THE ONTARIO TOBACCO RESEARCH UNIT
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Generating knowledge for public health

Smoking Cessation Interventions for Youth

A Review of the Literature

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Executive Summary

This report explores the current state of knowledge about effective and promising interventions and practices in addressing smoking cessation among youth. Cessation interventions targeting youth aged 15-19 years were of a particular interest as middle (15-17 years) to late adolescence (18-19 years) is considered a critical period for experimentation and development of regular smoking behavior.

This report reviews the academic and grey literature to identify effective and promising interventions aimed at helping youth quit smoking, as well as key factors to determine the success of such interventions.

The findings from this literature review indicate that:

- Youth cessation programs should have appropriate and relevant content, presentation approach, and frame, and take into account factors such as accessibility, affordability, cost-effectiveness, and recruitment to optimize reach and impact.
- Programs that are based on cognitive-behavioural or motivational interviewing strategies have been shown to be effective.
- There is considerable evidence of the effectiveness of established programs such as Not-On-Tobacco (N-O-T).
- Physical activity-based and school-based interventions appear to be promising options to help youth stop smoking.
- Internet and mobile-based cessation interventions are promising, although further research is needed as this remains a nascent field of inquiry.
- The evidence is mixed as to the impact of self-help, minimal interventions; however, the Quit4Life program has been shown to be successful in Canada.
- There is limited evidence on the efficacy of pharmacological and healthcare professional-delivered interventions on smoking cessation in youth, and further study is needed in these areas.
- Studies demonstrate that peer and family smoking status, social connectedness, sense of belonging, and school policies can impact youth smoking and cessation behavior.

Overall, evidence highlights the need for tobacco control programs to take a comprehensive approach. There is a need for multi-sectoral, cross-organizational collaboration to tackle the

myriad of factors that affect tobacco use and cessation in young people. Smoking cessation programs should seek to involve health professionals such as physicians and nurses, as well as parents, teachers and counselors. Interventions should also be supplemented by legislative and policy efforts to deter tobacco use among youth. Given the severe and well-known risks of smoking, it is important to continue to research and develop policies and interventions to prevent the uptake of smoking among young people, as well as to assist established youth smokers to quit smoking.

Background

Smoking is a public health epidemic, with over 80% of regular adult smokers beginning tobacco use before the age of 18.[1] Comprehensive tobacco control programs include a focus on reducing the initiation and prevalence of smoking among youth and young adults, as well as increasing access to and use of proven cessation resources and treatments. Adolescence presents a crucial window of opportunity to intervene with smoking cessation programs. As smoking cessation can help to reduce individual health risks and long-term, systemic health-care costs, there is a need for evidence-informed interventions to help youth quit smoking. This document provides an overview of the current evidence on effective and promising interventions to address smoking cessation among youth and factors to determine the success of such interventions.

Over the past 9 years, Ontario has seen a substantial decrease in smoking among youth aged 15-19: between 2003 and 2012, the prevalence of past 30-day smoking declined from 11.5% to 4% among 15 to 17 year olds, and from 23.5% to 11% among 18 to 19 year olds. However, the rates have not changed in the past 5 years. Furthermore, in 2013, 94% of past-year smokers under the age of 19 believed it was easy to obtain cigarettes; the proportion of youth holding this opinion has remained unchanged since 2011.[2]

Smoking is a learned behavior that evolves through several stages, including preparation, initiation, experimentation, regular smoking and nicotine addiction.[3] A multitude of factors can influence tobacco use among youth and their subsequent success in quitting. These include: sex; age and developmental stage; socioeconomic status; sexual orientation; education level; ethnicity; cultural background; history of tobacco use; risk-taking behavior and psychological aspects; personal acceptability of tobacco use and commitment to cessation; tobacco use among peers and family; external support for cessation; time availability; knowledge, attitudes, and beliefs about tobacco; self-esteem and self-perception; sense of control; and behavioural

skills.[4] Smoking rates are also influenced by additional factors such as the density of tobacco retailers around schools[5] as well as social and environmental influences such as those in the media, marketing, and the modeling of tobacco products through popular role models.[1]

Although young people experiment with or begin regular use of tobacco for a variety of reasons, nicotine dependence is established rapidly.[6] On average, it takes 2-3 years to become a regular smoker and addicted to nicotine. As youth become increasingly dependent on nicotine over time, it proves to be difficult to quit smoking.[7]

Young people tend to underestimate the addictive nature of nicotine. Adolescent smokers are more likely than nonsmokers to think they can quit at any time.[8] However, only about 4 percent of smokers aged 12 to 19 successfully quit smoking each year.[9] The majority of quit attempts are ultimately unsuccessful.[10] In fact, most individuals tend to relapse within a couple of days after quitting.[11] Meanwhile, many adolescents attempt to quit smoking each year. Internationally, 60-85% of young tobacco users are likely to have made at least one quit attempt and failed.[12]

Milton et al.[4] note that prevalence of quitting is lower among young smokers than adults. Youth quit attempts are rarely planned, and they tend to use unassisted rather than assisted quit methods.[13] Research indicates that youth are not attracted to adult appropriate cessation programming, making the need for youth-relevant interventions all the more necessary.[14] Finally, lack of awareness or access to cessation services, lack of interest in participating in interventions, and concerns over whether available services will understand and address young people's needs pose barriers to accessing cessation programs or services by youth.[4]

Rationale and Purpose

This report explores the current state of knowledge about smoking cessation interventions for youth. Cessation interventions targeting youth aged 15-19 years were of a particular interest as middle (15-17 years) to late adolescence (18-19 years) is considered a critical period for experimentation and development of regular smoking behavior.[15]

In this report, we summarize the peer-reviewed and grey literature regarding various effective and promising interventions aimed at helping youth quit smoking and key factors to determine the success of such interventions.

Methods

The literature search was conducted in January 2014. The following interdisclipinary databases were searched for relevant peer-reviewed manuscripts published in English between 1985 and 2014: PsycINFO, Web of Science, MedLine, and ProQuest. The key search terms were: “youth”, “adolescent”, “teen”, “children”, “high school student”, “smoking cessation”, “tobacco cessation”, “quit smoking”, “best practice intervention”, “strategy”, and “method.” The search returned 131 unique articles: all abstracts were reviewed and those providing evidence about the research question were included. The references cited in relevant studies and previous reviews of the literature were also examined. In total, 52 papers were included in the review. We also searched Google for relevant grey literature such as reports, and documents from governmental and non-governmental organizations.

Limitations

This report does not aim to provide a comprehensive review of all the evidence on smoking cessation interventions for youth; rather, it provides an overview of established evidence and promising practices about interventions that have been associated with promoting quitting among youth and factors that determine the success of such interventions. Further, the search returned very few articles related to the context in Ontario or Canada, and therefore the report relies mainly on publications from other jurisdictions. Consequently, it is important to note that the interventions examined in the report have been implemented in different tobacco control and social environments (with differing youth smoking rates, restrictions on marketing and promotion of tobacco products, social norms about smoking, etc); therefore, different outcomes might be expected when similar interventions are implemented in Ontario.

Results

1. Types of Cessation Interventions for Youth

Social-cognitive Approaches

A number of reviews of the literature on youth smoking cessation have been conducted over the past decade.[16,17,18] Although these reviews varied in inclusion criteria, and many of the studies examined lacked a comparison condition or follow-up data, the reviews appeared to arrive at

similar conclusions. The reviews suggested that cognitive-behavioral and motivation enhancement interventions were a promising approach for helping young smokers to quit smoking.

A meta-analysis of 48 youth smoking cessation studies with comparison groups[19] revealed a significantly higher average treatment quit rate compared to the average control quit rate (9.1% vs. 6.2%). Furthermore, use of social influences strategies (e.g. teaching refusal assertion skills, informing about tobacco industry promotions, media and peer social influence, etc) was also found to be relatively effective. A subsequent 2009 meta-analysis by Sussman and Sun, which involved a review of 64 relevant studies, was consistent with the previous review.[12] The authors recommend that youth interventions should include motivation enhancement, cognitive-behavioral and social influence strategies.[19,12]

It should be noted that the reviews by Sussman and Sun did not indicate which specific elements of each strategy or a combination of elements of all three strategies would result in better cessation outcomes. While the authors suggest incorporating elements of all three strategies, motivation enhancement, cognitive-behavioral and social influences, in youth interventions, they call for further work to examine the relative effectiveness of different treatment modalities for youth.[12]

Two other meta-analyses found psychosocial interventions for youth either promising or effective in general, but did not recommend specific intervention models or elements. A Cochrane systematic review of 25 randomized control trials by Grimshaw and Stanton[20] found that interventions incorporating elements of motivational interviewing, the transtheoretical (stage of change) model and cognitive-behavioral therapy are promising. Due to lack of evidence on sustained abstinence, the authors did not recommend any specific model for widespread implementation, and emphasized a need for well-designed and adequately powered research studies for adolescents.

A meta-analysis of seven research trials by Fiore et al.[21] found that the use of counseling can almost double (OR=1.8) long-term abstinence rates when compared to usual care or no treatment (e.g. brief advice, self-help pamphlets, referral). The authors concluded that behavioral counseling can be recommended as a treatment for adolescent smokers; however they could not identify any specific counseling techniques for use due to the small number of studies reviewed and variation in the content of interventions used in these studies. Meanwhile, the authors

acknowledged the need for improved counseling interventions as the absolute quit rates were found to be low (11.7%).[21]

Youth psycho-social cessation interventions that show most promise are those that include cognitive-behavioral components, motivation interviewing and social influence strategies. Yet, there is insufficient evidence demonstrating the effectiveness of specific elements of these strategies.

Pharmacological Interventions

Several systematic reviews have found limited evidence on the efficacy of pharmacological interventions in youth cessation. In a review of 10 studies of comparison and single-group design reviewed by Sussman and Sun,[19] the use of pharmacotherapy (nicotine gum, nicotine patch, or bupropion) failed to show any significant effects. Grimshaw and Stanton[20] also concluded that there was limited evidence on the effectiveness of pharmacotherapy in youth. Two studies examined in the review found that use of nicotine replacement therapy (NRT) with bupropion,[22] and bupropion alone[23] did not have any statistically significant effects on youth cessation. In another systematic review of randomized controlled trials (RTCs) of youth smoking cessation interventions, Gervais et al[24] found the effects of pharmacological therapy in youth to be inconsistent across studies, with only one of four studies[25] having an increase in abstinence six months after the quit date.

Studies that demonstrated the ineffectiveness of NRT for adolescent smokers suffered from small sample sizes and a lack of control groups. Colligan et al.[26] evaluated the safety, tolerance, and efficacy of a daily nicotine patch therapy for 8 weeks (22 mg/d for 6 weeks followed by 11 mg/d for 2 weeks) in a small sample of adolescent smokers (n=22, aged 13 through 17 years, with current smoking rate of 20 or more cigarettes per day) in a nonrandomized, open-label, clinical trial. However, only 3 of the 22 subjects (14%; 95% confidence interval, 3% to 35%) had achieved biochemically verified abstinence from smoking at the end of the intervention.[26] At 6 months follow-up, all but one participant reported smoking, resulting in a 5% long-term cessation rate.[26] However, the study revealed a significant reduction in cigarette consumption over the course of the intervention. Overall the results of this study did not support the efficacy of nicotine patch therapy.

Similarly, a non-randomized, open-label trial,[27] involving a 15 mg/16 h patch plus minimal behavioural therapy for adolescent aged 13-17 (n=101) concluded that the intervention was not an effective treatment for adolescent smokers. After six months, the abstinence rate (5%) appeared to be lower than "some of the estimates of the natural history of smoking cessation in adolescents that range from 0% to 11%".[27]

Two studies report promising results about the effectiveness of NRT for smoking cessation among adolescents. Using a double-blind, randomized design, Moolchan et al.[25] examined the effects of a nicotine patch and nicotine gum versus a placebo patch and gum (combined with cognitive-behavioural therapy) among 120 adolescents (ages 13-17 years) who smoked more than 10 cigarettes per day and were motivated to quit smoking. After twelve weeks of nicotine patch or gum with cognitive-behavioural therapy, it was found that the nicotine patch was significantly more effective than placebo in helping dependent adolescent smokers quit smoking (i.e., CO-confirmed prolonged abstinence rates were 18% for the active-patch group, 6.5% for the active-gum group, and 2.5% for the placebo group). The difference between active-patch and placebo was statistically significant.[25]

Likewise, Hanson et al[28] conducted a double-blind, placebo-controlled, randomized trial of the nicotine patch, looking at its effects on craving, withdrawal symptoms, safety, and effectiveness among adolescents (n=100 participants). The intervention was also complemented with intensive cognitive-behavioral therapy and a contingency-management procedure. The results showed that the nicotine patch had a promising impact on cessation among the active nicotine patch group who experienced a significantly lower craving score and overall withdrawal symptom score (p=.011 and p=.025, respectively) compared to the placebo patch group.[28] Given the purpose of the study, no data on quit rates were provided.

Safety of NRT for Youth

Findings from the limited number of studies suggest that that NRT is safe to implement in youth populations as an adjunct to a smoking cessation program. In their randomized control trial, Moolchan et al.[25] found that the nicotine patch (21 mg) and gum (2 and 4 mg) were well tolerated among their study participants and "appeared safe". Use of the nicotine patch was also deemed to be safe in the randomized-controlled trial by Hanson et al.[28] In this study, there were no differences in adverse effects experienced by the treatment (nicotine patch) group and the placebo patch group, except that headaches were experienced more by the participants in the placebo patch group than those in the active nicotine patch group. The nicotine patch (with daily

dosages between 11 mg/d and 22 mg/d) was also shown to be safe in adolescent smokers by Colligan et al.[26] The most common adverse effect was minor skin reactions from wearing the patch with prevalence similar to that reported in adult studies.[26]

In Canada, the federal government has restricted the sale of NRT so that youth (age 18 and under) need a valid prescription from a physician.[10] Similar age related restrictions also exist in Finland[29] and the United States.[30] In contrast, other countries for example, the United Kingdom and New Zealand, have made the sale of NRT available to youth over the age of 12.[10] Despite the NRT restrictions for youth in Canada, research indicates that a significant number of youth use NRT.[5]

Given its potential use as an adjunct therapy to core cessation programming, larger clinical studies of NRT are needed to enhance knowledge about its effectiveness and safety for youth smokers.[25,28]

Internet and Mobile Approaches

One of the recent, emerging trends in smoking cessation programming is the advent of web- and mobile-based approaches. Web- and mobile-based technologies can serve as useful tools for disseminating smoking cessation programming due to their interactivity, appeal, and wide reach.[31]

Internet-based Interventions

Only a limited number of studies have examined the effect of internet-enabled interventions on youth health outcomes.[31] Norman et al.[31] showed that the use of an interactive website, *Smoking Zine*, complemented by journal writing and motivational interviewing, provided motivation for cessation among smokers most resistant to quitting at baseline and prevented nonsmoking adolescents from becoming regular smokers at 6 months. Two studies using internet-assisted program instruction,[32] and a website combined with proactive phone calls[33] have resulted in increased quit attempts and reduced smoking among youth.

On the other hand, a study by Patten et al.[34] produced mixed results. The study looked at the efficacy of a home-based, internet cessation program (Stomp Out Smokes [SOS], n = 70) compared with a clinic-based, brief office intervention (BOI, n = 69). The SOS website resulted in significantly greater reduction in the average number of smoking days than BOI ($p = .006$),

however the smoking abstinence rate at week 24 for SOS was lower (6%) than for the BOI intervention (12%), although this was not statistically significant.[35]

A follow-up study by Patten et al.[35] examined how youth participants engaged with the SOS system, and what characteristics were associated with SOS use in order to optimize the design and efficacy of future internet-based strategies for young smokers.[35] This study found that primarily *interactive* pages were viewed far more than those that were primarily *informational* (median pages accessed 65 vs. 6); females used the interactive pages more than males (median pages accessed 93 vs. 51); and the discussion support group and quit plan were the most frequently accessed SOS components as indicated by the proportion of page hits (35% and 30% respectively). The qualitative analysis revealed that adolescents sought support for quitting and more specific guidance on how to quit in the discussion support group.[35] High frequency of use of the discussion support group was found to be "consistent with prior studies evaluating web-based studies with adult and adolescent smokers".[35] The 'ask an expert' section of the website was minimally used, in contrast with prior studies on home-based internet interventions.[35] Adolescent smokers preferred seeking support from their peers through the discussion support group, as opposed to adult or teen "experts".[35]

The use of electronic media in designing smoking cessation programming seems particularly appropriate for adolescents because they are large users of internet technologies and consumers of online health information.[31] Despite their potential, many questions remain about how to optimally develop and implement internet-based interventions. Some of the barriers to online programming include: uniformity (how to give all participants a similar experience); security and privacy (how to limit the intervention to participants, protect their rights, and avoid contamination); sampling (how to recruit and retain participants), and follow-up (how to track participants over time).[31]

Given the limited number studies in this area, the current evidence is inconclusive about the role of internet-based strategies in youth smoking cessation. Continued research in this area is needed, especially given the speed at which technologies evolve.

Mobile-based Interventions (Texting/SMS)

Young people are more disposed to mobile phone use, with text messaging in particular being a frequent form of leisure time activity.[36]

There are several potential benefits to mobile -based cessation programming. Text messaging not only allows for wide reach of program content, but also saves time and costs when compared to personal interventions such as counseling.[36] In a randomized controlled trial examining the effectiveness of a mobile phone text messaging smoking cessation program among youth and adults (ages 15 and over), Rodgers et al.[37] found that affordability, personalization, age specificity, and lack of dependence on location were all major advantages of SMS-based cessation interventions. Mobile-based interventions can be easily implemented across schools or via national prevention campaigns.[37] Mobile-based interventions are also easily adaptable and customizable. For example, the frequency of messages can be altered and/or optimized to best serve the target individuals' needs, and youth can also be targeted regardless of their motivation to quit.[36]

There are limited studies available on the efficacy of such interventions in both youth and adults. A study focusing on youth was recently conducted by Haug et al.[38] In a two-arm cluster-randomised controlled trial testing the efficacy of an SMS intervention for smoking cessation in adolescents and young adults (n=755: intervention: n=372; control: n=383), Haug et al.[38] did not find the SMS intervention to have statistically significant short-term effects on smoking cessation (7-day smoking abstinence rate at follow-up was 12.5% in the intervention group and 9.6% in the control group (ITT: P=.92). However, the intervention did result in statistically significant lower cigarette consumption (ITT: P=.002). Additionally, it resulted in significantly more attempts to quit smoking in occasional smokers. Overall, the study demonstrated the potential of SMS-based interventions in smoking cessation efforts, but the impact on quitting is inconclusive.

Although the benefits of mobile technology for youth cessation interventions are promising, further research is needed to determine the long-term effects of such interventions on youth cessation.

School-based Interventions

Systematic reviews have found classroom and school-based cessation programs to be effective relative to other channels, such as through medical clinics, family or other settings. The authors suggest that cessation interventions should be delivered in a school-based context.[19,12] In a systematic review of randomized controlled trials of youth smoking cessation interventions, Gervais et al.[24] found that three of four behavioural interventions conducted in school settings

demonstrated positive effects, increased abstinence four weeks to 24 months after the interventions.

There are a number of potential benefits of school-based youth interventions, including: their reach, impact, relevance to youth, and relatively low cost.[39] These types of interventions also allow for enhanced communication and engagement with parents of youth smokers as parents can be sent information about smoking and cessation (e.g., newsletters), help provide program feedback, and be given guidance to support the cessation process.[14]

The literature indicates that school-based cessation programs show promising results in achieving cessation among youth; however continued research is needed in this field.

Interventions Delivered by Health Professionals

Physicians

A physician's office can serve as an important setting for cessation message delivery for smokers. For many smokers wanting to quit, their doctors are their first point of contact to gain advice and assistance on cessation techniques.[40] A meta-analysis of seven studies exploring the effectiveness of physician advice to quit smoking showed that brief physician advice (an interaction of 3-5 minutes) significantly increases long-term smoking abstinence rates.[21]

Despite the potential for cessation interventions delivered by physicians to youth, recruitment of physicians in such initiatives presents a challenge.[41] A number of possible barriers may prevent physicians' participation in cessation programming such as: lack of time, lack of incentives, and beliefs that smokers will be unable or unwilling to quit. Increased physician buy-in for their role in smoking cessation could help to increase quit rates among youth.[40] Ways to garner such support could include: endorsement from physician organizations and prominent members of the medical community; cost-efficiency, flexibility, provision of resources, and easy-to-understand program materials.[42,40] Moreover, physicians themselves should be knowledgeable about innovative treatments, and have confidence in their abilities to help patients quit.[40]

Nurses

There is limited evidence about the impact of nurse-delivered interventions on youth quitting or other behavioral changes (e.g. reductions in smoking). Further research is needed to assess the effects of nurse-delivered interventions on youth smokers. However several studies noted the

opportunities for nurses to be involved in cessation programming for youth, especially in schools.

In the school setting, school nurses are in an ideal position to make impact in smoking cessation, given their devotion to the health and welfare of students.[14] Specifically, nurses can communicate new health knowledge, provide smoking cessation interventions, provide brief smoking cessation counseling to students, and develop and provide support for school policies addressing smoking.[14] Moreover, students view school nurses as "nonauthoritarian, nonjudgmental and credible", and able to assure confidentiality more than teachers.[14]

In a randomized control trial evaluating a school-based, smoking harm-reduction intervention school nurses found the resources (incorporating motivational interviewing techniques and written activities) to be appropriate, useful, and complementary to their other school-wide approaches to assist adolescents to quit smoking; and made them more interested in enhancing their smoking cessation role in the school.[14] Furthermore, Wewers, Ahijevych, and Sarna[43,11] and Fritz et al.[11] found that a team approach, in which nurses collaborate with teachers, counselors, health class instructors, athletic coaches, community members, and parents, produced optimal results in cessation efforts among students.

Cessation and Physical Activity

Physical activity might contribute positively to cessation efforts because it spurs several mediating mechanisms such as reductions in weight gain, withdrawal symptoms, and cigarette cravings, the latter two of which are known to directly impact cessation.[44] It may also instill feelings of competency, motivation, and self-efficacy among youth, which would be helpful in the cessation process.[44]

The literature shows promising implications of physical activity on smoking cessation efforts. In a longitudinal cohort study looking at the predictors of smoking adoption among 978 high school students, Audrain-McGovern et al.[45] found that higher levels of physical activity reduced the odds of progressing to smoking or a higher level of smoking by nearly 1.5 (1.44; $P < 0.05$). In a nationally representative survey of U.S. high school students, Escobedo et al.[46] found that students who participated in interscholastic sports were less likely to be regular and heavy smokers than those who did not participate. Likewise, using a cross-sectional, population-based

design (n=4746), Larson et al.[47] saw that smoking frequency was inversely related to participating in team sports, eating regular meals, and consuming healthful foods and nutrients.

In a study by Horn et al.,[44] a physical activity component (FIT) was created as an adjunct to the Not-on-Tobacco (N-O-T) program, a smoking cessation program targeted to youth 14-19 years of age. The study employed a randomized group design with 3 conditions: brief intervention (BI) vs. N-O-T vs. N-O-T + FIT. At 6-month post-enrolment, the CO-validated 7-day quit rate was significantly higher among youth in the N-O-T + FIT group compared to those in the N-O-T and BI groups (31.2% vs. 21.1% and 15.9% respectively). There were also gender differences in outcomes: girls were more likely to quit through N-O-T than BI components at 3 months post-enrolment, while boys had higher likelihood of quitting with N-O-T + FIT than BI or to N-O-T components. The authors thus concluded about the effectiveness of the physical activity adjunct to N-O-T program, particularly for boys.

Promising Interventions

Not-on-Tobacco (N-O-T) Program

The Not On Tobacco (N-O-T) program, established and coordinated by the American Lung Association[48] has been widely implemented and rigorously evaluated in the U.S., and has been selected by Centers for Disease Control and Prevention as a model program. Based on social cognitive theory, the 10-week N-O-T curriculum helps high school students to (1) stop smoking, or reduce the number of cigarettes smoked, (2) improve life skills, and (3) increase healthy lifestyle behaviors. The program identifies youth's reasons for smoking, healthy alternatives to tobacco use, and people who will support them in their efforts to quit. N-O-T covers the entire quitting process, including preparing to quit and preventing relapses Dino et al.[49] indicate that N-O-T is a highly cost-effective cessation intervention. The program takes place in the school setting, and is implemented by trained teachers, counselors, nurses and health educators. It is a structured, educational initiative that allows educators to take a non-punitive approach to stopping smoking in youth.

Evaluation studies of over 12,000 teens who participated in the N-O-T have shown that the program helped approximately 90% of teens to either quit or reduce smoking. The N-O-T program produced intent-to-treat quit rates between 15% and 19%.[49] In a controlled, field-based evaluation involving approximately 6,130 youth from 5 states and 489 schools, Horn et al.[50] found the participants of N-O-T to have consistent, significant positive smoking behavior change, with N-O-T youth being two times more likely to quit than then youth in a comparison condition

(OR = 1.94; p = .002; 95% CI 1.267-2.966). Additional benefits of the N-O-T program include higher school grades and enhanced self-esteem.[44] Evidence is largely conclusive that N-O-T is an effective method for achieving smoking cessation in youth.

Quit 4 Life/Vie 100 Fumer (Q4L)

Quit 4 Life/Vie 100 Fumer (Q4L) has demonstrated promising results in promoting smoking cessation among youth. Q4L was developed by Health Canada, in association with the Canadian Lung Association and Ciba-Geigy Ltd. in 1993.[51] As a minimal contact, self-help program, it is directed at teenagers aged 13-18 years old who smoke cigarettes on a daily basis. Quit 4 Life is based on behavioural principles, helping to build self-efficacy and motivation; and consists of an interactive web site, a handbook and facilitators' guide for nurses, teachers and professionals who work with youth.[51] The program content focuses on four youth's stories and their experiences quitting smoking; and is organized around 4 central steps: Get Psyched, Get Smart, Get Support, Get On With It. Quit 4 Life helped youth smokers learn about why they smoke, how to quit and how to maintain cessation once one gets there.

In 2003/2004, Health Canada piloted and evaluated the Q4L group program in five sites across the country. A total of 114 participants completed follow-up surveys between 12 and 18 months after program completion, corresponding to 31% of the entire sample of Q4L pilot participants. While the findings were positive, they must be interpreted with caution given the low response rate. The evaluation results revealed that the average number of cigarettes smoked decreased from 12.4 per day at program entry to 5.9 at program end, and 7.7 at 12-18 month follow-up.[51] The number of quit attempts increased from 1.9 in the previous year (at entry), compared to 2.5 quit attempts at follow-up.[51] Moreover, 73% of Q4L participants indicated that they were still smoking less than when they started the program.[51] Many youth continued to feel motivated to quit following the program (56% at follow up, compared to 42% at program end), and indicated that health factors and the strategies that they had learned during the program were the most important factors which had motivated or will help them in the future to quit.[51]

2. Internal and Program Related Factors Affecting the Success of Cessation Interventions for Youth

Individual's Intentions to Quit

According to Leatherdale,[52] the success of a cessation program depends on the individual's willingness to quit in the first place. The Theory of Planned Behavior states that the immediate

precursor of quitting smoking would be an individual's intention, or how hard they are willing to try or how much effort they are planning to exert in order to quit.[53] The first step in better understanding youth cessation is to "better understand the factors associated with intentions to quit smoking among youth populations".[52] Using a cross-sectional study with self-reported data collected from 26,379 grade 9 to 12 students in Ontario, Canada, Leatherdale found that intentions to quit can be influenced by a number of possible factors such as having friends who smoke, the frequency of smoking, being overweight, and being physically inactive – all of which are negatively correlated with quitting smoking.[52] Additional factors include self-efficacy and self-identification as a smoker, as many young smokers tend to either overestimate their ability to quit smoking, or do not consider themselves to be 'smokers' in the first place.[52]

Program Design and Relevant Messaging

A review of the literature shows that there are a number of strategies to optimize program design and messaging that enhance the impact of cessation interventions. For instance, Latimer et al.[54] conducted a formative evaluation to identify the optimal content and presentation approach for adolescent-targeted smoking cessation messages (n=151 high school students, aged 13-18 years). The results indicated that "message targeting" should focus program messaging towards the interests and characteristics of the target population – in this case, youth – in order to be more persuasive and effective. That said, many of the messages currently in the public domain are either unfocused (i.e., they dually promote smoking prevention and cessation in the form of anti-smoking campaigns), or are irrelevant or uninteresting to youth (e.g., generic warning labels on cigarette packages, which are shown to be paid attention to only some of the time).[54] According to Lane *et al.*,[10] young smokers are not attracted to existing evidence-based better practices for cessation such as telephone quit lines, and health professional guidance.

To design more "relevant" programming for adolescents, Latimer *et al.* suggest there are three factors to consider: preferred message *content, presentation approach,* and *frame*.[54] In regards to *content*, a 'future orientation' tends to lead to more socially desirable, health-promoting decisions and should therefore be emphasized.[54] According to a study of high school students' smoking behaviour and perceptions toward smoking (n=64), information that stresses the short- and long-term physiological and pathological effects of smoking has the potential to improve quit rates.[11] A quantitative study which interviewed teen smokers (n=64) about their state of mind, the availability of cigarettes, and coping strategies used to resist smoking, found that 'shock value' in the form of graphic videos depicting head and neck tumours and patients with

laryngectomies force adolescents to contemplate the health risks of smoking.[55] At the same time, Sussman and Sun emphasize that program content should also be as interesting and fun as possible, with dramatizations, games and other interactive activities.[12]

Presentation approach encapsulates the credibility and relevance of the message.[54] In other words, messages that are delivered by a spokesperson with whom the target population can relate, and that are delivered in the context of a relevant or popular genre/format are shown to have enhanced persuasiveness.[54] In the case of adolescents, younger models are preferred in anti-smoking and cessation programs, while formats such as video can increase the appeal and relevance of the information provided.[54] Overall, the delivery and tone should be "informative but not preachy".[56]

Latimer *et al.* state that messages can be *framed* as either 'gain-framed' (i.e., emphasizing the benefits) or 'loss-framed' (i.e., emphasizing the costs), which can have different impacts on the persuasiveness of the health message.[54] In their study, loss-framed cessation programming was understood easier by youth, and resulted in more positive attitudes towards quitting.[54]

Length of Programs

Both the 2006 and 2009 meta-analyses by Sussman and Sun found relatively higher quit rates for programs offering at least 5 sessions.[12,19] There was no incremental effect of including additional sessions and therefore the authors recommended that youth programming should consist of at least 5 sessions.

Accessibility of Programs

The evidence suggests that youth-focused cessation programs should be geographically and temporally accessible, such as in the school setting and during school hours, in order to ensure maximum reach.[12] Programs that do not require youth to be physically present are especially advantageous in this regard. For example, in a review of mobile phone-based interventions for smoking cessation, Whittaker et al. found that such interventions provide opportunities for individualized and interactive information that can be delivered anywhere, at appropriate times, confidentially, and direct to the participant with minimal direct contact.[57] These are characteristics that may be appreciated by youth populations.[57] While accessibility appears to be a crucial factor to consider in youth cessation programs, further research is required to

understand how and where youth engage with programming, especially given the constant introduction of new technologies in youth's lives.

Affordability and Cost-effectiveness of Programs

Cessation programs should be cost-free and cost-effective, having maximum reach while employing minimal resources.[12,31] Affordable interventions such as those based on SMS/mobile or internet strategies, are attractive models to increase cessation rates among adolescents.[31] This is because they can be administered independent of smokers' motivation to quit, and targeted toward smokers from all socio-economic backgrounds due to the wide availability of electronic devices.[36]

Furthermore, when resources and monetary costs associated with program delivery are low, a greater proportion of youth smokers can be targeted. For instance, electronic interventions in general tend to be more cost-effective than methods such as one-on-one counselling.[58] Internet or mobile-based interventions allow for program registration, content, and assessment to be administered online on any computer with Internet access or mobile phone with service provision.[31] Additionally, school-based programs based on physical activity, can be incorporated into the school curriculum, allowing for a cost-effective way to reach youth.[59]

While affordability and cost-effectiveness appear to be important factors to determine the success of youth cessation programs, further research is needed in this area, to assess their relevance among various youth subgroups and subpopulations.

Recruitment

In a review of 64 studies, Susman and Sun[12] found that direct interpersonal contact of treatment personnel (agent, facilitator, etc) with potential participants and recruitment in contexts that include most potential participants (e.g., classrooms) resulted in relatively high reach. The most popular recruitment strategies included: word of mouth, public announcements, screening, monetary incentives (movie tickets, gift cards, money). Because multiple strategies were used in most studies, the researchers could not identify which recruitment methods are the most effective, suggesting that the use of multiple strategies is likely to lead to a higher reach of the target population.

Recruitment of youth in interventions is a constant challenge to cessation success. Recruitment should be a key part of intervention planning as many youth smokers tend to underestimate the need for professional assistance, or face other barriers to access such as lack of awareness of services, lack of knowledge about the cessation process, geographical distance, etc.[4] In order to optimize reach, researchers suggest that programs should involve local agents, who can disseminate information at the grassroots level e.g., in schools and community centres.[60]

Gender-based Approach

Success of cessation interventions may also depend on participants' gender. For instance, a school-based intervention study by Fritz et al. found that males and females exhibited different reasons for smoking.[11] More assertive recruitment techniques may be required for enrolling males into cessation programs due to male participants' tendency to downplay the health risks associated with smoking.[11] On the other hand, female participants appeared more psychologically attached to smoking than their male counterparts as they tended to smoke when they were upset, depressed, worried, and/or in order to control their weight.[11] Therefore the researchers expressed a need for quit strategies for females that focused on increasing self-efficacy, and included a nutritional component. The evidence in the literature for the need for gender-specific programming is limited. Further study is needed to understand whether interventions need to be tailored separately for male and female youth smokers.

3. External Factors Affecting Smoking Cessation among Youth

A multitude of systemic, psychosocial, and environmental factors can also affect the success of cessation efforts among youth. Studies demonstrate that the smoking status of peers and family, social connectedness, sense of belonging, school policies and a comprehensive tobacco control approach in general, can impact youth's smoking and cessation behavior.

Peer and Family Influences

Existing evidence demonstrates that youth's attitudes towards smoking and cessation are shaped by peer and family influences, as well as their sense of belonging to their community. According to Smith et al.,[61] having more favorable attitudes toward remaining tobacco free, and perceiving that friends would not be supportive of smoking are both associated with decreased likelihood of intending to smoke. Increased odds of intentions to smoke are associated with normative influences and peer use, such as having more friends who smoke.[60] Using data from

the 2004 National Youth Tobacco Survey, Villanti, Boulay and Juon[62] found that peer smoking and smoking at home are strongly associated with current smoking among early and middle adolescents. The association between peer smoking and current smoking decreased in magnitude from early adolescence to middle adolescence, while the association between smoking at home and current smoking remained static across the developmental stage.[62]

Similarly, in a cross-sectional study using elementary school data from the Tobacco Module of the School Health Action, Planning and Evaluation System (SHAPES), Leatherdale et al. found that non-smoking grade 6 and 7 students are more likely to be susceptible to smoking if they have (a) smoking friends, (b) a mother who smokes, or (c) two or more close friends who smoke and attend a school with a relatively high smoking rate among the grade 8 students.[63] There is also evidence that cigarette consumption by an elder sibling is significantly correlated with a higher probability of youth smoking.[64,65] According to Schultz et al.,[65] older siblings act as role models for behaviors and a source for obtaining tobacco products that youths are otherwise unable to legally purchase.

Given that smoking behaviours are impacted by youth's peer and family networks, it may be important for programs to include a component which addresses the role that family and friends can play in the cessation process, and even perhaps, extend the reach of the programming beyond the individual. For instance, Bricker et al.[66] found that parental smoking cessation is associated with reduced risk of their children's daily smoking. Using a prospective study design (n = 3012), the authors assessed parental smoking status when children were aged 8/9 years and then assessed the children's smoking status at age 17/18 years. It was found that when both parents quit smoking, children's odds of daily smoking were reduced by 39% (95% CI=15- 56%) compared to when both parents were current smokers. Furthermore, when both parents never smoked, children's odds of daily smoking were reduced by 71% (95% CI=62%, 78%). Likewise, Schultz et al. suggest that parents play a significant role in supporting their children's resolve to remain smoke-free regardless of their own smoking status.[65] Smoking bans in the home and in the vehicles when children are present can help sustain a strong resolve to remain smoke-free throughout their adolescent years (grades 5 to 9). For older youths (grades 10 to 12) whose resolve has weakened, household and vehicle smoking bans have limited effects on decisions to initiate smoking and stay smoke-free.[65]

Connectedness and Sense of Belonging

School connectedness and sense of belonging to the community are also associated with smoking and quitting among youth. According to Sabiston et al.,[67] constructs such as attachment, culture, students' sense of community, and connectedness are all protective of smoking behaviour. Based on social control theory, an adolescent's social bond to the school is "likely protective of deviant acts such as tobacco use because he or she feels compelled, or committed, to adhere to appropriate behavioral standards".[67]

These data suggest that cessation initiatives may benefit from involving peer and family networks and investing in social capital, as a means to increase youth cessation intentions and decrease the amount of youth smoking.

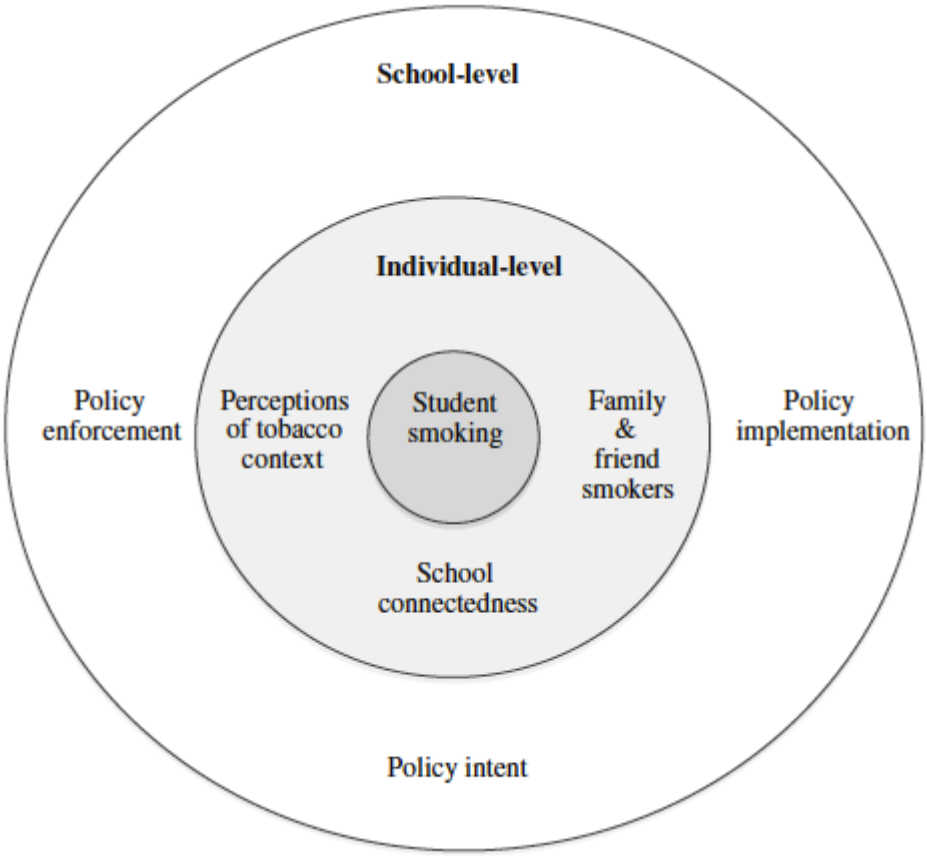
Comprehensive Approach

Overall, it is important for tobacco control programs to take a comprehensive approach.[4] There is a need for multi-sectoral, cross-organizational collaboration to address the myriad factors that affect tobacco use and cessation in young people.[4] Smoking cessation programs should seek to involve health professionals such as physicians and nurses, as well as parents, teachers and counselors. They should be targeted at multiple levels, from the individual and community to broader environmental and political levels (see Figure 1).

Outside the school environment, legislative and policy efforts can also help to deter tobacco use among youth.[4] These may include stricter regulatory policies that protect youth from secondhand smoke, increased taxes on tobacco to make cost a barrier, and creation of more smoke-free public places to make tobacco use less socially acceptable.[4]

Moreover, mass media can play a crucial role in preventing and/or reducing smoking among youth. For example, to counteract the advertising and promotional influence of tobacco companies, counter-advertising can help to create an environment where smoking is seen as socially undesirable or unacceptable among youth, thereby increasing motivation and interest to quit.[4]

Figure 1: The Ecological Perspective of Student Smoking Behaviour



Source: Bricker JB, Leroux BG, Peterson AV Jr, Kealey KA, Sarason IG, Andersen, MR et al.[66]

Conclusion

The findings from this literature review indicate a number of key considerations in developing smoking interventions for youth. Programs should have appropriate and relevant content, presentation approach, and frame; and take into account factors such as accessibility, affordability, cost-effectiveness, and recruitment to optimize reach and impact to youth populations. There is strong evidence that programs based on cognitive-behavioural or motivational interviewing strategies are effective. Established programs such as Not-On-Tobacco (N-O-T) have also shown to be effective.

A number of cessation strategies seem promising yet require further study. One such area is internet and mobile-based interventions, which despite their interactivity, wide reach, and potential appeal among youth, represent a nascent field of inquiry. Physical activity-based and school-based interventions also appear to be promising as options to help youth stop smoking. The literature review revealed mixed evidence about pharmacological and self-help/minimal interventions, where further research is needed specifically in youth populations. There is also a need for further studies on the impact of health professional-delivered interventions on youth cessation efforts. While other reviews of the literature conclude that cessation programs in general are effective in helping youth quit smoking,[19] reviews conducted by Grimshaw and Standon[20] and McDonald *et al.*[18] indicate that additional evidence is yet needed in order to ascertain their effectiveness.

Overall, it is important for tobacco control programs to take a comprehensive approach to address the systemic, psychosocial, and environmental factors that influence smoking behavior and smoking cessation.[4] Studies demonstrate that peer and family smoking status, social connectedness, sense of belonging, school policies and a comprehensive tobacco control approach, can impact youth's smoking and cessation behavior. Interventions should be supplemented by legislative and policy efforts to deter tobacco use among youth.[4]

Given the severe and well-known risks of smoking, it is important to continue to research and develop policies and interventions to prevent the uptake of smoking among young people, as well as to assist established youth smokers to quit smoking. Adolescence presents a crucial window of opportunity to intervene with youth smoking behaviour. Understanding and developing cessation interventions focused on young smokers is necessary as most of these youth either want to quit on their own or quit with help from their friends, displaying limited interest in formally organized programs. Further studies would increase knowledge and awareness of how to best tailor the setting and practices for cessation interventions among youth smokers.

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