system for translating the advances of prevention science into well-chosen and well-implemented prevention practices in communities. The Center for Substance Abuse Prevention provides CTC materials electronically for downloading free of charge. However, federal resources are currently unavailable to support training and technical assistance in CTC for communities that seek to use it.

Accepted for Publication: February 5, 2009.

Correspondence: J. David Hawkins, PhD, Social Development Research Group, University of Washington, 9725 3rd Ave NE, Ste 401, Seattle, WA 98115 (jdh@u.washington.edu).

Author Contributions: Dr Hawkins had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis. *Study concept and design:* Hawkins, Oesterle, Brown, Arthur, Abbott, and Catalano. *Acquisition of data:* Hawkins and Arthur. *Analysis and interpretation of data:* Hawkins, Oesterle, Brown, Arthur, and Abbott. *Drafting of the manuscript:* Hawkins, Oesterle, and Brown. *Critical revision of the manuscript for important intellectual content:* Hawkins, Oesterle, Brown, Arthur, Abbott, Catalano, and Fagen. *Statistical analysis:* Oesterle, Brown, and Abbott. *Obtained funding:* Hawkins, Arthur, and Catalano. *Administrative, technical, or material support:* Hawkins. *Study supervision:* Hawkins and Arthur.

Financial Disclosure: Dr Catalano is a board member of Channing Bete Company, distributor of *Supporting School Success* and *Guiding Good Choices*. These programs were used in some communities in the study that produced the data set used in this article.

Funding/Support: This study was supported by research grant R01 DA015183-03 from the National Institute on

Drug Abuse (with cofunding from the National Cancer Institute, the National Institute of Child Health and Human Development, the National Institute of Mental Health, and the Center for Substance Abuse Prevention).

Role of the Sponsor: The funding and cofunding organizations had no role in the design and conduct of the study; collection, analysis, or preparation of data; or preparation, review, or approval of the manuscript.

Previous Presentations: This study was presented in part at the 161st Annual Meeting of the American Psychiatric Association, Washington, DC, May 5, 2008; the 16th Annual Meeting of the Society for Prevention Research, San Francisco, California; May 29, 2008; and at a research briefing for National Institutes of Health staff at the National Institute on Drug Abuse, Bethesda, Maryland, July 15, 2008.

Additional Contributions: Steven Raudenbush, PhD (The University of Chicago, Chicago, Illinois), David Murray, PhD (The Ohio State University, Columbus), and John W. Graham, PhD (Pennsylvania State University, University Park) provided paid statistical consultation on this study; however, the authors are responsible for all analyses and results. The authors acknowledge the contributions of the communities participating in the Community Youth Development Study and the collaborating state offices of drug abuse prevention in Colorado, Illinois, Kansas, Maine, Oregon, Utah, and Washington.

REFERENCES

1. Mokdad AH, Marks JS, Stroup DF, Gerberding JL. Actual causes of death in the United States, 2000 [published corrections appeared in *JAMA*. 2005;293(3):293-294 and *JAMA*. 2005;293(3):298]. *JAMA*. 2004;291(10):1238-1245.
2. Woolf SH. The big answer: rediscovering prevention at a time of crisis in health care. *Harvard Health Policy Rev*. 2006;7(2):5-20.
3. Specter A. Making youth violence prevention a national priority. *Am J Prev Med*. 2008;34(3)(3, suppl):S3-S4.
4. US Department of Health and Human Services. *Youth Violence: A Report of the Surgeon General*. Rockville, MD: US Dept of Health and Human Services, Substance Abuse and Mental Health Services Administration, Center for Mental Health Services, National Institutes of Health, National Institute of Mental Health; 2001.
5. Sampson RJ, Laub JH. Life-course desisters? trajectories of crime among delinquent boys followed to age 70. *Criminology*. 2003;41(3):555-592. doi:10.1111/j.1745-9125.2003.tb00997.x.
6. Robins LN, Przybeck TR. Age of onset of drug use as a factor in drug and other disorders. In: Jones CL, Battjes RJ, eds. *Etiology of Drug Abuse: Implications for Prevention*. Rockville, MD: National Institute on Drug Abuse; 1985:178-192. NIDA Research Monograph No. 56.
7. Moffitt TE. Adolescence-limited and life-course-persistent antisocial behavior: a developmental taxonomy. *Psychol Rev*. 1993;100(4):674-701.
8. Farrington DP. Developmental and life-course criminology: key theoretical and empirical issues: the 2002 Sutherland Award Address. *Criminology*. 2003;41(2):221-255. doi:10.1111/j.1745-9125.2003.tb00987.x.
9. Hingson RW, Heeren T, Winter MR. Age at drinking onset and alcohol dependence: age at onset, duration, and severity. *Arch Pediatr Adolesc Med*. 2006;160(7):739-746.
10. Johnston LD, O'Malley PM, Bachman JG, Schulenberg JE. *Monitoring the Future: National Survey Results on Drug Use, 1975-2006*. Bethesda, MD: National Institute on Drug Abuse; 2007. *Secondary School Students*; vol 1. NIH Publication No. 07-6205.
11. Kandel DB, Simcha Fagan O, Davies M. Risk factors for delinquency and illicit drug use from adolescence to young adulthood. *J Drug Issues*. 1986;16(1):67-90.
12. Elliott DS, Huizinga D, Menard S. *Multiple Problem Youth: Delinquency, Substance Use, and Mental Health Problems*. New York, NY: Springer-Verlag; 1989.
13. Woolf SH. Potential health and economic consequences of misplaced priorities. *JAMA*. 2007;297(5):523-526.
14. Centers for Disease Control and Prevention. *Surgeon General's Report: the health consequences of smoking, 2004*. http://www.cdc.gov/tobacco/sgr/sgr_2004/index.htm. Accessed August 11, 2008.
15. Substance Abuse and Mental Health Services Administration, US Department of Health and Human Services. *Report to Congress: a comprehensive plan for preventing and reducing underage drinking*. <http://www.stopalcoholabuse.gov/media/underagedrinking/pdf/underagerpttocongress.pdf>. Accessed September 5, 2007.
16. Aos S, Lieb R, Mayfield J, Miller M, Pennucci A. *Benefits and Costs of Prevention and Early Intervention Programs for Youth*. Olympia: Washington State Institute for Public Policy; 2004.
17. Mihalic S, Fagan A, Irwin K, Ballard D, Elliott D. *Blueprints for Violence Prevention (NCJ 204274)*. Washington, DC: Office of Juvenile and Delinquency Prevention; 2004.
18. Substance Abuse and Mental Health Services Administration. *Science-Based Prevention Programs and Principles: Effective Substance Abuse and Mental Health Programs for Every Community*. <http://download.ncadi.samhsa.gov/preline/pdfs/BKD479.pdf>. Accessed September 5, 2007.
19. Welsh BC, Farrington DP. Evidence-based crime prevention. In: Welsh BC, Farrington DP, eds. *Preventing Crime: What Works for Children, Offenders, Victims, and Places*. Dordrecht, the Netherlands: Springer-Verlag; 2006:1-17.
20. Ennett ST, Ringwalt CL, Thorne J, et al. A comparison of current practice in school-based substance use prevention programs with meta-analysis findings. *Prev Sci*. 2003;4(1):1-14.
21. Gottfredson DC, Gottfredson GD. Quality of school-based prevention programs: results from a national survey. *J Res Crime Delinquency*. 2002;39(1):3-35. doi:10.1177/0022427802039001101.
22. Hallfors D, Godette D. Will the "principles of effectiveness" improve prevention practice? early findings from a diffusion study. *Health Educ Res*. 2002;17(4):461-470.
23. Wandersman A, Florin P. Community interventions and effective prevention. *Am Psychol*. 2003;58(6-7):441-448.
24. Woolf SH. The meaning of translational research and why it matters. *JAMA*. 2008;299(2):211-213.
25. Woolf SH. The power of prevention and what it requires. *JAMA*. 2008;299(20):2437-2439.
26. Hallfors D, Cho H, Livert D, Kadushin C. Fighting back against substance abuse: are community coalitions winning? *Am J Prev Med*. 2002;23(4):237-245.
27. Hawkins JD, Catalano RF. *Investing in Your Community's Youth: an Introduction to the Communities That Care System*. South Deerfield, MA: Channing Bete; 2002.
28. Hawkins JD, Catalano RF, Arthur MW. Promoting science-based prevention in communities. *Addict Behav*. 2002;27(6):951-976.
29. Coie JD, Watt NF, West SG, et al. The science of prevention: a conceptual framework and some directions for a national research program. *Am Psychol*. 1993;48(10):1013-1022.
30. Arthur MW, Hawkins JD, Pollard JA, Catalano RF, Baglioni AJ Jr. Measuring risk and protective factors for substance use, delinquency, and other adolescent problem behaviors: the Communities That Care Youth Survey. *Eval Rev*. 2002;26(6):575-601.
31. Arthur MW, Briney JS, Hawkins JD, Abbott RD, Brooke-Weiss BL, Catalano RF. Measuring risk and protection in communities using the Communities That Care Youth Survey. *Eval Program Plann*. 2007;30(2):197-211.
32. Glaser RR, Van Horn ML, Arthur MW, Hawkins JD, Catalano RF. Measurement properties of the Communities That Care Youth Survey across demographic groups. *J Quant Criminol*. 2005;21(1):73-102. doi:10.1007/s10940-004-1788-1.
33. Fagan AA, Hawkins JD, Catalano RF. Using community epidemiologic data to improve social settings: the Communities That Care prevention system. In: Shinn M, Yoshikawa H, eds. *Toward Positive Youth Development: Transforming Schools and Community Programs*. New York, NY: Oxford University Press; 2008:292-312.
34. Pentz MA, Dwyer JH, MacKinnon DP, et al. A multi-community trial for primary prevention of adolescent drug abuse: effects on drug use prevalence. *JAMA*. 1989;261(22):3259-3266.
35. Pentz MA, Trebow EA, Hansen WB, MacKinnon DP. Effects of program implementation on adolescent drug use behavior: the Midwestern Prevention Project (MPP). *Eval Rev*. 1990;14(3):264-289. doi:10.1177/0193841X9001400303.
36. Chou CP, Montgomery S, Pentz MA, et al. Effects of a community-based prevention program in decreasing drug use in high-risk adolescents. *Am J Public Health*. 1998;88(6):944-948.
37. Perry CL, Williams CL, Komro KA, et al. Project Northland: long-term outcomes of community action to reduce adolescent alcohol use. *Health Educ Res*. 2002;17(1):117-132.
38. Wagenaar AC, Gehan JP, Jones-Webb R, et al. Communities mobilizing for change on alcohol: lessons and results from a 15-community randomized trial [published online ahead of print April 15, 1999]. *J Community Psychol*. 1999;27(3):315-326. doi:10.1002/(SICI)1520-6629(199905)27:3<315::AID-JCOP6>3.3.CO;2-T.
39. Grube JW. Preventing sales of alcohol to minors: results from a community trial. *Addiction*. 1997;92(suppl 2):S251-S260.

40. Holder HD, Gruenewald PJ, Ponicki WR, et al. Effect of community-based interventions on high-risk drinking and alcohol-related injuries. *JAMA*. 2000;284(18):2341-2347.
41. Spoth R, Redmond C, Shin C, Greenberg M, Clair S, Feinberg M. Substance-use outcomes at 18 months past baseline: the PROSPER Community-University Partnership Trial. *Am J Prev Med*. 2007;32(5):395-402.
42. Substance Abuse and Mental Health Services Administration. *Communities That Care Planning System*. <http://ncadi.samhsa.gov/features/ctc/resources.aspx>. Accessed October 31, 2007.
43. Arthur MW, Ayers CD, Graham KA, Hawkins JD. Mobilizing communities to reduce risks for drug abuse: a comparison of two strategies. In: Bukoski WJ, Sloboda Z, eds. *Handbook of Drug Abuse Prevention: Theory, Science and Practice*. New York, NY: Kluwer Academic/Plenum Publishers; 2003:129-144.
44. Jenson JM, Hartman JC, Smith JR, Draayer D, Schurtz R. *Evaluation of Iowa's Juvenile Crime Prevention Community Grant Fund Program*. Iowa City: University of Iowa, School of Social Work; 1997.
45. Greenberg MT, Feinberg M, Gomez BJ, Osgood DW. Testing a community prevention focused model of coalition functioning and sustainability: a comprehensive study of Communities That Care in Pennsylvania. In: Stockwell T, Gruenewald P, Toumbourou JW, Loxley W, eds. *Preventing Harmful Substance Use: the Evidence Base for Policy and Practice*. New York, NY: John Wiley & Sons Ltd; 2005:129-142.
46. Harachi TW, Ayers CD, Hawkins JD, Catalano RF, Cushing J. Empowering communities to prevent adolescent substance abuse: process evaluation results from a risk- and protection-focused community mobilization effort. *J Primary Prev*. 1996;16(3):233-254. doi:10.1007/BF02407424.
47. Feinberg ME, Greenberg MT, Osgood DW, Sartorius J, Bontempo D. Effects of the Communities That Care model in Pennsylvania on youth risk and problem behaviors. *Prev Sci*. 2007;8(4):261-270.
48. Fagan AA, Hanson K, Hawkins JD, Arthur MW. Bridging science to practice: achieving prevention program implementation fidelity in the Community Youth Development Study. *Am J Community Psychol*. 2008;41(3-4):235-249.
49. Hawkins JD, Catalano RF. Communities That Care community board orientation: participant's guide. <http://ncadi.samhsa.gov/features/ctc/resources.aspx>. Accessed August 11, 2008.
50. Quinby RK, Fagan AA, Hanson K, Brooke-Weiss B, Arthur MW, Hawkins JD. Installing the Communities That Care prevention system: implementation progress and fidelity in a randomized controlled trial [published correction appears in *J Commun Psychol*. 2008;36(6):833]. *J Commun Psychol*. 2008;36(3):313-332. doi:10.1002/jcop.20194.
51. Brown EC, Hawkins JD, Arthur MW, Briney JS, Abbott RD. Effects of Communities That Care on prevention services systems: findings from the Community Youth Development Study at 1.5 years. *Prev Sci*. 2007;8(3):180-191.
52. Arthur MW, Glaser RR, Hawkins JD. Steps towards community-level resilience: community adoption of science-based prevention programming. In: Peters RD, Leadbeater B, McMahon RJ, eds. *Resilience in Children, Families, and Communities: Linking Context to Practice and Policy*. New York, NY: Kluwer Academic/Plenum Publishers; 2005:177-194.
53. Hawkins JD, Catalano RF, Arthur MW, et al. Testing Communities That Care: the rationale, design and behavioral baseline equivalence of the Community Youth Development Study. *Prev Sci*. 2008;9(3):178-190.
54. US Bureau of the Census: 2000 Summary File 1; 2001. http://factfinder.census.gov/servlet/QTGeoSearchByListServlet?ds_name=DEC_2000_SF1_U&lang=en&_ts+258305601727. Accessed December 15, 2008.
55. National Center for Education Statistics Common Core of Data (CCD) "Public Elementary/Secondary School Universe Survey" 2002-03 v.1a, 2003-04 v.1a, 2004-05 v.1b, 2005-06 v.1a; 2002-2003. <http://nces.ed.gov/ccd/>. Accessed December 15, 2008.
56. Fagan AA, Hanson K, Hawkins JD, Arthur MW. Implementing effective community-based prevention programs in the Community Youth Development Study. *Youth Violence Juvenile Justice*. 2008;6(3):256-278.
57. Spoth R, Greenberg M, Turrissi R. Preventive interventions addressing underage drinking: state of the evidence and steps toward public health impact. *Pediatrics*. 2008;121(suppl 4):S311-S336.
58. Social Development Research Group. *Community Youth Development Study, Youth Development Survey [Grades 5-7]*. Seattle: Social Development Research Group, School of Social Work, University of Washington; 2005-2007.
59. Brown EC, Graham JW, Hawkins JD, et al. Design and analysis of the Community Youth Development Study longitudinal cohort sample. *Eval Rev*. In press.
60. Collins LM, Schafer JL, Kam CM. A comparison of inclusive and restrictive strategies in modern missing data procedures. *Psychol Methods*. 2001;6(4):330-351.
61. Schafer JL, Graham JW. Missing data: our view of the state of the art. *Psychol Methods*. 2002;7(2):147-177.
62. Schafer JL. *NORM for Windows 95/98/NT Version 2.03*. University Park: Center for the Study & Prevention Through Innovative Methodology at Pennsylvania State University; 2000.
63. Graham JW, Taylor BJ, Olchowski AE, Cumsille PE. Planned missing data designs in psychological research. *Psychol Methods*. 2006;11(4):323-343.
64. Liang K-Y, Zeger SL. Longitudinal data analysis using generalized linear models. *Biometrika*. 1986;73(1):13-22. doi:10.1093/biomet/73.1.13.
65. Breslow N, Clayton DG. Approximate inference in generalized linear mixed models. *J Am Stat Assoc*. 1993;88(421):9-25. doi:10.2307/2290687.
66. Murray DM. *Design and Analysis of Group-Randomized Trials*. New York, NY: Oxford University Press; 1998.
67. Rubin DB. *Multiple Imputation for Nonresponse in Surveys*. New York, NY: John Wiley & Sons Inc; 1987.
68. Raudenbush SW, Bryk AS, Cheong YF, Congdon RT Jr. *HLM 6: Hierarchical Linear and Nonlinear Modeling*. Lincolnwood, IL: Scientific Software International; 2004.
69. Raudenbush SW, Bryk AS. *Hierarchical linear models: applications and data analysis methods*. 2nd ed. Thousand Oaks, CA: Sage Publications; 2002.
70. Barber JS, Murphy S, Axinn WG, Maples J. Discrete-time multilevel hazard analysis. *Social Methodol*. 2000;30(1):201-235.
71. Reardon SF, Brennan RT, Buka SL. Estimating multi-level discrete-time hazard models using cross-sectional data: neighborhood effects on the onset of adolescent cigarette use. *Multivariate Behav Res*. 2002;37(3):297-330. doi:10.1207/S15327906MBR3703_1.
72. Singer JD, Willett JB. *Applied Longitudinal Data Analysis: Modeling Change and Event Occurrence*. New York, NY: Oxford University Press; 2003.
73. Rasbash J, Browne W, Healy M, Cameron B, Charlton C. *MLwiN Version 2.02*. Bristol, England: Multilevel Models Project, Institute of Education, University of Bristol; 2004.
74. Pocock SJ, Geller NL, Tsiatis AA. The analysis of multiple end-points in clinical trials. *Biometrics*. 1987;43(3):487-498.
75. Grant BF, Dawson DA. Age at onset of alcohol use and its association with DSM-IV alcohol abuse and dependence: results from the National Longitudinal Alcohol Epidemiologic Survey. *J Subst Abuse*. 1997;9:103-110.

Call for Papers

Archives will publish a special theme issue in March 2010 on Children and Cancer. We invite submission of papers that are especially focused on the physical, psychological, and emotional outcomes of children with cancer and the impact of cancer on their families. Papers submitted by September 1, 2009, will have the best opportunity to be considered for this theme issue.

Copyright of Archives of Pediatrics & Adolescent Medicine is the property of American Medical Association and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.