

# A National Evaluation of Community-Based Youth Cessation Programs: End of Program and Twelve-Month Outcomes

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**Abstract** Most youth cessation treatment research consists of efficacy studies in which treatments are evaluated under optimal conditions of delivery. Less is known about the effectiveness of youth cessation treatments delivered in real-world, community based settings. A national sample of 41 community-based youth cessation programs participated in a longitudinal evaluation to identify site, program, and participant characteristics associated with successful cessation. Validated quit rates were comparable to those in randomized controlled trials; 7-day abstinence at the end of program averaged 14% and 30-day abstinence at 12 months averaged 12%. Multivariate GEE models explored predictors of smoking cessation at the end of the programs and at 12 months. Results showed correlates of both short- and long-term cessation. Findings point to the importance of both individual and community-level variables, including motivation, opportunities for and encouragement to engage in activities outside of academics, having youth participate in treatment before they become highly dependent smokers, and community norms and ordinances that discourage youth

purchase, use and possession of tobacco. Providing evidence-based treatment to youth in community-based settings results in successful cessation.

**Keywords** Community health promotion programs · Program evaluation · Youth smoking cessation

## Introduction

Among the more than 47 million smokers in the United States, more than 3 million are youth aged 18 and younger (Centers for Disease Control and Prevention 2010). Nearly one-fifth of high school seniors in the United States were current smokers in 2010, with more than half of them reporting daily smoking (Johnston et al. 2011). With the majority of children smoking their first cigarette by age 13, many older teens have well-established addictions to tobacco (Johnston et al. 2008). Continued efforts to promote and support smoking cessation among these new generations of smokers are critical.

Surveys of youth tobacco users indicate that the majority of youth smokers want to quit smoking and make serious attempts to do so (Marshall et al. 2006). Among respondents to the 2009 Youth Risk Behavior Survey, 51% of youth who smoked cigarettes in the 12 months prior to the survey reported trying to quit smoking (Centers for Disease Control and Prevention 2011). Among respondents to the 2007 Youth Risk Behavior Survey, 61% of youth who smoked daily reported making a serious quit attempt in the prior year and 12% of those who attempted cessation were abstinent for at least the 30 days prior to the survey (Centers for Disease Control and Prevention 2009). This translates to an approximate 7% quit rate overall. Most youth attempted to quit without using treatment. Among

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Authorship on the title page is alphabetized after the 4th author.

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respondents to the 2009 National Youth Tobacco Survey (NYTS) (National Youth Tobacco Survey Dataset 2009) who reported making one or more serious quit attempts, only 7.5% said that they participated in a behavioral program; 14.6% used pharmacotherapy; 2.4% called a quit line; and 3.1% visited an internet quit site. Youth most often reported using nicotine gum (8.4%), nicotine patch (4.4%), or a program in school (4.3%) to help them stop smoking.

The evidence base for youth cessation program efficacy is modest. There are fewer than 50 experimental studies of youth cessation programs and even fewer randomized controlled trials, compared to more than 8,700 studies of adult smoking cessation treatments (Fiore et al. 2008). The available evidence indicates that youth tobacco cessation treatment significantly increases the likelihood of cessation compared to no-treatment (Grimshaw and Stanton 2006; Sussman et al. 2006). Treatment components that focus on increasing motivation for cessation and on cognitive-behavioral strategies such as problem solving and coping skills improve outcomes with youth smokers (Curry et al. 2009).

The vast majority of youth cessation treatment research comprises efficacy studies in which youth cessation interventions were evaluated under optimal conditions of delivery. Less is known about the effectiveness of youth cessation treatments delivered in real-world settings. This paper reports the outcomes from a national evaluation of community-based youth cessation programs, conducted as part of a Robert Wood Johnson Foundation initiative, helping young smokers quit (HYSQ). Previous work under the auspices of HYSQ included a national survey to assess the prevalence and characteristics of community-based youth cessation programs (Curry et al. 2007; Emery et al. 2010; Houser-Marko et al. 2010; Sterling et al. 2009). In this paper we describe participant, program, and community site characteristics as well as smoking cessation outcomes at the end of treatment and at the 12-month follow-up. Multivariate analyses are used to identify individual, program, and site-level characteristics that are associated with outcomes.

## Methods

### Design

A detailed description of the overall design and implementation of this study has been published previously (Curry et al. 2010). The evaluation comprised a longitudinal observational study of community-based smoking cessation programs. The study did not aim to estimate general treatment outcomes across a representative sample of programs, but focused on identifying aspects of community-based youth cessation programs that are associated

with successful cessation. Our design was guided by a heuristic framework delineating a multi-level approach that encompassed the site context of the program, program characteristics, and participant characteristics.

### Program Recruitment

Based on available funds for the evaluation and staffing logistics, we targeted recruitment of 40 programs, each serving a minimum of 15 youth per year. National recruitment focused on both programs that had been identified in our previous national survey of youth cessation programs (in-reach strategy; Curry et al. 2007) and dissemination of information via national organizations and interest groups, departments of education, and the Centers for Disease Control and Prevention contacts with tobacco control officers from all 50 states and the District of Columbia (out-reach strategy). Programs interested in potentially being involved in the evaluation completed a web-based application process designed for this project.

Using the information from our national survey of programs (Curry et al. 2007) we developed eligibility criteria designed to ensure the inclusion of state-of-the-art, replicable, and viable community-based youth cessation programs. To be eligible for consideration, programs were required to meet the following 8 criteria:

- Provided direct smoking cessation services, primarily through an in-person group setting;
- Primarily served high school age youth (75% of participants are aged 14–18 years)
- Have offered the program at least once before and planned to offer it during the study period;
- Used a written program manual and used trained treatment providers;
- Included at least four of six cognitive-behavioral components (self-monitoring, disrupting smoking patterns, contingency control, coping skills training, general health and lifestyle balance, social support);
- Was not currently participating in a research effort (other than for self-evaluation);
- Served a minimum of 15 eligible participants per year;
- Had a minimum number of four treatment sessions and minimum session length of 30 min.

In addition, applicant programs needed to provide a letter of support from a senior leader of the sponsoring organization, agree to insert an extra session for baseline data collection prior to beginning the program, and designate a specific person in their organization who would serve as the primary liaison with the Helping Young Smokers Quit field team. Programs and liaisons received modest financial incentives for participation paid in increments over the 12-month evaluation period. Programs

could receive a total of \$2200.00 (\$1000.00 following baseline data collection; \$600 at the completion of the 6-month and again following 12-month follow-up completion). Program liaisons received a total of \$300.00, paid in \$100.00 increments at the same times as the program incentives. Recruitment proceeded from initial review of written applications to telephone interviews, with finalists participating in an on-site visit for enrollment in the evaluation.

#### Data Collection

Data collection occurred at multiple levels including abstraction of state and local tobacco control ordinances, key informant surveys with community leaders, and organizational leader interviews to assess program site context; program leader surveys to measure program components; and repeated in-person surveys of youth cessation program participants at pretreatment baseline, end of program, 6 and a 12-month follow-ups (Curry et al. 2010). The timeframe for data collection spanned October 2004–October 2006. All of the survey data collection activities received review and approval by the University of Illinois at Chicago and Westat Institutional Review Boards. Both IRB's granted a waiver of active, written parental consent for the participant surveys. Youth under age 18 provided active assent to the survey and youth age 18 and over provided active consent. A complete description of the survey constructs for all data collection can be found in Curry et al. 2010. Copies of all surveys can be obtained as electronic supplementary material from the journal.

#### Program Characteristics

Program characteristics were determined by interviews with program leaders and leaders of the organization that offered the youth cessation program. Program leaders completed attendance records and responded to a telephone survey after the completion of each group they led. Organizational leaders completed a one-time telephone survey approximately 6 months after the start of the study. A total of 77 of the possible 79 program leaders completed surveys (97.5% response). There were 65 individuals eligible to be interviewed as organizational leaders (some programs involved more than one sponsoring organization (e.g., a school and a voluntary organization) and 64 individuals completed surveys (98% response).

#### Participant Characteristics

Program participants completed surveys at baseline (prior to the start of the program), end of program, 6 and 12 months post-program. Self-reported abstinence was

biochemically confirmed at each follow-up with carbon monoxide testing. A total of 878 youths assented to participate in the evaluation and completed baseline surveys. Respondents to the end of program survey were 801 (91% response rate); 672 participants completed the 6 month survey (77% response rate); 601 participants completed the 12 month survey (68% response rate). Overall 550 youth completed all four surveys (63% response rate). Twenty-one program participants indicated on their baseline survey that they had never smoked a cigarette not even a puff and so were participating as supportive friends of smokers; these 21 were not included in analyses.

#### Site Characteristics

Site characteristics were obtained from interviews with sponsoring organization leaders, community leaders, and tobacco control ordinances. Organizational leaders combined with other sources identified a total of 120 community leaders to interview. This included 33 education leaders, 31 health leaders, and 56 individuals in juvenile justice. Of the 120 eligible leaders, 94 completed surveys (78% response rate). In addition to these interviews, we collected information about 19 types of smoking-related ordinances at the state ( $n = 18$ ) and local ( $n = 55$  cities and counties) levels. A total of 91 state ordinances, 31 city and 33 county-level ordinances were identified.

#### Analytic Models

Data analysis focused on how site, program, and participant level variables were related to three primary outcomes of interest: 7-day abstinence at the end of program; serious quit attempts at the end of the program (among non-abstainers); and 30-day abstinence at the 12-month follow-up. Our analyses comprised a multi-step process as follows:

#### Descriptive and Bivariate Analyses

These analyses were conducted within the three levels of variables (site, program, and participant) in order to describe the characteristics of programs and participants and to provide an initial bivariate assessment of associations among site, program, and participant variables and the three primary outcomes.

#### Assessment of Missing-Data Patterns and Use of Multiple Imputation

Although we obtained high response rates for all surveys and the item-response rate of missing on each survey was low (average across all variables = 2%; range 0–10%),

missing data with longitudinal, multi-level data analysis can be problematic. To address this issue, we conducted multivariate regression analyses to model missing items as a function of our outcomes of interest to assess whether data are missing at random. Confirming that data were missing at random, we used multiple imputation to create analytic datasets with complete cases.

#### *Evaluation of Variables of Interest*

Our surveys included multiple variables related to the key constructs that were evaluated as candidates for the multivariate analyses by regressing each outcome of interest on potential multivariate predictors. Variables with the strongest explanatory power were retained in the analyses. Selection of the final variables for the multivariate models occurred separately for each level of data using backward variable selection for each outcome. The initial number of within-level variables considered was 53 youth-level, 23 program-level, and 41 site-level. The youth level variables were reduced to 20, and the number of program- and site-level variables remained the same.

#### *Construction of Final, Multi-Level Model*

Once the final set of variables was determined within each level, these were combined into a comprehensive data set with youth-, program-, and site-level data. The final data included variables averaged from imputed datasets. Using the combined dataset, logistic regression models utilizing backward selection, with an inclusion criterion of  $p < .15$  were used to reduce the number of variables in the final model. After we obtained a computationally manageable and conceptually relevant model for each of the three major outcomes, multivariate GEE models using PROC GENMOD in SAS V9.2 (SAS 2011) was used to model the response variables, adjusting for program-level clustering. To control for demographics and because we were interested a priori in whether program attendance or mandated participation was associated with outcomes, the following variables were forced into each model: participant age, gender, race, proportion of program sessions attended, whether the youth reported their participation was mandated, whether the program included mandatory participation.

## **Results**

### **Program Recruitment**

Web-based applications were accepted during a 2-month period in 2004. From 107 initial applicants we identified 81 as eligible for an initial telephone interview. From the

telephone interviews we selected 45 programs for site visits and completed site visits and enrolled 43 programs in the evaluation. Two programs withdrew, leaving a final sample of 41 participating programs.

### **Program Characteristics**

The program characteristics are summarized in Table 1. Most programs were offered in schools and used multiple strategies to recruit participants. Programs enrolled an average of 14 youth per group offering and, on average 11 of 14 (79%) of youth participants completed more than half of the program. Over one-third of the programs reported having some participants who were mandated to the program. Programs averaged 9 sessions of approximately 1-h each. Supplemental components were reported with some frequency; the most common was access to telephonic support from a quit line. Over 80% of programs offered some type of incentive for attendance and over half reported offering incentives for cessation. The most commonly reported incentives were clothing, accessories, or trinkets (40%), food (19%) and gift certificates (13%). Only 3% of programs reported offering a cash incentive.

By design, all of the programs included at least 4 cognitive-behavioral components and the vast majority addressed issues related to youth including tobacco marketing and non-tobacco issues such as mental health, other drug and alcohol use, school success and careers. Overall, the group sessions were fairly didactic with 74% of facilitators indicating that they used structured lectures most/all of the time. Using 1–5 point scales, group cohesion was relatively high, with facilitators indicating good levels of group interaction, closeness, and supportiveness among group members.

Facilitators were predominantly women with an average age of 40 years. The vast majority were white. Two-thirds of the facilitators had ever smoked, only 4% were current smokers. Facilitators reported an average of 60 h of smoking cessation training and had nearly 5 years of experience.

### **Youth Participant Characteristics**

Baseline characteristics of the 857 youth participants who were ever smokers are summarized in Table 2. Participants averaged 16.8 years of age and were evenly divided by gender. Over one quarter of participants was non-white race and 13% indicated Hispanic ethnicity. Nearly half of the participants indicated that they were employed for pay, and common outside activities included involvement in sports and attending church at least monthly. Nearly one-third of the participants were overweight as indicated by a body mass index (BMI) greater than or equal to 25, and a high proportion indicated they were trying to lose weight.

**Table 1** Characteristics of youth cessation programs ( $n = 77$ )

Construct	Variable	Percent	Mean
Setting	Public school	63	
	Alternative school	17	
	Health care facility	10	
	Other	9	
Recruitment strategies	Flyers	63	
	TV/radio ads	21	
	Adult referrals	48	
	Other participant referrals	52	
	Peer outreach	32	
Participation	Number enrolled		14
	No. of completed one session		14
	No. of completed $\geq$ half of program		11
	Any mandated participants	39	
Program logistics	Number of sessions		9
	Average session length (minutes)		62
	Any booster sessions (% yes)	31	
	Any non-HYSQ evaluation (% yes)	57	
Supplemental components	Internet sites	39	
	Quit line	47	
	1–1 counseling	26	
Program content	At least 4 cognitive-behavioral components	100	
	Address tobacco marketing	85	
	Address youth-related non-tobacco issues		
	Stress and/or depression	100	
	Drugs and/or alcohol	86	
	Participants' future plans	62	
	Offer incentives for attendance	86	
	Offer incentives for cessation	56	
Facilitator style	Structured lectures most/all of the time	74	
Group cohesion	Level of group interaction (1–5)		4.1
	Closeness of group to each other (1–5)		3.4
	How supportive group members were to each other (1–5)		3.4
Priority of youth tobacco use	Perceived priority of youth tobacco use in home organization (1–10)		6.3
	Perceived priority of youth tobacco use in community (1–10)		5.1
Program leader	% Female	81	
	Average age		40.4
	% Hispanic/latino	8	
	% Non-white	9	
	Smoking status		
	Never	33	
	Tried, never daily	42	
	Former daily	21	
	Current	3.9	
Years of experience leading youth cessation programs		4.9	
Total hours of smoking cessation training	60		

There were 41 programs and 46 individuals delivered the interventions. Program surveys were completed after each administration. Of 79 completed programs, 77 program leader completed surveys

**Table 2** Characteristics of youth cessation program participants ( $N = 857$ )

Construct	Variable	Percent	Mean
Demographics	Male gender	50	
	Age		16.8
	Non-white race	28	
	Hispanic ethnicity	13	
Work and free activity	Enrolled in school	94	
	Employed for pay	42	
	Attend church at least monthly	49	
Health and Health Behaviors	Involved in sports	49	
	BMI $\geq 25$	32	
	Trying to lose weight	41	
Tobacco use and cessation history	Exercise > 1ce/month	60	
	Binge drinking at least 1ce last 30 days	56	
	Age at 1st whole cigarette		11.8
	Ever smoked daily	85	
	Smoked during the past 30 days	95	
	Smoked during past 7 days	91	
	No. of cigarettes smoked per day (6-day diary average)		6.8
	Smoke within 15 min of waking	36	
	Smoke with parents	34	
	Smoked on school property in past 30 days	47	
	Use other tobacco products	65	
	Ever quit smoking for at least 1 day	81	
	Quit smoking 1 or more days in the past 12 months	75	
	Asked about smoking status by health professional in past 12 months	58	
	Advised to quit by health professional in past 12 months	33	
	Sent to quit smoking class because caught smoking	20	
	Used behavioral treatment	51	
	Used pharmacotherapy	22	
	Level and type of motivation to quit	Want to quit smoking (% yes)	81
Stage of change			
Precontemplation		25	
Contemplation		33	
Preparation		42	
Definitely not be smoking in 5 years		20	
Level of motivation (1–10)			6.1
Level of confidence in quitting (1–10)			6.6
Family and friends smoking	Level of intrinsic motivation (1–5)		3.5
	Level of extrinsic motivation (1–5)		2.2
	Live with a smoker	74	
	Mother smokes	51	
	Father smokes	50	
	Any close friend smokes	95	
	Mother very supportive of quitting	67	
Father very supportive of quitting	56		
Friends very supportive of quitting	49		

**Table 2** continued

Construct	Variable	Percent	Mean
Tobacco use environment	Smoking prohibited in home	50	
	>50% of students smoke	71	
	Smoking banned indoors and outdoors at school	69	
	Some/a lot of students smoke where it's not allowed	72	
	Students who break smoking rules get in trouble	76	
	Often see teachers smoke at school	17	
General attitudes about smoking	All public places should be smoke free		
	Definitely yes	25	
	Probably yes	25	
Depression and well-being	Depressive symptomatology	27	
	Perceived stress (0–4)		2.4
	ADD/ADHD diagnosis	34	
	Alcohol-related trouble in the past 30 days	26	
	Ever suspended or expelled from school	69	
Program participation	Mandated/forced participation	24	
	Heard about program from:		
	Friend	34	
	Doctor	4	
	Teacher	33	
	Parent	7	
	Poster/flyer	13	
	School assembly	13	
	Will definitely stick with program until the end	57	
Think the program definitely will help me quit	26		

There were 21 program participants who reported being 'never smokers' and participated as supports for youth smokers, their data are not summarized in this table

Over half of the participants indicated that they exercised more than once per month. Binge drinking was reported by nearly two-thirds of the participants. A sizeable minority of participants reported depressive symptomatology and moderately high levels of perceived stress. A third of participants reported having a diagnosis of attention deficit disorder (ADD) or attention deficit hyperactivity disorder (ADHD). Problems with alcohol and school problems were frequently reported.

On average, participants smoked their first whole cigarette at age 11.8. Prior to the start of the program 85% reported ever smoking daily and 91% had smoked during the past 7 days, averaging 6.8 cigarettes per day. As an indicator of addiction to nicotine, over a third of participants reported smoking within 15 min of waking. A similar proportion reported that they smoked with their parents. Use of other tobacco products was common. With regard to quitting history, over 80% indicated that they had ever quit smoking for at least 1 day and 75% had quit smoking for one or more days during the past 12 months. Just over half of the participants indicated that they had been asked about their smoking status by a health professional in the past

12 months; only a third reported being advised to quit by a health professional in the past 12 months. Prior use of behavioral treatment was reported by half of the participants and just under a quarter of participants reported using pharmacotherapy.

Smoking among family and friends was commonly reported. Three-quarters of participants indicated they lived with at least one a smoker, although 50% reported that smoking was prohibited inside their homes. Nearly all participants had at least one close friend who smoked. Participants reported moderate levels of strong support for quitting from their mother, father, or friends.

Level of motivation to quit was modest. One quarter of the sample indicated they were not even seriously thinking about quitting, which mirrors the proportion who indicated that they were mandated for treatment. Only 20% of participants indicated that they would definitely not be smoking in 5 years. On a 10-point scale, participants averaged 6.1 level of motivation and 6.4 level of confidence in quitting. Their average intrinsic motivation was greater than extrinsic motivation for quitting. Just over half of the participants believed that they would definitely stick



**Table 3** Characteristics of organizations that sponsored the youth cessation programs ( $N = 64$ )

Construct	Variable	Percent	Mean
Setting	Public school	42	
	Private or alternative school	9	
	Community organization	5	
	Health care facility	23	
	Other	20	
Tobacco use prevalence	% of staff who smoke	10	
	% of students/youth who smoke	28	
Written organizational policies against tobacco use	Prohibit smoking on premises	92	
	Prohibit possession of tobacco products on premises	76	
	Prohibit wearing clothes or carrying accessories with tobacco logos	72	
Attitude towards organizational policies	Too lenient	19	
	Just right	81	
	Too restrictive	0	
Reasons for offering program	Legislation with penalties for youth possession, use or purchase	23	
	Staff initiative	77	
	Organizational leader initiative	30	
	Health or education department initiative	48	
	Parent demand	21	
	Youth demand	47	
Resources	Annual dollars spent on program		\$3,694
	Outside funding for program staff (% yes)	25	
	Resources adequate to implement program (% yes)	84	
Community prioritization	Perceived priority of youth tobacco use in community (1–10)		6.5
	Awareness of program among community leaders (very/somewhat aware)	81	
	Supportive of program among aware community leaders (very/somewhat supportive)	98	
Organizational involvement in youth health	Alcohol prevention or treatment	78	
	Drug use prevention or treatment	76	
	Nutrition or weight management	66	
	Eating disorders	48	
	Violence prevention	67	
	Pregnancy prevention	76	
	Mental health (depression, self-esteem, etc.)	54	

Among the 41 programs, 24 involved more than one organization. Of 65 eligible organizational leaders, 64 completed surveys

with the program until the end, but only a quarter thought that the program would definitely help them quit.

#### Site Characteristics

Site-level information is summarized in Tables 3 and 4. The vast majority of sponsoring organizations had written policies that prohibit smoking on their premises and many had additional written policies that prohibit the possession of tobacco products and wearing clothes or carrying accessories with tobacco logos on the premises. Over 80% of organizational leaders believed that their organizational policies were just right with the remainder feeling they were too lenient. Most of the programs began with staff

initiative. The average annual dollars spent on the program was about \$3700.00 and most organizational leaders reported that their resources to implement the program were adequate. The majority of organizations reported involvement in other youth health issues, including alcohol and drug use prevention or treatment, nutrition or weight management, violence prevention, and mental health.

Most organizational leaders reported that community leaders were very or somewhat aware of their program and that leaders who were aware of the program were supportive. On a 10-point scale, organizational leaders rated the perceived priority of youth tobacco use in their community higher than community leaders (means = 6.5 and 5.6, respectively). Overall, community leaders most



**Table 4** Community characteristics ( $n = 94$ )

Construct	Variable	Percent	Mean
Concerns facing youth in community	Biggest concern facing youth in your community is <sup>a</sup>		
	Tobacco	3	
	Drug use	21	
	Alcohol use	15	
	Teen pregnancy	3	
	Violence	4	
	Community prioritization of youth tobacco use (1–10)		5.6
Community tobacco control ordinances (state or local)	No smoking in publicly owned buildings	32	
	No smoking in public gathering places	16	
	No tobacco vending machines	1	
	Penalties for sale of tobacco to minors	77	
	Tobacco retailer licensing	67	
	No tobacco use by students on school property	15	
	No tobacco use by adults on school property	15	
	No tobacco use on school buses	9	
	PUP laws		
		No youth tobacco possession	52
	No youth tobacco purchase	54	
	No youth tobacco use	24	
Ordinance enforcement <sup>b</sup>	No smoking in public buildings	84	
	No smoking in public gathering places	78	
	Enforce limit/prohibition of tobacco vending machines	91	
	Identify stores that sell tobacco to minors	71	
	Enforce no student use of tobacco on school property	95	
	Enforce no adult use of tobacco on school property	90	
	Enforce no youth tobacco possession	48	
	Enforce no tobacco use on school buses	100	
	Enforce prohibition of youth tobacco purchase	66	
	Enforce prohibition of youth tobacco use	52	
Youth recreational resources (% many)	School-based athletics	95	
	Non-school based athletics	72	
	Music, theater, art, dance	42	
	Special interest clubs	60	
	Mentoring programs	24	
	Activity centers (e.g., YMCA, boys/girls clubs, community centers)	28	

Responses from 94 of 120 eligible community leaders in the education, health, and juvenile justice sectors. Respondent N's are: 28 health department; 46 police department; and 20 school board members

<sup>a</sup> % do not sum to 100% because of other infrequent responses

<sup>b</sup> % most/all of the time among those with ordinances

frequently rated drug or alcohol use as the biggest concern facing youth in their communities. Tobacco use was selected by only 3% of respondents.

A minority of communities had tobacco control ordinances limiting smoking in publicly owned buildings, public gathering places, or prohibiting adult use on school property. Although a majority of communities required tobacco retailer licensing, only 1% explicitly prohibited tobacco vending machines. Some youth restrictions were

common, including ordinances limiting or prohibiting purchase or possession of tobacco among youth, and penalties for the sale of tobacco to minors. Fewer ordinances existed for youth tobacco use overall or in specified places such as school property or school buses.

Among communities with ordinances, enforcement was reported at 80% or higher for no smoking in public buildings, limiting or prohibiting tobacco vending machines, and enforcement of no student and no adult use

**Table 5** Cessation program outcomes based on intent to treat

Outcome	% or mean
Percent abstinent for at least 7 days at the end of the program	13.89
Number of serious quit attempts <sup>a</sup>	
Have not tried to quit	26.42
1 time	27.78
2 times	27.24
3 times or more	18.56
Percent abstinent for at least 7 days at 6 month follow-up	13.89
Percent abstinent for at least 30 days at 12 month follow-up	12.49

Intent to treat includes all participants in the denominator ( $n=857$ )

<sup>a</sup> Among non-abstainers at the end of treatment

of tobacco on school grounds, and no use of tobacco on school buses. Less frequent enforcement was reported for youth possession, tobacco use, and purchase.

### Smoking Cessation Outcomes

Table 5 reports smoking cessation outcomes using intent to treat analyses. Abstinence rates are biochemically confirmed. Cessation outcomes were similar when calculated across all youth respondents and as the average percent abstinent by treatment program. Fourteen percent of youth reported 7-day abstinence at the end of treatment; the average percent abstinent by program was 13%, but ranged from 0 to 50% across the 76 program implementations. Six and twelve-month abstinence rates were similar; at 12 months 12.5% of youth reported being abstinent for at least 30 days. Among youth who were not abstinent at the end of their program, 74% reported making at least one serious quit attempt; 3 or more serious quit attempts was reported by 19% of participants.

### Outcome Modeling

Tables 6, 7, and 8 summarize the significant predictors from the final GEE models for each of the three primary outcomes, including beta coefficients, odds ratios, confidence intervals, and  $p$  values.

#### *End of Program Abstinence*

As indicated in Table 6 7-day abstinence at the end of program was significantly associated with participant and site-level variables. In addition to variables that were forced into the model, the final model included 11 participant-level variables and six site-level variables. One participant-level variable (father's support) did not reach significance in the final model. The following variables were associated with a significantly lower likelihood of

quitting: white, non-Hispanic race, involvement only in sports as an outside activity, alcohol use and alcohol-related trouble, smoking more than 5 cigarettes per day, living with a smoker, previously trying pharmacotherapy, having a community or state-level ordinance that prohibits smoking on school buses that is enforced all the time, stricter clean indoor-air restrictions. A significantly higher likelihood of quitting was associated with the following variables: higher rate of program attendance, high baseline confidence in quitting, the presence of smoking restrictions in the home, higher than precontemplation stage of readiness to quit, support for smoke-free public places, prohibition of smoking on the premises where the cessation program is offered, prohibitions on youth tobacco possession and tobacco use on school property.

#### *Serious Quit Attempts at the End of Program*

Results presented in Table 7 are restricted to the 738 youth who reported smoking at the end of the program. Among these participants, making one or more serious quit attempts during the program was associated with participant-, program-, and site-level variables. In addition to the variables that were forced into the model, the final model included seven participant-level, five program-level, and four site-level variables. Two participant-level variables (time to first cigarette and ever expelled from school) and one site-level variable (compliance checks for sales to minors) did not reach significance in the final model. Continuing smokers were less likely to report one or more serious quit attempts if they were older, reported higher baseline confidence, reported prior use of pharmacotherapy, participated in a program with sessions that lasted longer than 50 min, had a facilitator with less than 5 years of experience, and were in a community with ordinances that banned tobacco advertising. A higher likelihood of reporting one or more serious quit attempts among continuing smokers was associated with involvement in a mixture of sports and non-sports activities, higher baseline motivation to quit, prior cessation of at least 1 day, a program leader with a close and supportive style, and community ordinances that prohibit youth tobacco possession and that prohibit tobacco use on school buses.

#### *30-Day Abstinence at 12 Months*

At the 12-month follow-up the model included 13 participant-level variables, six program-level variables and three site-level variables, in addition to those variables that were forced into the model. Four participant-level variables (abstinent at least 30 days at baseline, asked by doctor if smoked, involvement in extra-curricular activities, and household smoking bans) and one program-level variable

**Table 6** GEE model predicting 7-day abstinence at the end-of-program with youth-, program-, and site-level variables adjusted for participants clustered in sites

Variable	Beta	OR	Confidence interval	<i>p</i> value
<i>Youth level</i>				
Age <sup>a</sup>	0.07	1.07	0.89–1.29	0.452
Gender (male) <sup>a</sup>	0.06	1.06	0.72–1.57	0.772
Race (white, NonHispanic) <sup>a</sup>	−0.53	0.59	0.35–0.98	0.044
Percent attendance <sup>a</sup>	1.08	2.95	1.09–7.95	0.033
Mandated participation <sup>a</sup>	0.17	1.19	0.66–2.13	0.562
Extracurricular activities (none as reference)				
Sports only	−0.74	0.48	0.23–0.98	0.005
Alcohol use (any vs. none)	−0.79	0.45	0.27–0.76	0.003
Alcohol trouble (yes vs. no)	−0.45	0.64	0.40–1.01	0.054
Baseline daily smoking rate (<1–5 cig/day as reference)				
6–10 cig/day	−0.83	0.44	0.28–0.67	0.000
>10 cig/day	−3.08	0.05	0.01–0.16	<.0001
Confidence (high vs. low)	1.11	3.02	1.62–5.68	0.001
Live with a smoker (yes vs. no)	−0.69	0.50	0.26–0.97	0.039
Pharmacotherapy use (yes vs. no)	−0.71	0.49	0.24–1.01	0.053
Home smoking restrictions (yes vs. no)	0.68	1.98	1.03–3.79	0.040
Stages of change (precontemplation as reference)				
Preparation	1.26	3.52	1.85–8.21	0.001
Action	4.21	67.37	9.89–458.90	<.0001
Smoke free (definitely not as reference)				
Probably not	1.20	3.31	1.44–7.65	0.005
Probably yes	1.52	4.59	2.39–8.73	<.0001
Definitely yes	1.32	3.75	1.57–8.92	0.003
<i>Program level</i>				
Mandated participate (program: vol vs. mand/other) <sup>a</sup>	0.45	1.57	0.96–2.56	0.071
<i>Site level</i>				
Prohibit smoke premises (yes vs. no)	2.35	10.48	1.66–66.05	0.012
Tobacco advertising ordinances (none as reference)				
Exist and enforced not all the time	1.17	3.21	1.80–5.77	<.0001
Youth tobacco possession laws (none as reference)				
Exist and enforced not all the time	1.36	3.90	1.52–9.96	0.005
Tobacco use rules on school property (none as reference)				
Exist and enforced not all the time	1.03	2.81	1.24–6.32	0.013
Exist and enforced all the time	1.25	3.48	2.19–5.56	<.0001
Tobacco use on school buses rules (none as reference)				
Exist and enforced not all the time	1.27	3.57	1.38–9.21	0.009
Exist and enforced all the time	−1.06	0.35	0.15–0.82	0.017
Clean indoor air laws (range 1–10; higher value strict)	−0.21	0.81	0.74–0.89	0.000

*N* = 857; Abstinence at end of program (7 days abstinent): 1 = abstinent; 0 = not abstinent

<sup>a</sup> Variable forced into the model

(coverage of future plans) did not reach significance in the final model. Youth were less likely to report a minimum of 30-day abstinence at the 12 month follow-up if they had the following characteristics: had ever smoked daily; heard about the program from a friend only or just from a flyer, poster, or school assembly; reported their mother as

somewhat versus very supportive of their quitting; would use a promotional item from a tobacco company; were in a program with a higher number of sessions than average, were in a program with incentives for quitting, were in a program with a leader that was older than average, lived in a community with an ordinance that prohibited youth

**Table 7** GEE Model predicting serious quit attempts at end-of-program (among participants not abstinent at end-of-program) with youth-, program-, and site-level variables adjusted for participants clustered in sites

Variable	Beta	OR	Confidence interval	<i>p</i> value
<i>Youth level</i>				
Age <sup>a</sup>	−0.20	0.82	0.70–0.96	0.014
Gender (male) <sup>a</sup>	0.22	1.24	0.81–1.91	0.322
Race (white, NonHispanic) <sup>a</sup>	−0.30	0.74	0.47–1.18	0.200
Percent attendance <sup>a</sup>	−0.08	0.92	0.45–1.89	0.829
Mandated participation <sup>a</sup>	0.14	1.15	0.72–1.83	0.563
Extracurricular activities (none as reference)				
Mixture of sports and other activities	0.85	2.34	1.05–5.24	0.039
Confidence (high vs. low)	−1.03	0.36	0.21–0.59	<.0001
Motivation (high vs. low)	0.88	2.40	1.28–4.55	0.007
Pharmacotherapy				
Yes versus no	−0.35	0.70	0.52–0.95	0.022
Ever stop for at least 1 day (any vs. none)	1.02	2.78	1.71–4.51	0.0001
<i>Program level</i>				
Mandated participate (program: vol vs. mand/other) <sup>a</sup>	0.50	1.66	0.89–3.04	0.107
Facilitator style (continuous close/supportive)	0.41	1.50	1.04–2.18	0.030
Average length of session (<50 min as reference)				
51–60 min	−1.27	0.28	0.11–0.70	0.004
61–90 min	−1.66	0.19	0.09–0.40	<.0001
>90 min	−1.41	0.24	0.09–0.70	0.009
Use of medication (yes vs. no)	−0.56	0.57	0.35–0.93	0.024
Number of years led youth cessation program (≤1 year as reference)				
2–5 years	−0.78	0.46	0.22–0.96	0.037
Organizational leader awareness/support (aware, not supportive as reference)				
Not aware	−1.76	0.17	0.04–0.75	0.019
<i>Site level</i>				
Tobacco advertising ordinances (none as reference)				
Exist and enforced not all the time	−1.05	0.351	0.13–0.92	0.034
Exist and enforced all the time	−0.83	0.437	0.21–0.89	0.023
Youth tobacco possession ordinances (none as ref)				
Exist and enforced not all the time	0.98	2.656	1.28–5.53	0.009
Exist and enforced all the time	1.44	4.219	1.08–16.48	0.038
Tobacco use on school buses ordinances (none as ref)				
Exist and enforced not all the time	1.62	5.074	1.85–13.78	0.002

*N* = 738; Quit attempt at end of program since beginning of program (1 = Any; 0 = None)

<sup>a</sup> Variable forced into the model

tobacco use that was not enforced all the time, living in a community with a stricter clean indoor air law. Variables associated with a higher likelihood of 30 day abstinence at the 12 month follow-up were: greater attendance at the program sessions; longer time to first cigarette after waking; father very supportive of quitting; starting the program with the strong intention to stick with it; participation in a program that only has volunteer participation; and organizational leadership that is aware and supportive of the program.

## Discussion

A prior national survey found a high prevalence of community-based youth cessation programs that included evidence-based components, were delivered by trained professionals, and were committed to program evaluation (Curry et al. 2007). The national survey did not obtain information about specific program implementation and outcomes from either participants or program leaders. The current study extended this work and implemented a

**Table 8** GEE model predicting 30-day abstinence at the 12-month follow-up with youth-, program-, and site-level variables adjusted for participants clustered in sites

Variable	Beta	OR	Confidence interval	<i>p</i> value
<i>Youth level</i>				
Age <sup>a</sup>	−0.11	0.89	0.68–1.17	0.412
Gender (male) <sup>a</sup>	−0.12	0.88	0.50–1.58	0.676
Race (white, NonHispanic) <sup>a</sup>	−0.06	0.94	0.64–1.38	0.752
Percent attendance <sup>a</sup>	1.79	6.01	2.55–14.05	<.0001
Mandated participation <sup>a</sup>	−0.09	0.91	0.38–2.21	0.843
Ever smoke daily (yes)	−0.72	0.49	0.26–0.92	0.028 <sup>a</sup>
How soon smoke after waking (within 15 min ref)				
After 30 min	1.27	3.57	1.92–6.59	<.0001
How heard about program				
Friend only	−0.74	0.47	0.28–0.82	0.007
Flyer, poster, assembly, meeting only	−0.76	0.47	0.22–0.98	0.045
Father support (not at all as reference)				
Somewhat versus very supportive	0.60	1.82	1.01–3.28	0.046
Don't have versus very supportive	0.75	2.12	1.08–4.14	0.028
Mother support (not at all as reference)				
Somewhat supportive	−1.60	0.20	0.05–0.84	0.028
Somewhat versus very supportive	−1.35	0.26	0.10–0.66	0.005
Would use promotional item (yes vs. no)	−0.58	0.56	0.34–0.92	0.021
Think I'll stick to the program (definitely yes vs. not)	0.68	1.97	1.26–3.10	0.003
<i>Program level</i>				
Mandated participate (program: vol vs. mand/other) <sup>a</sup>	0.50	1.64	1.09–2.50	0.020
Number of sessions	−0.13	0.87	0.81–0.95	0.001
Incentive for quitting (yes vs. no)	−0.79	0.45	0.32–0.65	<.0001
Organizational leader awareness/support (aware and not supportive as reference)				
Not aware	2.66	14.28	4.56–44.82	<.0001
Aware and somewhat supportive	3.03	20.66	5.73–74.72	<.0001
Aware and very supportive	1.92	6.85	2.00–23.22	0.002
Likelihood of program operating in 1 year (not likely as reference)				
Very likely	−1.27	0.28	0.13–0.61	0.001
Provider age	−0.03	0.97	0.95–0.99	0.032
<i>Site level</i>				
Prohibit smoke premises (yes vs. no)	1.30	3.67	2.03–6.65	<.0001
Youth tobacco use ordinances (none as reference)				
Exist and enforced not all the time	−0.69	0.50	0.33–0.76	0.001
Clean indoor air laws (range 1–10 higher value strict law)	−0.16	0.85	0.76–0.96	0.007

*N* = 857; Abstinence at 12 month (30 days abstinence) 1 = abstinent (no smoking at all in past 30 days); 0 = not abstinent

<sup>a</sup> Variable forced into the model

rigorous, longitudinal evaluation that included multi-level data collection. The evaluation benefited from high levels of cooperation from program participants, program leaders, and organizational and community leaders which enabled a rich description of youth cessation programs as implemented in real-world settings.

By design, the programs that participated in this evaluation were homogenous with regard to format (group), setting (primarily school-based), and content (all programs

included cognitive-behavioral components). Customization of program content for youth was evident in the high percentage of programs that addressed tobacco marketing and youth-related non-tobacco issues. Included in a majority of programs was attention not just to tobacco and other drugs, but stress and depression and youths' future plans. Overall, the programs provided rather intensive treatment that occurred over an average of 9 sessions lasting an hour each with dedicated program leaders. These

youth cessation programs operated in supportive organizations and communities. A sizeable majority of organizational leaders indicated that staff initiative was a primary reason for offering the program, and organizational leaders felt that youth tobacco use was a moderately high priority for their organization. Community representatives perceived youth tobacco as somewhat less of a priority. The ordinance review also showed a high prevalence of local or state tobacco control ordinances. While some ordinances had an impressively high rate of enforcement, the lowest rates of enforcement were reported for ordinances related to youth tobacco possession, use, and purchase. This is a major lost opportunity as there is robust evidence that enforcement contributes to reduced levels of youth tobacco use (Stead and Lancaster 2005; Jason et al. 1999).

The cessation programs attracted a diverse group of adolescent smokers. In contrast to adult programs, where the majority of participants are female, half of the youth participants were male. The gender balance reflects a relatively high percentage of programs that reported both mandated and volunteer participants. Previous analyses (Houser-Marko et al. 2011) showed that males were over-represented in mandated participants. Program participants were experienced with tobacco cessation efforts, as evidenced by prior quit attempts and some treatment use. However, there was considerable pessimism about their future as non-smokers, with only 20% believing they would definitely not be smoking in 5 years.

High retention of participants in the evaluation, particularly at the end of program follow-up, along with biochemical validation of self-reported smoking status provided reliable estimates of short- and long-term quit rates in these community-based programs. The observed quit rates of 12–13% across the 12-month follow-up period are impressive and even higher than quit rates that are reported in research studies. For example, in a recent meta-analysis of 48 studies, Sussman and colleagues reported an aggregate quit rate for youth cessation interventions of 9.14% compared to 6.24% for control conditions (Sussman et al. 2006). There was considerable range in quit rates, however, across programs; almost 20% reported no abstainers at the end of the program, and about 30% reported quit rates greater than 20%.

Exploration of youth-, program-, and site-level correlates of outcomes was complex to execute and even more complex to interpret. Creating a multi-level model required an iterative process of variable selection. While our priority was to identify a parsimonious set of conceptually-driven variables to test, we acknowledge an element of data-driven model building to our approach. Our findings do not point to a single set of correlates with short- and long-term outcomes. The only variable associated with both end of program and 12-month abstinence was program

attendance. As would be expected, higher attendance was associated with a higher likelihood of abstinence at both time points.

It is notable that no program-level variables were associated with end-of-program abstinence. The multivariate model suggests that lower-risk youth, from supportive home and community environments were most likely to achieve initial abstinence. Program-level variables did emerge as important correlates of long-term outcome. Long-term abstinence is most likely among voluntary versus mandatory participants, in programs with supportive organizational leadership, and with younger providers. The youth-level correlates of 12-month abstinence suggest that less dependent smokers were more likely to succeed and that these youth were more intrinsically motivated to attend and stick with the program.

Tobacco dependence is a chronic relapsing condition that typically requires multiple serious quit attempts. Thus, it is of interest to identify correlates of serious quit attempts among the majority of youth smokers who do not achieve abstinence. Here we find both participant- and program-level factors are key, although the pattern of results has some interesting twists. Younger youth with involvement in outside activities who are highly motivated, have supportive fathers, have previously tried to quit and reject tobacco company promotional items were more likely to make a quit attempt. Programs with sessions under 50 min that were facilitated by individuals with a close and supportive style resulted in more quit attempts among participants, even though they did not achieve abstinence at the end of the program. Two variables have interesting associations: very supportive mothers were a disadvantage as was higher confidence.

Most puzzling in our findings are some of the associations between site-level variables and outcome. Less strict clean indoor air laws were positively associated with 12-month abstinence and bans on tobacco advertising on school property were negatively associated with serious quit attempts and the end of program. Moreover, inconsistent enforcement of bans on school buses and youth tobacco use was also associated with better outcomes at the end of program and 12 months. We are cautious about over-interpreting these findings and would suggest that further research, including replication of these measures in other cohorts is needed.

This study is the largest longitudinal evaluation of community-based youth cessation programs reported to date. We are heartened by the observed quit rates that rival those in randomized controlled efficacy trials. The commitment of community-based organizations and the adults who conduct the cessation programs was evident at every step of this evaluation. The observed correlates of positive outcomes are consistent with those reported in randomized

trials and point to the importance of motivation, opportunities for and encouragement to engage in activities outside of academics, having youth participate in treatment before they become daily, highly dependent smokers, and community norms/ordinances that discourage youth purchase, use and possession. Clearly, there is no magic bullet for youth cessation programming. That only a few program-level variables emerged as correlates in our multivariate models likely points to the homogeneity of program characteristics and the high level of commitment to quality programming associated with a willingness to participate in this evaluation. Thus, our take-home message is simple. Providing evidence-based treatment to youth does result in successful cessation and in serious involvement in the quitting process even if youth do not quit. These programs are vital resources for the health of our youth.

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