

Tobacco Control Research: A Journey of Discovery in Prevention and Cessation

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My personal journey as a tobacco researcher started at the University of Northern Colorado where I was an assistant professor of psychology and helped a student with his master's thesis study on "rapid smoking." This therapy is a format of aversion counter-conditioning, the purpose being to turn the previously pleasant experience of smoking into an aversive event. Subjects were asked to puff on their usual brand of cigarette every 6 seconds, and my job was to call out "smoke" to prompt the participant at the end of each interval. My first subject was puffing away on schedule, and within a few minutes he was turning blue, and I was dying from all of the smoke in the small unventilated clinic room. He grew suddenly nauseated and threw up as I grabbed the wastebasket, unprepared for this event. That was my introduction to tobacco cessation research.

During my 30 years in the field, I have witnessed many changes. We have made significant progress in reducing the prevalence of tobacco use, yet it remains the number one preventable cause of death in the United States, implicated in over 430,000 deaths annually.^{1,2} Each day, more than 3000 children and adolescents join the nearly 25% of adults who smoke cigarettes or use smokeless tobacco products.³

This paper will share personal perspectives about shifts in the focus and content

of tobacco-related research, highlighting 3 areas: clinical and public health cessation efforts, traditional prevention approaches, and a new focus on reducing antisocial behavior and promoting school adjustment as an innovative way to reduce the onset of tobacco use.

Trends and Changing Context for Tobacco Cessation Research

My experience in aversion therapy was only one example of the research typical at the time, largely conducted in clinical settings with volunteers who wanted to quit smoking and were willing to come to several group or individual sessions with a trained therapist. For a long time, tobacco cessation programs focused on these intensive methods, changing one or more variables to determine what methods worked best for cessation and long-term abstinence. The cessation rates for the various methods did not differ much, and they reached very few of the smokers who needed assistance. (See Table 1.) What was needed was a more effective way to reach a large number of smokers and to do so in a cost-effective manner. Clinical interventions are an important element in assisting smokers to quit, especially high-risk or highly dependent smokers. However an estimated 95% of smokers quit on their own, with no professional treatment,⁴ and in the past quarter century, tobacco cessation research has expanded to include a public health orientation to encourage those who can quit with minimal help.

Currently, tobacco cessation treatment exists on a continuum from clinical, individual-focused treatment to population-based, public health interventions.^{5,6,7}

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Table 1
Comparing Clinical and Public Health Interventions for Tobacco Cessation

Clinical Mode	Public Health
<p>Focus on individual behavior change Advantage: Higher quit rates Disadvantages: Costly in time and expertise Low reach to target group</p>	<p>Focus on populations or groups Advantage: Low cost, broad reach to smokers Disadvantage: Low quit rates</p>

Public health or population based interventions typically try to identify and reach all smokers in a given setting (such as medical clinics), irrespective of the smokers' interest in quitting, and the intervention is typically brief and delivered by nonspecialists. Although clinical interventions typically report higher cessation rates (such as 25-30% at one-year follow-up as compared to the 10-15% quit rates for public health interventions), both kinds of interventions are important elements in our effort to reduce smoking. Although cessation rates may be lower, the public health approach is designed to reach a much larger population, so with the larger denominator the overall impact is much greater. One could argue that the movement from clinical research to public health interventions has been one of the major changes in the tobacco

cessation field over the past quarter century and continues to be an impetus for the success in reducing the prevalence of smoking in the United States.

One way to consider the public health impact of an intervention is to use the RE-AIM model reported by Glasgow and colleagues.⁸ In this model (Table 2), the *Reach* of the intervention is multiplied by its *Efficacy* to determine the overall impact on prevalence. If only the individual dimensions of reach and efficacy were used in an evaluation, one might conclude that the intervention has a large potential effect. However even if an intervention had a large impact in terms of reach (eg, all patients coming to an adopting medical clinic) and efficacy (eg, high quit rate for patients receiving the intervention), the overall impact would still be quite small if the program were only

Table 2
RE-AIM Framework for Evaluating Public Health Impact of an Intervention

Level	Dimension	Definitions
Both	Reach	<ul style="list-style-type: none"> · (Individual) Participation rate among eligible individuals · (Setting) Participation rate among eligible clinics
Individual	Efficacy	<ul style="list-style-type: none"> · Effects on primary outcome of interest
Setting	Adoption	<ul style="list-style-type: none"> · Participation rate among possible settings · Representativeness of settings participating
Setting	Implementation	<ul style="list-style-type: none"> · Extent to which intervention delivered as intended · Time and costs of intervention
Both	Maintenance	<ul style="list-style-type: none"> · (Individual) Long-term effects of intervention (>=6 months) · (Individual) Impact of attrition on outcomes · (Settings) Extent of continuation/modification of intervention

adopted, implemented, and maintained at a small number of clinics and required specific resources that are not available in the typical "real world." Comparison of the public health impact of programs using this model can help evaluate the overall impact of a program and help policy makers allocate resources accordingly. Public health interventions may reach large populations of smokers either through health clinics or via mass media, such that even with a low efficacy of 10% achieving cessation, the overall impact will be greater than more successful programs that have limited reach. This model provides a nice way to compare the relative impact of different interventions, and it has been widely adopted to assess disparate approaches to a problem. See the web site re-aim.org.⁹

My own research reflects the trend toward public health-oriented interventions. I have gradually moved from clinical interventions for smoking¹⁰ and smokeless tobacco cessation¹¹ to assessing the impact of having dentists and dental hygienists provide brief counseling and interventions in the context of oral health care.¹² I started my work with a focus on smoking but shifted attention to smokeless tobacco when we discovered that more of the boys in our Oregon tobacco prevention trial were reporting use of snuff and chewing tobacco than were smoking cigarettes. There was little attention to this form of tobacco use, and I found that a focus on smokeless tobacco cessation and prevention would be a unique niche for my own work. Additionally, I grew up in Wisconsin, where chew and snuff were widely used by my peers, and the tobacco we grew on our farm was used as chewing tobacco. I became interested in how we might reach chewers to offer them cessation assistance. Over 70% of regular users of moist snuff have observable lesions in their mouth where the tobacco is held, and the severity and degree of lesions are directly related to the number of years of using ST and the amount of exposure over time.¹³ These oral health implications suggested the desirability of a focus on getting dentists and dental hygienists to provide brief interventions to their tobacco-using patients. We have done several studies using the dental office as the context in which to provide brief interventions with smokers and smoke-

Table 3
Effectiveness of Dental Health Care Professionals in Promoting Tobacco Cessation

	Usual Care	Intervention
HMO Dental Clinics		
Quit All Tobacco	7.0% ^a	10.2%
Fee-for-Service Clinics		
Quit All Tobacco	3.3%	10.2%
Public Dental Clinics		
Quit All Tobacco	2.7%	13.1%

Note.
a Intent to treat cessation at one year follow-up

less-tobacco users in an effort to promote cessation.

We have now completed a series of randomized clinical trials (RCTs) that evaluated this approach in a variety of settings: with managed care dental clinics as part of the Kaiser-Permanente Northwest region,¹⁴ with private dental offices,¹² and in public health clinics.¹⁵ Table 3 presents a summary of the outcomes for RCTs using this model of intervention. The intervention followed the clinical practice guidelines¹⁶ of using the 5As model (Ask, Assess, Advise, Assist, Arrange follow-up) in which we trained key personnel in the office to ask about the patient's tobacco use when they come for an annual dental hygiene visit. If the patient reports smoking or chewing tobacco, the dental hygienist assesses his or her readiness to quit, and then provides direct advice to quit and assistance via self-help materials. After the visit the office staff follows up with a phone call or mailed message to provide additional support for quitting or to make a referral to a cessation clinic or telephone help line. We have found that the effectiveness of using the brief encounter with a dental professional can significantly increase the patients' quitting of smokeless tobacco and, to a lesser degree, smoking.¹⁷

While we concluded that this intervention is efficacious, the next challenge was to determine if we could get the intervention adopted by dental practices as part of their usual care routine. For example, studies assessing tobacco ces-

sation interventions conducted in dental and health care settings have found that health care professionals have a much easier time incorporating the first 3 A's (Ask, Assess, and Advise) into their routine interaction with patients, but the delivery of assistance in helping the patient quit is much more challenging to integrate into a busy practice. Recent interventions have focused on this issue and have combined the first 3 A's in the office with proactive referral for telephone cessation counseling. This combination of initial motivational intervention and referral to a telephone help line could reduce the burden of having the health professionals engage in tobacco cessation with patients. There are clinical trials underway that are evaluating this model in both medical and dental settings. The model may encourage both adoption and maintenance of tobacco interventions in the health-care delivery systems.

Another development in the public health framework is the widespread use of pharmaceutical therapies. The development of nicotine replacement products and subsequent approval of bupropion as effective adjunctive aids to cessation provided the medical professional with medications to treat the addictive aspect of smoking. According to a meta-analysis of these trials, these adjunctive aids have been found to double the success rates in smoking cessation.¹⁸ The advent of these therapies and the subsequent availability of nicotine patches, nicotine gum, and nicotine lozenges over the counter have promoted cessation by giving health care professionals an aid to their brief intervention that assists in reducing withdrawal symptoms and appears consistent with their mission of providing medical interventions.

In the RE-AIM model, the adoption of the intervention is often a key challenge to move from efficacious research to effectiveness in practice. My colleagues and I conducted a study that helped us understand some of the issues involved in adoption and diffusion: a randomized clinical trial that assessed 2 models of dissemination for the training of dental hygienists in carrying out the brief office-based intervention. We compared the delivery of training via workshops with mailed materials (video and manual) to dental hygienists in matched communi-

ties in 20 states. We also had a control condition in which we assessed the practices of hygienists but offered a delayed intervention. We found that both dental hygienist groups who received the training reported better adoption of the intervention and lower perceived obstacles, and improved self-efficacy, with the workshop attendees achieving slightly more improvement on these variables.¹⁹ However, the cost of the in-person training was very high, and the mailed materials intervention was more cost-effective.²⁰

Most research in public health interventions can be considered efficacy trials, as they determine the effect of the intervention in public health settings with support from research staff. Efficacy trials have been defined by Flay²¹ and Greenwald and Cullen²² as "a test of whether a program does more good than harm under optimal conditions." These trials are characterized by strong control in that the program is delivered under carefully managed conditions to a defined and sometimes narrow homogeneous population. This is an important step in moving the field forward, but even after the efficacy of an intervention has been shown in multiple trials in different settings, there still needs to be a demonstration of the effectiveness of the intervention in real world settings without research staff support. An effectiveness trial is defined as a test of whether "a program does more good than harm under real world conditions."²¹ There is a shortage of effectiveness trials, and often interventions that have been shown to be efficacious are not readily adopted or maintained in health care settings in the absence of a study of the conditions necessary for adoption and maintenance.

For example, the public health guidelines of treatment of tobacco use and dependence¹⁶ reviewed over 6000 published reports of tobacco cessation, focusing on efficacy outcomes, and provided recommendations for evidence-based interventions. Although this is very important, more effort is needed to increase translation into practice.²³ Many studies have reported excellent internal validity, but more emphasis on external validity is necessary in order to move the translational research in this area. For example, one would need to know more about context of the study than is usually reported in order to know if the findings can be

Table 4
Outcomes of 3 Self-Help Smokeless Tobacco Cessation Interventions

Condition ^a	6 Months		
	ASH (%)	MAN (%)	MV ^b (%)
Participants completing survey	31.5	23.11	23.72
All participants(Intent-to-treat model)	21.1	16.5	15.92

¹ASH vs MAN, $P < .05$

²ASH vs MV, $< .05$

^aASH = assisted self-help condition; MAN = manual only condition; MV = manual + video condition

^bQuasi-experimental comparison group

generalized to other populations or settings. A recent review for behavioral medicine research recommends an increasing emphasis on external validity,²³ and Green and Glasgow²⁴ have suggested a specific set of reporting criteria for publications that address this concern for both clinicians and policy makers. Our current and past studies in dental settings are more like effectiveness trials, as they use existing resources and can be maintained over time without assistance from research staff.

One additional variable that is often overlooked in considering the adoption of an intervention is its cost-effectiveness. Although most public health interventions will be less costly to deliver than intensive clinical interventions, it is important to include cost data in reports of interventions to allow policy makers to evaluate the cost of delivering an intervention and allow comparison of the relative efficiency of interventions. The new emphasis in NIH research funding on including cost analysis is a positive trend, as any consideration of program adoption and diffusion must consider this issue.

My own research in tobacco cessation has moved from clinical research to efficacy trials in medical and dental settings and subsequently progressed to exploring ways to encourage and support self-help cessation. Although interventions in medical and dental clinics are an important link to smokers and provide an opportunity to promote quitting, this approach still does not reach other populations of tobacco users. One approach we have taken is to use media to attract interest in free cessation assistance and then

mail self-help cessation guides and video materials to interested persons who were seeking assistance in quitting their use of smokeless tobacco (moist snuff or chewing tobacco). We evaluated the efficacy of this approach by randomizing participants to receive a manual, a manual and video, or these materials plus 2 supportive phone calls from our counselors. We found that participants who received the supportive phone calls were able to quit at a significantly higher rate than were chewers who received only the mailed materials.²⁶ The results of the trial are shown in Table 4. The results of this study point out the potential for assisting tobacco cessation through some very low-cost mailings of materials to people who respond to media stories about offers for cessation assistance. The recruitment of smokeless tobacco users (ST) to this study was done largely on "earned media" — stories that were carried by local print and broadcast media in response to press releases. This method of recruitment was effective in soliciting over 1600 participants to the study and has been used successfully in other studies such as our Internet cessation project described below.²⁵ It is notable that the cessation rate for persons receiving the manual alone was high enough to justify this method of cessation as cost-effective²⁶ if one assumes a spontaneous quit rate for tobacco users of 3% or lower.

We also conducted a study with military personnel that confirmed the significant benefit of providing brief telephone counseling to ST users. In this Department of Defense-supported research study we recruited ST users to participate in the study during their annual dental

exam, and 785 participants were randomized to receive either usual care support for quitting or mailed materials (cessation guide and video) and 3 supportive phone calls from counselors. The phone counseling calls were modeled on a "motivational interviewing model,"²⁷ and counselors were trained in this procedure and followed a protocol for the intervention. The results at both 3- and 6-month follow-up support the effectiveness of the brief intervention. Participants from the 22 participating dental clinics in all branches of the service who received the brief phone calls reported significantly higher quit rates at each follow-up assessment on both point prevalence and continuous quit rates.

Meta-analysis has shown tobacco quit lines to be effective as a cessation intervention,²⁸ and 31 states now have tax-supported telephone help lines to assist tobacco users in quitting. There is strong support for the effectiveness of telephone counseling as an adjunct in helping both smokers²⁹ and smokeless tobacco users.³⁰ Telephone help lines are an excellent example of widespread adoption and maintenance of an efficacious model for low-intensity public health interventions to tobacco cessation. We have incorporated phone counseling into several projects as a way to assist health care workers in delivering brief interventions. Although telephone counseling is a low-cost and low-contact intervention that does not require much on the part of the smoker it does have some demands on providing trained counselors to deliver the calls and counseling.

One new method of intervention that requires no professional time or expertise to deliver and can have broad reach is to use the Internet to provide tobacco cessation assistance. We have found that the Internet can provide a valuable avenue to reach tobacco users and give them assistance via interactive web-based programs. We have just completed a randomized trial evaluating the efficacy of an interactive computer based program that is delivered via the Web. We created a highly tailored and interactive program called ChewFree.com and recruited over 2500 ST users to the site in 15 months. Participants completing the online enrollment and consent were randomized to receive either the tailored interactive site (Enhanced Condition) or

another site that provided text-based cessation information and links (Basic Condition) similar to what the user may find on the web. The tailored site also provided streaming video narration and testimonials, and social support via 2 forums ("Talk With Others," in which the user could post messages, and "Ask the Expert," where they could post messages to project staff). Follow-up data were collected at 6 weeks, 3 months, and 6 months post enrollment. Although the analysis of the results is not complete, preliminary findings show that point prevalence of self-reported tobacco cessation among participants in the Enhanced Condition was significantly higher than those assigned to the Basic Condition using both respondent data and intent-to-treat analysis. This is the first study to show the efficacy of a smokeless tobacco cessation program delivered via the Web. Other recent reports confirm that Internet-delivered cessation programs can be effective for smokers as well.³¹⁻³³ The limitations of our study and other Internet programs include the lack of biochemical verification of self-reported abstinence and the high attrition at follow-up. Attrition is often high in follow-up in Web delivered of interventions because most participants have no personal contact with the researchers. With the growing access to online resources and widespread use of the Internet for health information, the Web may offer special opportunities to reach populations of tobacco users who are otherwise unlikely to access cessation assistance. This delivery method can be very cost-effective as the ongoing cost of delivering the program is very minimal after development of the website.

A focus on assisting smokers and chewers to quit has resulted in a significant drop on prevalence of adult tobacco use, but the other side of the equation is an effort to prevent young people from taking up the use of tobacco. In my research on tobacco prevention, I have observed changes in the context and focus of this research that parallel many of the same trends described for cessation.

Tobacco Use Prevention Research

Prevention of tobacco use among young people is extremely important in our effort to reduce the prevalence in our society. It has been estimated that 85-90% of

Table 5
Students 7th – 12th Grade Reporting One or More
Health Risk Behaviors^a

	% Reporting the Behavior	% Reporting at Least One Other Problem Behavior
Regular tobacco use	11	85
Regular alcohol use	11	92
Regular binge drinking	7	97
Marijuana use	14	88
Other illicit drugs	5	95
Fighting	33	56
Weapon carrying	6	89
Suicide attempt	13	100
Unprotected sex	12	76

Note.

a US Department of Health and Human Services. The 1999 National Household Survey on Drug Abuse, USDHHS, 2000 (on-line). Available at; <http://www.drugabusestatistics.samhsa.gov/>

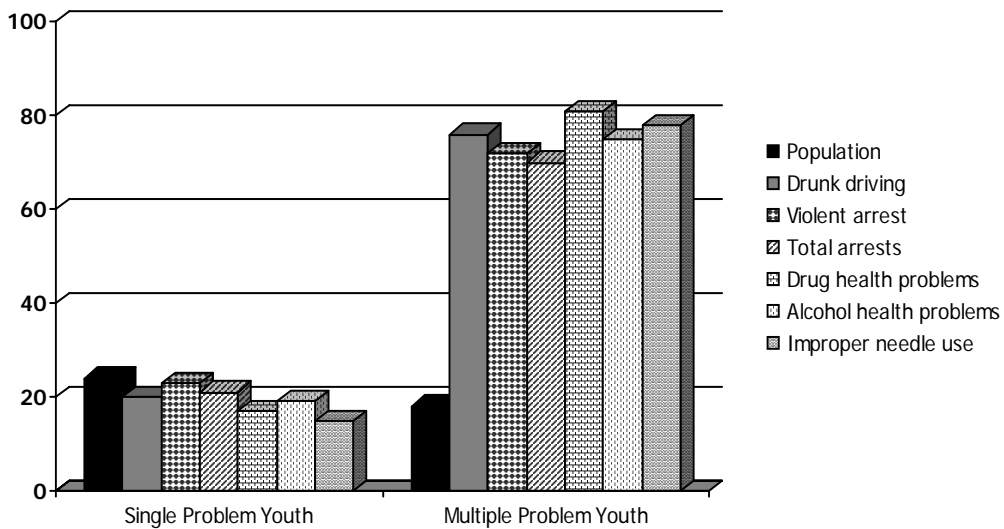
all adult smokers began smoking before age 18, which is the legal age of purchase for tobacco products.³⁴ Suffice it to say that that it is important to reduce the early use of tobacco products, as this translates to reducing adult prevalence. Even a delay in the onset of smoking may reduce tobacco dependence or make cessation easier when the user wants to quit.³⁴ My first funded grant from NIH was with NICHD in 1979, in which I was a co-investigator working with Anthony Biglan and Ed Lichtenstein, both of whom remain ongoing collaborators for both prevention and cessation research. In this first grant, we were funded to develop a classroom-based prevention program for middle and high school students.

There have been substantial research studies that have demonstrated the effectiveness of school- or classroom-based programs to reduce either the onset of smoking or the transition from experimental early use of tobacco to subsequent regular use. Tobacco prevention research has a long history, and there are some excellent summaries of the early research in this area³⁵⁻³⁷ that review the many published reports on prevention interventions. Most of the prevention programs showing positive effects in reducing tobacco use have been designed to use a social influences model for their curriculum,³⁸ and some programs have also used

more general life skills or competence in dealing with peer pressures to use tobacco.³⁹ Although some authors have questioned the efficacy of classroom-based interventions⁴⁰ and others have found a lack of long-term maintenance of the effects of research studies,⁴¹ a recent study by Skara and Sussman⁴² provides support for the long-term maintenance of preventive effects, noting several interventions which have maintained effects over at least 2 years.

Some authors have moved from classroom-based prevention programs to a broader application of community trials in which the peers, parents, and community are mobilized to support nonuse of tobacco as a norm and reduce access to tobacco in stores and other outlets.⁴³ There has been a general movement in the tobacco prevention area from the classroom curriculum programs alone to efforts to influence the broader social context in which smoking and other drug use begin. These programs have included efforts to mobilize youth in schools, to encourage parent-child communication about smoking and other drug use, to provide general parent education programs, and to reduce access to tobacco. In the same way that tobacco cessation has moved into a more public health arena, tobacco prevention researchers and practitioners have moved from the school

Figure 1
Proportion of Youth with One Problem or Multiple Problems and the Proportion of other Problems They Account For



Adapted from *Helping Adolescents at Risk: Prevention of Multiple Problems Behaviors* (Biglan, Brennan, Foster, Holder). Data from the 1994 National Household Survey on Drug Abuse.

classroom to the community in a broad effort to use every source of influence to reduce the attractiveness of smoking and create a social environment that supports no tobacco use. Public health policies such as increased taxation on tobacco products and smoke-free schools and workplaces have all supported the change in the social acceptance of smoking and are key components of the interventions described above.

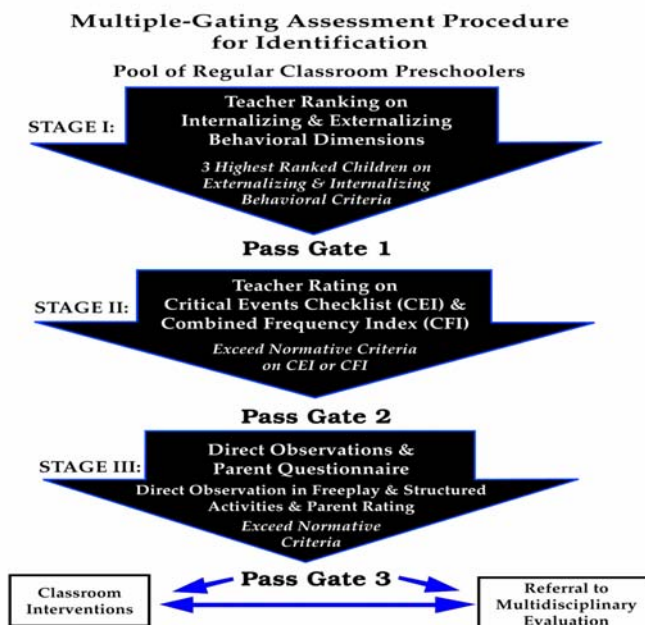
There is also an increasing awareness that smoking and tobacco use do not take place in isolation and that a child engaging in smoking is very likely to be engaging in other risk behaviors. Evidence increasingly supports this view. Only a small percent of youth report smoking in the 7th to 12th grade, but for those who do, they are also engaged in other health-risk behaviors. As shown in Table 5, youth who report engaging in one high-risk behavior are very likely to engage in other risky behaviors as well. As shown in Figure 1, adolescents who exhibit multiple problems account for a disproportionate

percent of the total problem behaviors that the society is concerned with preventing.

The implication of covariation of risk behaviors is that we cannot just focus on smoking or tobacco use as an isolated behavior, but we must consider risky behaviors in general. Many of the same risk and protective factors are involved in multiple risk behavior interventions and should focus on both general prevention programming that all students are exposed to (universal intervention) but also design and implement secondary prevention programs for youth who are identified as already exhibiting one or more of the risk behaviors (targeted intervention). Further, there is increasing evidence that certain very early behaviors can be indicative of a higher risk for engaging in smoking or other risk behaviors. There have been calls for using this information to intervene to reduce some behaviors, such as aggressive antisocial behavior, when it may respond more readily to intervention.

Figure 2 Multiple Gating Process Used by the Systematic Screening of Behavior Disorders

Figure 1
Multiple Gating Process Used by the Systematic Screening of Behavior Disorders



Adapted from: Feil, E., Severson, H. and Walker, H. (1994).
Early screening project: Identifying preschool children with adjustment problems.
The Oregon Conference Monograph, Vol. 6.

Screening and Early Intervention for at-risk Behaviors

For some time I have been involved in an independent research program in identification and intervention of behavior disorders in children. I was trained as a school psychologist and have been a training director for school psychology at 2 universities. In that capacity I have been working with my colleague Hill Walker at the University of Oregon conducting research on early screening and interventions with children who exhibit at risk behaviors. We have developed, evaluated, and disseminated both screening and intervention programs for primary-grade students who exhibit aggressive antisocial behavior profiles.

I believe that the way you define the problem will determine what you do to

solve it. In that vein, recently I have tried to connect these 2 seemingly disparate research interests. The core of both the tobacco prevention research and behavior disorders is that there may be similar risk factors or mediating variables that one might target in an attempt to ameliorate both problems.

Growing out of my interest in early screening for aggressive antisocial behavior, we have developed a screening system for early identification of children who exhibit either an externalizing behavior profile (aggressive antisocial acting out) or internalizing profile (socially withdrawn, inner directed).⁴⁴ This assessment tool is called the Systematic Screening for Behavior Disorders (SSBD), and a similar tool for children aged 3-5 is called the Early Screening Procedure (ESP).⁴⁵

Table 6
Screening Measures at Grades 3-5 Can Predict
Smoking Onset 2 Years Later⁴⁸

- Boys and Girls high on overt aggression were 3 times more likely to start smoking (OR = 3.21).
- Boys not displaying appropriate school adjustment were 4 times more likely to smoke (OR = 4.05).
- Girls who displayed lower levels of “teacher-preferred” social behavior were 3 times more likely to smoke (OR = 3.11).

Both use a multiple gating system for setting increasingly high criteria for moving through the system. In this case, gate 1 involves teachers, who are provided with a behavioral description of the profiles and asked to rank order students in the class on this dimension. Students who are ranked in the first 3 ranks are then rated on 3 behavior rating scales that have normative data for age and gender. If a student is rated in the 95th percentile, the parents are contacted for permission to observe the child in the classroom on Academic Engaged Time (AET) and on the playground in free-play peer interaction. The behavior codes have been developed to be reliable, and the behavior observations are then compared to age and gender norms to determine the risk profile of the student (Figure 2). Although screening is important, the information then needs to relate directly to an intervention designed to ameliorate or reduce the problem behavior.

We have also developed interventions to reduce aggressive antisocial behavior, and we have shown that our program entitled “First Steps to Success” can be an effective way to reduce the behavior problems exhibited both in the classroom and on the playground with other peers. The program uses a coach to work with the teacher on a contingency reward program that provides the student with immediate feedback on being on-task and appropriate and also provides rewards for the classmates if the target child meets the goals for each day. Parents are also involved in the program, as the coach makes 6 home visits to provide assistance and materials to assist the parent in being more positive and engaged in rewarding appropriate behavior. The program has been widely adopted and has been cited as a recommended practice for the treatment of behavior disorders and antisocial behavior problems in primary grades.^{46,47}

As noted above, there is increasing evidence that aggressive antisocial behavior is implicated in subsequent onset of tobacco use and other risk behaviors for both males and females. We have reported that measures of aggression in grades 3-5 can predict the likelihood of smoking initiation 2 years later.⁴⁸ As shown in Table 6, children rated by teachers as having high levels of overt aggression and a lack of school adjustment are 3 to 4 times more likely to smoke 2 years later than are other students within the normal range on these measures. Although we expect to see this relationship for males, girls who displayed lower levels of teacher-preferred social behavior were also at risk for subsequent initiation of smoking. Given this relationship and our ability to screen and identify these students at an early age, we should consider implementing effective interventions that can significantly reduce this set of at-risk behaviors. An example of this approach is the “Good Behavior Game” reported by Shep Kellam and colleagues^{49,50} in which first and second grade students who received the intervention in a randomized control trial not only reduced aggressive behavior but also were significantly less likely to smoke at age 14. I have become intrigued by the idea of using a similar intervention such as the First Steps program to both reduce antisocial behavior in primary grade students but also as an early intervention to prevent both smoking and other drug use during adolescence. This approach would bring together my interests in both tobacco prevention and early screening and intervention for antisocial behavior. We are currently involved in large-scale evaluations of the First Steps program in the Albuquerque, New Mexico, public schools and will soon start additional effectiveness trials of the program in 5 large metropolitan school districts to pro-

vide further validation of the feasibility of scaling up this approach in schools. However, determining the long-term benefits of this intervention will require a longitudinal evaluation of whether it has a subsequent impact on the other risk behaviors of students such as smoking and drug use. Further, such a program would likely benefit from additional booster sessions in subsequent years to support the intervention effects.⁴⁶

Knowing Where You Have Been Can Guide Where You Are Going

According to an old Sufi saying, "Good judgment comes from experience; experience comes from bad judgment." Despite the unpleasant outcome of my very first experience in tobacco research, I have found the past 30 years an exciting time to be involved in conducting research in tobacco prevention and cessation, as well as the early screening and interventions for at-risk behaviors.

This journey has taken me on several interesting and rewarding paths. The context and focus of programs in tobacco research have moved from clinical demonstrations and efficacy studies to studies that demonstrate public health impact on reducing tobacco use. Recent research has extended both the reach of the interventions and the likely adoption and maintenance of the intervention in our society. I am excited about the opportunity to pursue new avenues and creative solutions to reducing tobacco use and other health-risk behaviors.

My review of research has been brief and selective in my citations, such that I may not have given adequate credit to the many dedicated researchers who have both contributed to the field and to my research. Any research efforts in which I have been involved have been joint efforts, and I owe my success to the collaboration with many others on our research team at the Oregon Research Institute. Our goal continues to be to extend the reach of effective tobacco prevention and cessation interventions to and reduce the morbidity of tobacco use in America.

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