Better Practices for Youth Tobacco Cessation: Evidence of Review Panel

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***Objectives*: To offer programmers, policy makers, and researchers a scientific basis for developing and selecting smoking cessation treatments for adolescents. *Methods*: An evidence review panel systematically rated published and unpublished reports of cessation treatments for youth to make recommendations on theoretical foundations, delivery settings, types of intervention, and provider type. *Results*: Twenty studies had sufficient validity to inform the recommendations. The 9 studies that reported treatments that increased cessation were based on social cognitive theory. *Conclusions*: Cognitive-behavioral interventions are a promising approach for helping young smokers quit smoking. Evidence is insufficient to draw other conclusions at this time.**

***Key words*: smoking cessation, tobacco use, adolescent smoking cessation research**

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Notwithstanding recent declines in smoking among US high school students, tobacco use in this population is high. Current regular smoking (smoking cigarettes at least 20 of the past 30 days) is perhaps the best indicator of regular smoking. For high school students (grades 9-12), data from the Youth Risk Behavior Survey showed that current frequent smoking rose from 12.7% in 1991 to 16.8% in 1999, then decreased to 13.8% in 2001.[1] A similar pattern also exists in Canada. Factors that may have contributed to this reduction include increased cigarette prices, counter-marketing campaigns, and more school-based prevention programs. Although prevention programs contribute to the decrease in smoking prevalence, continued reductions in tobacco use and the health burden associated with smoking will remain difficult without reliable and safe methods to help youth quit smoking.[2,3]

Traditionally, regular youth tobacco users have been treated with nonspecific prevention-oriented messages or cessation programs designed for and evaluated among adults.[4] Although the evidence guiding the selection of cessation treatments for adult smokers is sound, there

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is a paucity of data to guide decision making for youth populations.[5] Despite the dearth of developmentally appropriate cessation treatments, large numbers of youth report they want to quit smoking, and over half have tried to quit smoking in the previous 6 months.[6-8] Youth's interest in quitting may grow as smoke-free policies, tobacco tax increases, and provisions to limit youth access to tobacco products are disseminated more widely and intensively, and are enforced.[2] Recent changes in social norms and policy have also increased the pressure on clinicians and educators to offer cessation treatments to youth. For example, educators need options beyond suspension for students who break policies that prohibit smoking on school grounds.[9]

A 1999 review by Sussman et al examined the literature on adolescent tobacco-use cessation programs.[10] They located 17 studies for review. The reviewed programs used various theoretical approaches, but most used a single-group design, and few included any form of biochemical validation of reported abstinence. A wide range of ages (12 – 22 years) was represented; race and ethnicity were reported in only 4 of the studies. Retention was described as "unevenly reported" but generally acceptable with a mean of 77%. Sussman et al suggested that the cessation programs tended to produce a greater quit rate than that among naturally occurring control groups, but stressed there was too much variation between programs and reports for a meta-analysis.

In 2001, an organizing team of Canadian and American research funders contracted Sussman to update and expand his original review.[12] This effort was undertaken to update the 1999 review in light of new interventions that had emerged and to expand on a better practices review methodology developed within the public health arena in Canada. The better practices model provided a framework for Sussman's updated review.

For his 2002 literature review, Sussman located 66 studies putatively concerned with smoking cessation among youth.[13] The mean overall cessation rate was 12% across all active treatments and 7% across control conditions. Sussman concluded that cessation interventions are effective, particularly those based on motivational enhancement and contingency-based reinforcement, and those delivered through classroom settings and school-based clinics.[13] Although Sussman's most recent paper makes a contribution to the literature, it raises several concerns. Most of the new studies identified suffered from the same methodological, conceptual, and theoretical problems as those from the original review. Each study in Sussman's analysis was given relatively equal consideration regardless of sample size, design, outcomes measured, or follow-up period. Moreover, a single investigator developed the operational definitions and reviewed the studies, thereby potentially compromising reliability and validity.

An evidence review panel was formed and funded by the Youth Tobacco Collaborative to review the 66 studies identified by Sussman, consider their scientific merit, and recommend better practices to help adolescents quit smoking. The term *better practices* is employed here instead of the more customary term *best practices* because of the limited literature on smoking cessation treatments for youth and in recognition of the imprecision of the review process. Although better practices will likely include public policy and comprehensive communication campaigns, the panel was asked to focus on treatments (including behavioral and pharmacological) delivered to individuals, groups, and populations of adolescent smokers. This paper describes the methods and findings of the panel.

METHODS

The evidence review panel consisted of 12 researchers, policy analysts and program providers with extensive experience in the design, review, funding and interpretation of studies on youth smoking cessation. The panel began by considering the 66 studies identified by Sussman.[13] Given the number of studies, as well as the diversity of research designs, settings, outcomes measures, theoretical foundations, and other factors, it was clear that traditional meta-analytic procedures were inappropriate.[14] For example, many potentially useful studies were community-based single-group designs that made it impossible to calculate an effect size. The panel developed an alternative approach that involved 8 steps. Steps 2 through 5 were conducted concurrently.

Step 1: Select Relevant Studies

The papers in Sussman's search had been located in or before January 2001 through a combination of bibliographic (MedINFO, PscyINFO) and website (Google) searches, and references provided from key informants in Canada and the United States. The search was limited to studies that putatively provided a cessation program or treatment to smokers aged 12 to 24 years. The vast majority focused on high-school-aged smokers.[13] Sussman indicated that some of his studies did not include explicit indicators of cessation behavior (eg, point prevalence or continuous abstinence). For example, many studies were primarily concerned with prevention in classroom settings. Although they reported the number of smokers over time, their analyses failed to report whether changes were due to current smokers who stopped smoking or a reduction in smoking initiation. Other studies reported intentions to quit tobacco consumption or proxy measures of cessation without providing data on actual quitting behavior. Because the panel was asked to focus specifically on cessation behavior, it was decided to exclude studies from further analysis that did not have clear, unambiguous measures of tobacco cessation.

The panel attempted to include the very best and most recent data available. Because research on tobacco cessation among youth is a dynamic and emerging field (eg, the National Cancer Institute funded more than a dozen research grants in the late 1990s), we deliberately chose to include unpublished studies, but to treat them with equal rigor as published studies. Unpublished studies were also included to reduce the possibility of publication or submission bias. Investigators may not submit small studies for publication that fail to produce a statistically significant effect. However, combining results from many small studies offers the potential to identify important patterns. Similarly, the panel also deliberately chose to include studies that employed nonrandomized designs. All studies, regardless of design, were subject to stringent inclusion criteria and weighted according to their validity. For example, all other things being equal, randomized designs were regarded as more valid and figured more prominently in the panel's recommendations (see Step 2).

Step 2: Develop Criteria for Assessing Validity

Sussman's 2 literature reviews have used liberal inclusion criteria with little attempt to place greater weight on data from the studies with greater validity.[10,13] As a consequence, the conclusions are largely based on studies with poor designs, small sample sizes, and weak outcome measures. The evidence review panel attempted to address these weaknesses by considering only studies that have a minimally acceptable level of validity and by placing greater weight on the higher quality studies. Internal validity was assessed by examining study design, sample size, follow-up time, type of cessation measure used and whether there was an attempt to confirm it, percentage of participants lost to follow-up, use of appropriate analytical procedures (eg, how analyses treated those lost to follow-up), and whether the participants complied with the intended treatment. Each factor was assigned a score that ranged from 0 to 2 or from 0 to 3 (according to predefined criteria). Scores across factors were summed to produce an overall validity score; a higher score reflected higher internal validity. Careful consideration was given to the range of allowable scores within each factor because the assigned score determined the relative weight the factor would play in determining the overall validity score. Original definitions and protocols for assessing validity were revised after some preliminary testing. The final set of factors, definitions, and scoring criteria are provided in Table 1. The highest score attainable for internal validity was 24.

To improve interpretability, the panel originally attempted to collapse validity scores into 3 levels: high, medium, and low. The distribution of initial scores, and the attributes of individual studies at various cut points suggested, however, that the continuum should be divided into 4 classes: high (scores of 17 or more), moderate (14 to 16), fair (11 to 13), and low (10 or less). Only studies with high or moderate validity were used to draw conclusions.

Step 3: Assess the Safety of Treatments

Validity alone is insufficient to recommend a particular treatment approach. Therefore, each study was also assessed

Table 1
Definitions of Factors Used to Determine the Internal Validity of Studies and How Each Factor Was Scored

Factor	Description	Total Validity Score	Scoring
Theoretical fidelity	How closely a treatment follows or uses the principles of a particular theory	8 3%	2 = *High* (the paper describes the significant aspects of the study derived from the application of the theory, the application represents the theory accurately, and the study implementation applies the theory as described, in short, the study matches the theory) 1 = *Low* (some aspects of the study match the theory, and this is described in the paper) *0 = No report* (the paper does not report how the theory is applied, or the study does not match the theory)
Implementation compliance	How many people received the intended treatment	12.5%	3 = *High* (a high percentage of the experimental group received the intervention, for example, if it was a group program, a high percentage of subjects attended most sessions) 2 = *Medium* (at least half of those in the experimental group received most of the intervention) 1 = *Low* (the majority of the experimental group did not receive most of the intervention)
Design	Research design used in the study	12 5%	3 = Randomized control trial 2 = Quasi-experimental design with a matched control 1 = Quasi-experimental design with no match control 0 = Not an experimental or quasi-experimental design
Sample size	Minimum number of participants who received a treatment at baseline	12.5%	3 = > 250 participants 2 = 150 - 249 participants 1 = 30 - 149participants 0 = < 30 participants
Posttreatment follow-up	Time between the end of treatment and the final follow-up	12 5%	3 = > 6 months 2 = 3 to < 6 months 1 = 1 to < 3 months 0 = < 1 month

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to determine whether a treatment might produce iatrogenic or harmful consequences. Specific criteria were not developed; each rater (see Step 6) flagged potential treatment concerns for discussion with the full panel. In the end the

Table 1 (continued)
Definitions of Factors Used to Determine the Internal Validity of Studies and How Each Factor Was Scored

Factor	Description	Total Validity Score	Scoring
Outcome measure	Type of method used to assess outcome (at the final follow-up period)	12.5%	3 = Continuous or prolonged abstinence (minimum of 60-day follow-up) 2 = 30 - 60 -day point prevalence abstinence 1 = 7 - 29-day point prevalence abstinence 0 = Other (not definable, < 7 day point prevalence)
Confirmation of cessation status	Mechanism used to confirm cessation status at the follow-up of interest	8.3%	2 = Biochemical verification 1 = Bogus pipeline (sample taken, but not measured; subjects told measure might be taken) 1 = Observer confirmation 0 = None
Participant retention	Number of participants providing cessation data at the follow-up of interest, divided by the number of participants at baseline	12.5%	3 = > 84% 2 = 70 - 84% 1 = 55 - 69% 0 = < 55%
Analysis	Use of "intent to treat" in calculating cessation rates	8.3%	2 = All participants assigned to treatment were included in the denominator in calculating quit rate 0 = Not all participants assigned to a treatment were included in the

panel deemed that only one study, involving the use of a sensory deprivation tank to treat smoking, constituted an unnecessarily large risk. Because the study also had low validity and poor cessation measures, it was eliminated from further consideration.

Step 4: Determine Whether the Treatment Can Be Effective

Once inclusion criteria had been established, the most important task was to determine whether sufficient evidence existed to conclude that a treatment can improve quit rates among adolescent smokers. Two approaches were discussed: mean quit rate and spontaneous quit rate. The use of a mean weighted or unweighted quit rate, calculated from across the body of studies, was problematic because the extant literature differs widely in terms of internal validity. Many studies did not conduct an intent-to-treat analysis that the evidence review panel considered important for determining internal validity, and these data could not always be gleaned from the reports. Additionally, calculating meaningful mean rates was impossible because investigators used very different time frames for posttreatment follow-up. Other considerations such as study inclusion criteria (daily smokers only vs all current smokers) and definitions of cessation were either undefined or varied.

Using spontaneous quit rate in the population, calculated from data sets such as the Youth Risk Behavior Surveillance System and Youth Tobacco Survey, was also inadvisable. The panel noted that

being included in a study increased the likelihood of cessation even among control subjects. The apparent combination of observation and social desirability effects, and interest in quitting to enroll in a program must be considered in calculating program effects. Moreover, comparison of quit rates in studies with single-group designs with a spontaneous population quit rate may create an illusion of more success in these interventions than in interventions with control groups. For these reasons, the panel did not calculate control rates.

In the end, the evidence review panel examined the number and size of treatment effects among studies with adequate controls. Quit rates were calculated, where possible, by dividing the number of quitters at follow-up in the treatment or control group, by the number of participants who were assigned at baseline to receive treatment or be in the control group. For the few studies that employed single-group designs (ie, they did not employ a control group), the panel was forced to resort to expert opinion on whether the reported quit rate in the treatment group was higher than might be expected in an appropriate control group (after considering the sample size, outcome measures, length of follow-up, and loss to follow-up).

Step 5: Develop Better Practice Criteria

The panel considered an extensive list of evidence that potential programmers, policy makers, and researchers might want to know when developing or selecting a cessation treatment for adolescent smokers. Data and time limitations, however, made it necessary to focus on the potential influence of just 4 factors on quit rates: the theoretical model that guided treatment development, the setting where treatments were delivered, the type of treatment or eligibility for treatment, and the type of treatment provider. A description of the various categories developed to address these factors is provided in Table 2. Each category was constructed to reduce the possibility that a given treatment would fall into more than one category within a given factor.

Step 6: Extract the Data

Each of the 66 studies identified by Sussman was independently reviewed by 2 panel members. If information of importance (eg, factors to determine internal validity) was missing from the study under review, panel members, by obtaining related papers or contacting the study author, collected as much critical data as possible. Each rater used the criteria developed in Steps 1 to 5. Assignments were made to eliminate potential conflicts of interest and maximize expertise. Pairs of raters then met to compare ratings and resolve differences. Unresolved differences between pairs of raters were referred to the full panel for a final decision.

Step 7: Determine Levels of Recommendation

After considerable discussion, the evidence review panel decided to use the assembled data to draw 4 possible conclusions: recommended, promising, not recommended, and insufficient evidence. The methods used to arrive at these conclusions are shown in Table 3.

Step 8: Apply the Criteria for Recommendations to the Data

Once the data had been extracted and consensus obtained on all ratings, the results were put into a series of tables that addressed each of the better practice questions. For example, one table was constructed to display all of the valid studies and corresponding quit rates and effect sizes, grouped by the various treatment settings. A similar table was constructed by grouping studies according to type of intervention, and so on. The panel then applied the criteria in Table 3 to each category within each better practice question.

RESULTS

Of Sussman's original 66 studies, 18 failed to provide an explicit outcome related to cessation behavior and were dropped from further analysis. The distribution of internal validity scores across the remaining 48 studies is shown in Figure 1. Five studies were rated high, 15 moderate, 11 fair, and 17 poor. Because the evidence review panel wanted to focus on those studies with higher scientific quality, the studies rated as fair or low in internal validity were eliminated. The following results are based on the 20 studies assessed as having moderate or high validity, which are listed in Table 4 with their validity score, theoretical ba-

Table 2
"Better Practice" Questions Examined by the Panel and How Data Were Categorized for Each Question

What theoretical approach was the treatment based on?
Treatments may be based on one or more of the following approaches Definitions were modified from Sussman.[13]

Pharmacological or nicotine dependency (provision of medications to ease cravings and/or withdrawal from nicotine)
- Cognitive-behavioral (self-monitoring, development of coping skills, stimulus control, reinforcement, building self-efficacy)

Stage of change or transtheoretical model (interventions tailored to stage of change including altering the balance of pros and cons of quitting)

Motivational enhancement (techniques to reduce ambivalence for quitting and clarify reasons for quitting)
- Affect clarification (clarifying feelings and removing internal conflicts)
- Education (provision of information about the risks of smoking, benefits of quitting)
- Fear appeal (provision of information designed to produce negative arousal)
- Response contingency (the opportunity to receive external rewards such as prizes)
- Social influences (oriented to neutralize social influences to smoke)
- Other (sensory deprivation, supply reduction)

In what setting was the treatment delivered?

School classrooms

Schools but outside the classroom (after school sessions, health clinic, etc)
- Health clinics outside the school (physician offices, hospitals, detention centers, rehabilitation centers)

Family based (through parents or siblings)
- Community based (workplaces, youth centers, etc, does not include health clinics or other health care settings such as a hospital)

What type of treatment was it?
This question required separate ratings on population vs clinical and mandatory vs voluntary.
- Population based (aimed at large groups of youth simultaneously)
- Clinical (delivered to individuals or small groups)
- Other (those studies that combined clinical and population-based approaches)
- Mandatory (treatments where youth had to participate because it was part of the normal classroom instruction or it was a mandatory disciplinary procedure)
- Voluntary (treatments where youth had exposure to the intervention because they elected to participate)

Who provided the treatment?
- Internal provider (a provider who works within the delivery system, such as a teacher delivering a classroom-based intervention or a health care professional in a health clinic)

External provider (a provider who normally works outside of the delivery system or treatment site, such as a trained psychologist or a researcher delivering the intervention in a classroom-based intervention)
- Medical (health care professionals such as physicians, nurses, dentists)
- Nonpersonal delivery (computer-based programs, self-help materials, videos)
- Peer support (lay youth trained to deliver the program)

sis of their active treatment condition, setting where treatments were delivered, intervention type (population vs clinical and voluntary vs mandatory enrolment), provider type, and quit rates.

Treatment effectiveness. Nine studies (2 of high validity and 7 of moderate validity) reported treatments that increased quit rates. The panel concluded that treatment to help adolescents quit smoking is promising.

Theoretical foundation. Cognitive-behavioral principles were at the core of 8 out of the 9 effective programs. The other successful treatment employed a combination of cognitive-behavioral principles and motivational enhancement. Cognitive-behavioral interventions may in-

Table 3
Criteria Used to Draw Conclusions

Conclusion	Criteria
Recommended	At least half (ie. 3) high-validity studies. or 2 high-quality studies plus 2 moderate-quality studies must show a significant positive treatment effect on quit rate; plus overall studies must show consistent positive results
Promising	Two high-validity studies plus at least one of moderate validity, or one high-validity study plus at least 3 studies with moderate validity, or at least 5 studies of moderate validity must show a significant positive effect on quit rate.
Not Recommended	At least half (ie, 3) of the studies with high validity, or 2 studies with high validity plus 2 or more studies with moderate validity, showed negative results.
Insufficient Evidence	All combinations of evidence that do not fall into one of the above categories.

clude: goal setting and self-monitoring, development of coping skills and self-efficacy through mastery, cognitive reframing, and problem solving as well as the use of operant techniques such as counterconditioning, stimulus control,

Figure 1
Frequency Distribution of the Internal Validity Scores of the 48 Studies Providing Explicit Cessation Outcomes

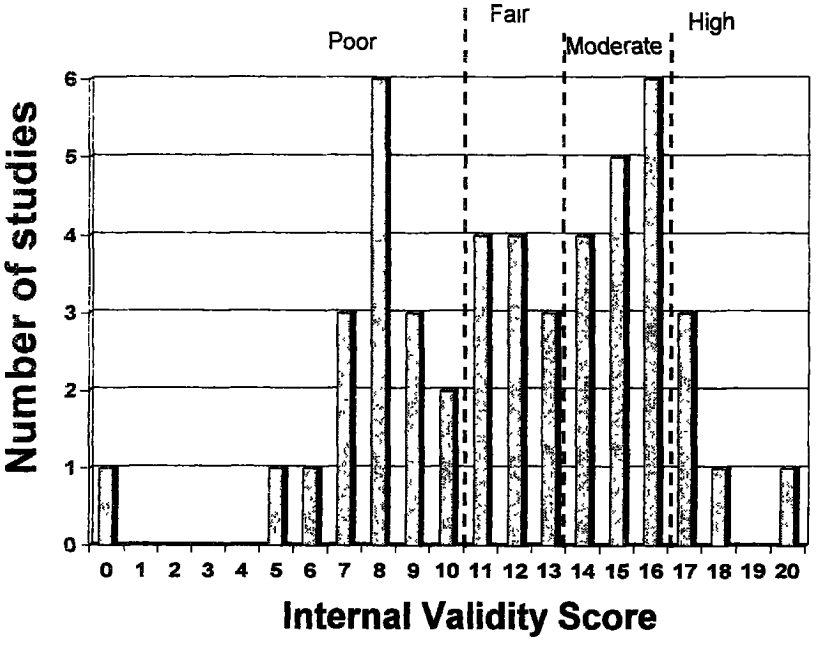

Table 4
Coding Results for Studies with Moderate to High Internal Validity and Low Risk of Treatment Iatrogenesis

Author, Year	Validity Score	Theory	Delivery Setting	Intervention Type	Provider Type	Treat Quit Rates	Control Quit Rate	Diff.
Glasgow et al[16]	20 (high)	Cognitve behavioral	Clinical	Voluntary	Medical	10.0	3 0	7 0*
Aveyard et al[17]	18 (high)	Cognitive behavioral/ stage of change	Classroom	Mandatory	Internal (teachers)	20.3	19.7	0 6
Baskerville et al[18] Hotte et al[b]	17 (high)	Response-contingent	School setting	Population based Voluntary	Internal peer support	2 4		
Sussman et al[19]	17 (high)	Cognitive behavioral	School setting	Voluntary		4.2	7.9	-2.7
Sussman et al[20]	17 (high)	Cognitive behavioral	School setting	Voluntary	Peer support	19 0	10.0	9 0*
Ary et al[21]	16 (moderate)	Social influences	Classroom	Multiple risk behaviors Mandatory	Internal peer support	35.0	31 0	4 0
Bauman et al[22]	16 (moderate)	Multiple theories (eclectic)	Family based	Population based Voluntary	External (health educator)	0 0	0.0	0 0
Colby et al[23]	16 (moderate)	Cognitive behavioral /motivation enhancement	Clinical	Voluntary	Medical	20.0	10 0	10.0*
Dino et al[24]	16 (moderate)	Cognitive behavioral	Classroom	Voluntary	Internal (school staff)	20 0	12.0	8 0*
Dino et al[25]	16 (moderate)	Cognitive behavioral	Classroom	Voluntary	Internal (school staff)	20.0	0 0	20 0*
Pallonen et al[26]	16 (moderate)	Cognitive behavioral/ stage of change	School setting	Voluntary	Nonpersonal (computer)	1 4		
Burton et al[c]	15 (moderate)	Cognitive behavioral	School setting	Voluntary	External (health educators)	6.8	7.9	-1 1
Coleman-Wallace et al (TEG)[27 d,e]	15 (moderate)	Education	School setting	Mandatory	Internal (teachers)	9.0		

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Table 4 (continued)
Coding Results for Studies with Moderate to High Internal Validity and Low Risk of Treatment Iatrogenesis

Author, Year	Validity Score	Theory	Delivery Setting	Intervention Type	Provider Type	Treat Quit Rates	Control Quit Rate	Diff.
Digiusto[28]	15 (moderate)	Cognitive behavioral	School setting	Voluntary	External (psychologist)	23 0	18 0	5 0*
Eakin et al[29]	15 (moderate)	Cognitive behavioral	School setting	Voluntary	External (counselors)	12.0[a]		
Greenberg et al[30]	15 (moderate)	Affect clarification (T1)	School	Voluntary		40.0	32 0	8 0
		Education (T2)	School	Voluntary		20 0	32 0	-12 0
		Fear appeal (T3)	School	Voluntary		12 0	32 0	-20 0
Coleman-Wallace et al (TAP)[27 d e]	14 (moderate)	Cognitive behavioral	School	Voluntary	Internal (teachers)	15 0[a]		
Horn et al[31]	14 (moderate)	Cognitive behavioral	Classroom	Voluntary	Internal (teachers)	14.0	4 0	10 0*
Hurt et al[32]	14 (moderate)	Pharmaco-therapy	Clinical	Voluntary	Medical	5 0		
Patten et al[33]	14 (moderate)	Cognitive behavioral	Clinical	Voluntary	Medical	7 0		

* **Statistically significant difference between treatment and control.**
a **Consensus opinion that treatment likely increased quitting.**

The following unpublished reports are from studies that were included in the evidence review. For more information, please contact the corresponding author, Dr McDonald.
b **Hotte A, Ellis E, Lindsay L, et al. Dissemination and evaluation of the Quit-4-Life cessation program for teenagers in Ottawa-Carleton high schools. A report presented to the Community Action Initiatives Program, Tobacco Demand Reduction Strategy. Ottawa, ON: Health Canada, 1990.**
c **Burton D, Chakravorty B, Weeks K, et al. Outcome of the TNT tobacco-cessation randomized trial with high school students.**
d **Colman-Wallace D, Wallace T, Wang D, et al. Predictors of adolescent smoking cessation by ethnicity and gender.**
e **Coleman-Wallace D, Montgomery S, Lee JW, et al. Can effective smoking cessation programs be implemented in schools for youth tobacco users at different level of readiness?**

and contingency management. For example, one of the high-validity studies that produced increased quit rates involved information on the effects of smoking, instructions on healthy ways to cope with stress through counter conditioning (deep breathing, meditation, yoga), setting of a quit date (a form of goal setting), developing psychological strategies for coping with withdrawal, and anger management and assertiveness training.[20] Motivational enhancement involves clarifying a smoker's desire for change and reducing ambivalence about change. Although many programs provide brief information to motivate smokers (eg, pro-

viding information about the health consequences of smoking and the benefits of quitting), motivational enhancement therapy is heavily focused on clarifying a smoker's desire to quit smoking and reducing ambivalence about quitting.

Overall, 9 studies (2 of high validity and 7 of moderate validity) of the 14 that employed cognitive-behavioral principles (in whole or in part) produced a significant effect. No other theoretical foundation was used in more than one study. The one study that used nicotine replacement therapy did not appear to produce a significant positive treatment effect. The panel concluded that cognitive-behavioral approaches are a promising foundation for treatment. There is insufficient evidence to recommend any other approach, including pharmacotherapy, at this time.

Delivery setting. Half of the treatments were delivered in school settings outside the classroom; 3 of these (all of moderate validity) produced significant treatment effects. Five studies delivered their interventions through classroom settings; 3 of these (all of moderate validity) reported a significant treatment effect. Four studies delivered treatments through clinical settings; 2 of these (one with high validity, one with moderate validity) produced a significant treatment effect. The one study that delivered a treatment through families did not produce a significant treatment effect. The panel concluded there is insufficient evidence to recommend any particular treatment setting or to suggest one type of treatment setting is more effective than any other.

Type of intervention. All but 3 studies offered voluntary treatment. None of the studies that examined mandatory treatments produced a significant effect. Nine trials (2 of high validity and 7 of moderate validity) of the 16 that employed voluntary programming resulted in a significant treatment effect. All but 2 studies targeted individuals or small groups; the studies that were population focused did not appear to produce a significant treatment effect. One study attempted to treat multiple health-risk behaviors simultaneously and was unsuccessful in producing a positive effect on smoking cessation. All other studies focused on tobacco-related behavior only (although some focused on both cessation and prevention). The panel concluded there is insufficient evidence to indicate that mandatory treatments for tobacco use are effective; all studies producing a treatment effect employed voluntary enrollment and were regarded as promising.

Provider type. Two studies did not provide sufficient information to determine who delivered the treatments. Four studies (all with moderate validity) out of 6 that used teachers and school staff to deliver interventions; 2 studies (one with high validity and one with moderate validity) of 4 using medical personnel; 2 studies (both with moderate validity) of 4 employing health educators, counselors, or psychologists external to the delivery setting produced effective treatments; and one study (of high validity) of 3 that relied on adolescent peers was effective in increasing quit rates. The single study that used a computer-based expert system did not appear to be successful in improving quit rates. The panel concluded there is insufficient evidence to recommend a specific type of treatment provider or to suggest one type of treatment provider is better than another.

DISCUSSION

There is little doubt of the need for effective, practical, and safe methods to help adolescents who are established tobacco users to stop using tobacco. Social and policy changes associated with tobacco use will put increasing pressure on youth to quit, as well as health care providers, educators, and employers to offer tobacco cessation programs to youth. In the absence of quality scientific evidence to guide decision making, there is a danger that people who work with youth may adopt ineffective treatments.

This paper describes an expert panel's attempt to systematically review the scientific literature on youth smoking cessation (through January 2001) to help program providers and developers make informed decisions. Perhaps the most significant conclusion of the evidence review panel, therefore, was that promising methods for helping adolescents to quit smoking have been developed. Unfortunately, they are still rare, and relatively little is known about why they work. Moreover, the few programs that have been evaluated as effective are undoubtedly underused. In this respect, treatments for adolescent smokers are similar to those for adult smokers.[34,35] Finally,

there is also little knowledge of the effects of population interventions such as mass communication and public policy on smoking cessation among youth.

The conclusion that cognitive-behavioral models are promising is also a large step forward because it provides programmers at least one criterion for identifying potentially worthwhile treatments and provides program developers a place to begin. Researchers now have a standard to incorporate into new studies. Interventions based on other theoretical models must now demonstrate they are as good or better than those designed using cognitive-behavioral techniques. Many approaches, such as motivational enhancement and stage of change, may be regarded as highly related to a cognitive-behavioral approach, but whether these related models offer advantages beyond the basic techniques of cognitive-behavioral approaches remains to be determined.

Despite the considerable evidence that nicotine replacement therapy and bupropion are effective with adult smokers, the same level of evidence does not exist for adolescent smokers.[5] It may be unwise to think that it is only a matter of time before such approaches demonstrate their merit in light of the dearth of published studies to date and barriers to conducting pharmacological studies with adolescents. Adolescents do experience cravings to smoke and nicotine withdrawal, but on the whole, they tend to be lighter smokers than adults and may be more likely to have lower levels of nicotine dependency.[36,37] Because nicotine replacement therapy may be effective only with heavy smokers, it is at least conceivable that pharmacotherapy may not be appropriate with a large proportion of adolescent smokers.[38] To *routinely* recommend pharmacotherapies without further research is unjustified. Also, over-the-counter and prescription pharmacotherapies for smoking cessation have not been approved by the US Food and Drug Administration, Health Canada, or most other national regulatory agencies for use by persons under 18 years old. A health care provider has the discretion, however, to provide a pharmacological aid to an adolescent for smoking cessation.

The inability of the evidence review panel to draw other conclusions of consequence may be discouraging to many program providers and policy makers. Although the panel was unable to make definitive statements, several trends appear to exist. For example, the majority of quality studies that delivered treatments in classrooms settings were effective; one or 2 more studies with effective treatments would have enabled the panel to declare this a promising approach. Similarly, 2 of the 4 quality studies conducted in clinical settings were found to be effective, and 4 of 6 quality studies delivered by teachers and school personnel were effective. Hence, the inability of the panel to offer conclusions appears to be related more to the number of available studies with sufficient validity than to the consistency with which these factors produce desired treatment effects. Although the evidence review panel was unable to undertake a formal analysis of the impact of program intensity, anecdotal evidence from the 5 high-validity studies appeared to support Sussman's observation that effective treatments tend to involve a great deal of provider-adolescent contact.[13]

The present paper represents a different, perhaps more cautious, way of approaching the literature than has been performed by Sussman. The panel's approach has its own limitations and challenges. For example, the panel was able to address only a handful of questions relevant to treatment providers and policy makers. Although a considerable effort was made to reduce bias, the developed criteria and definitions and their application were based largely on expert opinion rather than empirical data. Some responses to questions were confounded with responses to other questions. For example, teasing apart effects due to provider type and settings is difficult, because they are often highly correlated: Health care professionals deliver virtually all treatments in clinical settings. Therefore, it is impossible to tell whether treatment success was influenced by setting, provider, or the necessary combination of the 2.

Another limitation was the absence of data on programs that use emerging delivery methods such as telephone counseling or web-based interventions. These and other technologies have the potential to reach and engage large numbers of adolescent smokers at a relatively low cost. Finally, it should be noted that youth smokers have diverse characteristics. It

is unlikely that one type of intervention or intervention approach will be suitable for the spectrum of needs and circumstances demonstrated by adolescents. Hopefully, future studies will provide sufficient detail on the characteristics of their samples to analyses based on factors such as gender, age, nicotine dependency, and ethnicity.

Much more must be done to stimulate quality research on tobacco cessation among youth.[11] Yet, the paucity of current research and the modest conclusions reached by the evidence review panel should not paralyze program providers and policy makers from developing and implementing thoughtful treatments for smoking cessation among adolescents. Rather they should serve as a call to action. Instead of passively waiting for the research literature to mature and for future review panels to recommend direction, treatment providers and policy makers need to become more involved in producing quality data, and they need to form strategic partnerships with applied researchers in a manner that leads to the rapid development, evaluation, and dissemination of science-based treatments. Development needs to be thoughtful, innovative, and based on existing or emerging theory relevant to youth's behavior change. Evaluation must employ rigorous, standardized methods. Simple evaluations of haphazard treatments with a handful of adolescents using unstandardized measures over short periods of time will keep the field mired in ambiguity and increase the odds of institutionalizing ineffective programs. Finally, a conscious effort must be made to publish and disseminate the results of quality evaluations, regardless of whether the results suggest a treatment is effective or not.

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Appendix 1
Alphabetical List of Contributors to the Youth Tobacco Cessation Collaborative Evidence Review Panel on Smoking Cessation Treatments for youth

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