
Inferring Strategies for Disseminating Physical Activity Policies, Programs, and Practices from the Successes of Tobacco Control

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Abstract: Efforts at reducing tobacco use in the United States and Canada over the last half century have been amazingly successful. This article examines those efforts in order to identify policies, programs, and practices found useful in tobacco control that might be usefully disseminated to world populations to improve rates of physical activity. Tobacco-control activities began with efforts to influence the individual smoker through public education and counter-advertising. Increasing awareness of the addictive properties of tobacco, industry efforts to manipulate those properties, and to target youth with aggressive advertising, fueled public outrage that supported additional policy changes to include community interventions, legal actions, and restraints against the tobacco industry. The article first examines ways to view the process of transferring knowledge from one enterprise (reducing tobacco consumption) to another (increasing physical activity). Several theories of knowledge generalization and dissemination are explored: transfer, knowledge utilization, application, diffusion, and implementation. The second section identifies the dissemination of tobacco control by means of brief health behavior-change interventions for smoking cessation that have been successfully integrated into primary clinical care. The question of whether similar strategies can be successfully disseminated to increase physical activity is examined in detail. The article then moves on to look at the success of arguably the most successful program in the world at achieving a reduction in tobacco control—the State of California. Finally, we compare and contrast some of the lessons as they have played out in another national context—Canada. In the concluding section, some lessons are identified that we believe may be successfully utilized in societal attempts to increase physical activity in world populations.

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Introduction

Much of the burden of illness is preventable through interventions on the environment and on individuals to alter the circumstances and behaviors that cause or complicate chronic diseases, including tobacco use, sedentary lifestyle, unhealthful diet, and risky drinking.^{1–5} In pursuit of improved health outcomes and reduced healthcare costs, enormous volumes of research have accumulated that identify strategies that could be effective in contributing to the reduction of the behavioral risk factors for chronic diseases. Nowhere have the successes of

these strategies been more dramatic than with tobacco control, where a combination of policy, regulation, community-based, and mass media health education, organizing, advocacy and counter-advertising, primary care interventions to support smoking cessation, and various other supportive interventions in schools, work-sites, and homes have reduced the consumption of tobacco by nearly half in the last third of the 20th century. At the same time, changes in physical activity, as judged by summary estimates of overweight and obesity, have not kept pace with calories consumed.

This overview of the tobacco-control dissemination experience seeks to draw guidance for the challenges ahead in physical activity promotion from the successes as well as from the failures or blind alleys in tobacco control. Recent publications have drawn lessons from tobacco control to the nutrition side of the obesity energy-balance equation,^{6–9} the implications for interventions with children,¹⁰ and other implications for policy and programs in broader health promotion efforts.¹¹

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Some Parallels and Differences Between Smoking and Physical Activity

We seek here to suggest implications of successes in tobacco control specifically for the dissemination of science to effect policy, programs, and practice on the physical activity side of the energy-balance equation. We acknowledge at the outset some very significant differences between smoking, especially as it was understood when the campaigns against it arose, and physical activity: Tobacco was an easily purchasable product and smoking it an immediately gratifying, widely promoted, normative behavior that could be carried out any time of the day and several times a day, in almost any location. It was seen largely as a matter of individual (adult) choice. These characteristics, along with increasing evidence and awareness of the harms of tobacco use predisposed initial public health efforts toward public education and counter-advertising to influence individual attitudes and practices. But with growing awareness of the dangers of second-hand smoke exposure, public support was mobilized for legislation to restrict smoking in worksites and public places, to raise taxes to make the behavior more expensive and to fund tobacco-control programs, and to restrict access to the product through vending machines and sales to minors. These types of strategies are ones that we seek to generalize to physical activity by finding parallel opportunities, while recognizing the essential differences in the types of behavior and justifications for controlling or at least influencing such behavior through programs, environmental changes, and policy means.

Growing awareness of the addictive properties of tobacco use, of industry efforts to manipulate these properties and to target youth with aggressive advertising and other promotions to guarantee lifelong addiction, fueled some of the public outrage that supported further policy changes. It helped shake intervention activity loose from the earlier focus on individual attitudes and behavior change and turn it more aggressively toward community interventions, legal actions, and restraints against the tobacco industry, an industry that had few socially redeeming qualities other than supporting tobacco farmers, other employment, and stockholders. The growing costs to state Medicaid programs further raised the stakes in litigation against the tobacco industry to recoup some of these costs attributable to their product and their deceptive advertising of it.

Unlike the immediately gratifying aspects of tobacco, physical activity can be an inconvenience with changes of clothing, going to a fitness facility, finding parking, showering, most of which are often exacerbated by people's busy routines, energy levels, location, weather, and the like. These conditions are more varied and limited in the degree to which they can be regulated or

taxed; and the behaviors in question are generally without such immediate gratification as smoking. Early campaigns to promote physical activity similarly emphasized public education about the benefits of an active lifestyle, emphasized individual responsibility for lifestyle choices, and included early efforts to promote youth fitness by requiring that students meet annual school fitness standards. Physical activity was viewed more as elective "exercise" than routine active living, such as walking, biking, and recreational sports. Evidence of a boost in endorphin levels promoting a sense of well-being came closest to matching for physical activity the addictive properties of smoking, but with a positive outcome. The opposite of physical activity—sedentary behavior—could be viewed more as habituating, but unlike smoking, it could scarcely be seen as threatening the health of others as second-hand smoke could be. Finally, we acknowledge that the industries promoting sedentary behavior are generally promoting some other good (e.g., automobiles, television, computer and video games) and cannot be as readily vilified as the tobacco industry, so the regulation of their promotion must be more circumspect.

Initial efforts to promote physical activity, accordingly, focused as they did in tobacco control on information to promote healthful individual choices, community-based efforts to support routine exercise (e.g., walking clubs), signage to promote their use, and individually oriented treatment programs. It was only recently that community design, land use, zoning and transportation policy, and school and workplace policies were understood as critical determinants of healthful active living at the individual and population levels, and only recently that environmental and policy-legislative solutions have been advocated and adopted to make it easier, safer, and more appealing to walk or bike to school, work, shopping, parks, and other daily destinations. Growing recognition of the economic and social burden of sedentary lifestyle, especially those related to obesity, is again raising the stakes for policy solutions. The social-ecologic models of human behavior clarified by public health tobacco-control analyses and initiatives have paved the way to a public health model of physical activity promotion if we can identify the parallels and points of generalizability and transportability of the lessons learned.

We will first note some of the justifications and ways to view the process of transferring knowledge from one enterprise (reducing tobacco consumption) to another (increasing physical activity). Second, we identify implications for physical activity of studies of smoking cessation in the medical care setting, employing a "push-pull" model of dissemination. Third, we look at the success of arguably the most successful jurisdiction in the world in achieving a reduction in tobacco consumption—the State of California. And finally, we compare

and contrast some of these lessons as they have played out in another national context—Canada.

Moving Lessons from Tobacco to Physical Activity: Theoretical Perspectives on What Counts as Success

Although tobacco-control activities may have indisputable evidence of their success, and promising implications for physical activity, one must ask the external validity question of whether these lessons (as they are often called in previous articles attempting such generalization)^{6–9} can be moved from one field to another field in which the criteria of success and the types of populations at risk, the professions, organizations, and economies involved all may differ. Several underlying theories of knowledge generalization and dissemination are explored: transfer, knowledge utilization, application, diffusion, and implementation. These different theories imply different values and assumptions about the processes of generalization by which the movement of ideas from tobacco control to physical activity, and from science in physical activity to policies, programs, and practices, can be judged as appropriate and as successful or not. The intent here is not to favor one understanding of change over another, but to expand the lenses by which the movement or generalization of tobacco-control experience can be evaluated.

To Transfer Tobacco-Control Lessons

Transfer is about a precisely prescribed change, not just any change. The successful transfer of lessons implies that their use in physical activity policy, programs, or practices is faithful to the original tobacco-control lessons or findings, and their importation to physical activity is with “fidelity.” Rooted in industrial psychology, the transfer literature explores the influence of prior learning upon later learning. An educational model of transfer identifies multiple influences on the process of transfer, including context, the content of what is transferred, learning retention, generalization, and sustaining change over time.¹² Variables useful in assessing the success of transfer include the similarity of the tasks, amount of practice time with lessons, perception of similarity in contexts between tobacco control and physical activity, timing of feedback in lesson trials, complexity of lesson steps, incentives, opportunity, social systems, habits, and a sense of ownership.¹³

In a true transfer, there would be a clear and timely link from tobacco control to physical activity, lessons would be transferred intact, and the expression of the lesson by physical activity would look just as it did in tobacco control. In an unsuccessful transfer, or another form of generalization and dissemination, the link between tobacco control and physical activity contexts could not be made, only parts of the lesson were transferred, and the adaptations were so extensive that

the result appears to be new learning rather than a transferred lesson.

To Use Tobacco-Control Lessons

The “knowledge utilization” lens explores what constitutes the use of tobacco-control lessons. Asking if the lessons of tobacco control were used is a far more simplistic question than the realities of the process. “The issue of utilization has emerged at the interface between science and government. It has to do with our fundamental assumptions about human rationality, progress, and science applied to the creation of a better world.”¹⁴ Three categories of knowledge utilization models are identified in the social sciences—empiricist, engineering, and enlightenment¹⁵—that identify influences helpful in assessing lesson use, including individual understanding, values, beliefs, and expectations, and organizational, political, technical, and cultural factors.¹⁶

Instrumental use is best supported by empiricist and engineering models in which use of tobacco-control lessons would be more immediate, observable, and context-specific. In contrast, an enlightenment model supports problem solving over time that draws on multiple sources and kinds of knowledge applied more generally to classes or categories of setting, population, and circumstances. From an instrumental perspective, successful use of tobacco-control lessons would be judged by what people did differently in their formulation and execution of policies, programs, and practices in physical activity. From an enlightenment perspective, successful use of the lessons could be based on what people decided, thought, or felt differently. Much as we should like to keep the focus on action, the instrumental perspectives of transfer and use might be too literal in their expectation for the importation of experience from another field like tobacco control, considering the differences between that and physical activity dissemination.

To Apply Tobacco-Control Lessons

The application of tobacco-control lessons is more concerned with finding evidence of the ideas and principles of the lesson than the intact transfer of a lesson to another context. The application lens brings into focus how principles, ideas, or theories interface with what constitutes the practical in different contexts.^{17,18} Through this filtering, not only the principles and ideas of the tobacco-control lessons might change, but the physical activity context itself may change. An assessment of application is less concerned with the precision of transfer and the similarities of context than with the artistry of practice and the realities of context.

In the successful application of a tobacco-control lesson, the essence of the lesson remains intact. If the context, components, order, and means of the lesson

are adapted, changed, or eliminated, what needs to remain at the heart of the tobacco-control lesson to give it life in a physical activity context? To fully understand a successful application, contextual influences and adaptation to them need to be unearthed.

To Diffuse Tobacco-Control Lessons

The movement or spread of an innovation over time, through communication channels, and among members of a social system is the domain of diffusion theory.¹⁹ Drawing on communication research, multiple variables among these (the innovation, channel, members, and social system) can be used to assess how tobacco-control lessons diffuse to and within the field of physical activity. These include external conditions prior to diffusion, knowledge of the lessons, external persuasion to engage the lessons, the decision to adopt the lessons, implementation of the lessons, and acceptance or rejection of the lessons. It is at the implementation stage in diffusion that tobacco lessons change from ideas to action. Communication channels are essential to move tobacco-control lessons across time and context.

Conscious attempts to facilitate and hasten diffusion are what we refer to as dissemination. Successful dissemination of tobacco-control lessons adds a new variable not inherent in the previously highlighted processes, that is, “spreadability” or generalizability.²⁰ Whether recipients of tobacco-control lessons use lessons, transfer them from one place to another, or apply and adapt them to their context, they may share or spread them consciously (dissemination) or unconsciously through modeling or simply providing a demonstration of their acceptability and possible efficacy (diffusion) to sites other than their own.

To Implement Tobacco-Control Lessons

The implementation of tobacco-control lessons in a physical activity environment will require more than good ideas and good intentions. It involves that messy area of “how ideas are manifest in a world of behavior.”²¹ The metaphors of implementation include an assembly line, mutual adaptation, and evolution, which are not unlike the empiricist, engineering, and enlightenment models of knowledge utilization. Implementation has been analyzed from the top down and bottom up, at macro and micro levels, and as part of larger processes, such as change, diffusion, and policy development.²² Literatures in political science, sociology, economics, and philosophy suggest numerous variables as illuminating the process of implementation: ideas of the lessons learned, the contexts yielding and receiving the lessons, and the stakeholders involved. The political nature of some of the tobacco-control lessons means that variables of power, access, and resources need also to be considered.

Multiple Views on Successful Dissemination of Tobacco-Control Lessons

Sharpening the language and thinking about how tobacco-control lessons move from one context to another is about more than word-smithing. Transfer, knowledge utilization, application, diffusion, and implementation represent bodies of literature, disciplines, variables, experience, and insights from other fields, each of which has grappled with the similar problems of generalizing from one context to another. To be sure, there are common understandings of the transferability of lessons, such as the similarity of the object or process to be transferred and the purpose for its use. But, there are differences, too, such as a transfer focus on fidelity, an application understanding of mutual adaptation, and a diffusion emphasis on the natural history of the spread of lessons. These approaches provide multiple lenses to evaluate whether and how these lessons move into physical activity.

Translating Research on Primary Care Health Behavior-Change Interventions Into Practice and Policy: Implications for Physical Activity

Among the lessons for dissemination in other applications, such as physical activity promotion, few could be more thoroughly documented and validated than the scientific literature on the dissemination of tobacco control by means of brief, effective health behavior-change interventions for smoking cessation that can be integrated into routine primary care. Primary care represents as important a dissemination and intervention channel for physical activity as it did for tobacco control, although both fields might have expected too much from it based on controlled trials before they recognized the importance of the dissemination of guidelines into practice, and organizational and policy reforms to support its adoption. Over 80% of U.S. adults report having a usual source of care, visiting their doctor's offices an average of three times per year,²³ and they expect and are uniquely motivated by advice from their provider about their personal health behaviors.²⁴

Much of the seminal research to develop and disseminate feasible and effective primary care health behavior-change interventions has focused on tobacco use and dependence. This section highlights some of the lessons learned from tobacco that can be applied to accelerate earlier-stage work to disseminate effective primary care interventions on physical activity.

Tobacco Use and Physical Activity Promotion in Healthcare Settings

Critical gaps persist in the adoption of recommended healthcare practices for both tobacco use and physical

Closing The Gaps Between “What We Know” and “What We Do” -- Push-Pull-Capacity Model

GOAL: To increase the adoption, reach and impact of primary care evidence-based health behavior change treatments

Push: Proving, improving & communicating research for wide application

- Standards for defining what's effective; formal clinical practice guidelines
- Research to develop effective, feasible and replicable intervention
- Test/adapt interventions in new populations or settings
- Communications and advocacy geared to key decision makers and end-users – e.g., policy makers, health plan leadership, employers/insurers, providers, patients

Building the capacity of healthcare systems to deliver effective treatments

- Provider training and implementation tools
- Technical assistance for “real world” practice settings
- Systems-level changes, such as information and reminder systems to identify behavioral risks and cue providers, performance measurement, feedback and incentives
- Health plan performance measurement and reporting (e.g., HEDIS)

Pull: Creating demand for proven health behavior change treatments among consumers, purchasers and policymakers

- Population-level policies and community strategies that motivate/support health behavior change and increase treatment demand
- Increased treatment coverage and reimbursement
- Direct-to-consumer marketing and treatment redesign
- Making the business case for purchasers and policymakers



ULTIMATE GOAL:
Improve population health outcomes and reduce healthcare burden

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Figure 1. Closing the gaps between “what we know” and “what we do”—Push–Pull Capacity Model.

activity. The major gaps between current health objectives set for the nation (“what we seek to accomplish”) and health practices (“what we do”) for both tobacco use and physical activity are greatest for disadvantaged low-income and racial/ethnic minority groups (e.g., African Americans, Hispanics).²⁵ Despite growing evidence for behavioral prevention in primary care, large gaps persist between recommended best practices and usual care for addressing tobacco use and sedentary lifestyle.

Progress has been made in identifying and delivering effective primary care tobacco interventions over the past 2 decades, interventions that could double the nation’s national annual quit rates²⁶ and save 2.5 million quality-adjusted life-years at a cost savings of \$500 per smoker.^{27,28} Unfortunately, these interventions still reach fewer than half the patients who could benefit from them.²⁹ Almost 60% of current smokers report being asked about tobacco use or being advised to quit by their doctors, but only about half who are so asked and/or advised report getting any further assistance (counseling, pharmacotherapy). Rates are higher

for managed care enrollees^{30,31} but lower for smokers in underserved low-income populations.²⁹ Similar, but somewhat larger, healthcare gaps exist for primary care physical activity interventions. Recent National Health Interview Survey surveys found that only 54% of adults who had seen a doctor in the past 12 months reported being asked about physical activity,³² and only 21% reported getting physician advice.³³ Rates of intervention are lowest in low-income populations.³⁴

Closing the gaps between “what we know” and “what we do” for patients and providers

The push–pull capacity model outlined in Figure 1 provides a conceptual roadmap for closing the gaps described above, with the aims of increasing the number of practitioners and healthcare systems providing evidence-based primary care tobacco dependence treatments and the number of patients receiving them, and the ultimate goal of reducing tobacco use and tobacco-caused disease and healthcare burden.^{35,36} It illustrates

the need to work simultaneously on three fronts to translate research into practice: (1) strengthening science “push” by proving, improving, and communicating effective interventions for wide population use; (2) boosting demand, or market “pull,” for these interventions among consumers, and healthcare purchasers and policymakers; and (3) building the capacity of relevant systems and institutions to deliver them. Selected accomplishments and challenges in each area—push, pull, and capacity—for primary care tobacco intervention can be used to extract themes and lessons to advance progress in both tobacco and physical activity interventions. It highlights the need to take a broader practice-ecology approach to understanding and promoting provider behavior change and improving population health care (e.g., through supportive changes in healthcare systems, standards, and policies)³⁷ and a broader social-ecology approach to understanding patient health behavior change and improving population health.³⁸

Science Push

Strengthening “science push” includes: defining rigorous standards for what’s effective; identifying effective, feasible, and replicable interventions; developing formal practice guidelines; testing or adapting best practice interventions for new populations and settings; and effectively communicating the science base (Figure 1). For tobacco, science push involved 3 decades of intentional multidisciplinary research funding, which began with an effort to set common standards for measuring success (i.e., biochemical and self-reported measures of long-term tobacco abstinence) and culminated in the development of formal clinical practice guidelines to identify practical, evidence-based interventions that could be delivered in a range of healthcare settings by a variety of practitioners (e.g., physicians, nurses, dentists).³⁹

The interventions these guidelines recommend were designed by teams of researchers and clinicians working to find strategies that would be feasible, adaptable, and cost effective in real-world practice settings. Its components are described as the 5A’s—*Ask* all patients about tobacco use; *Advise* all smokers to quit; *Assess* readiness to make a quit attempt; *Assist* with brief quitting counseling and pharmacotherapy (e.g., nicotine replacement therapy, bupropion) or motivational strategies for those not yet ready to quit; and *Arrange* for follow-up care and referral. Primary care tobacco use screening and intervention have been beneficial and cost effective in clinical preventive services.^{27,28} The 5A’s strategy has been tested with and adapted for a variety of populations and settings (e.g., underserved low-income and racial/ethnic minority groups, pregnant women, older adults), with only a few minutes of quitting advice (the first two A’s) drawing on resources

outside of the practice (e.g., individually-tailored computerized mailings, telephone quit lines) to provide the more intensive assistance and follow-up required (the last three A’s).^{40,41} Telephone quit lines provide convenient, barrier-free, and individually tailored behavioral cessation counseling and medication advice. They are offered by health plans, public- and private-sector organizations, and are now available free of charge to all Americans at 1-800-QUIT-NOW. Reactive quit lines depend on smoker-initiated calls to deliver counseling and follow-up assistance; proactive quit lines include outgoing calls from the quit-line staff to the smokers, following a specific treatment plan or schedule.⁴¹

Finally, guidelines have been widely publicized to primary care practitioners and to healthcare leaders, including through professional societies and health plans. In addition, they have provided a vital platform for numerous supportive healthcare systems and public policy changes. Simply having evidence-based guidelines alone is not sufficient. Effective communication, committed leadership, and advocacy are required to disseminate them and achieve widespread practice and policy change.^{29,36,42}

The science push is weaker for primary care behavioral counseling to promote physical activity. In 2002, the U.S. Preventive Services Task Force (USPSTF) reviewed the existing studies. While effective and promising interventions were identified, including several using individually tailored follow-up mailings and telephone counseling reducing provider counseling burden, the USPSTF found mixed results overall and insufficient evidence to determine intervention efficacy or to recommend physical activity counseling as an effective preventive service.^{43,44} The lack of common, valid measures to assess long-term change in activity levels, and a dearth of data on health harms and benefits made it difficult to evaluate intervention efficacy. The lack of full descriptions of the interventions, combined with limited data to assess intervention costs and/or external validity, made it difficult to assess effectiveness.^{45,46}

Strengthening science push for primary care physical activity intervention will require the adoption of common valid outcome measures, perhaps starting with those recommended by Glasgow et al.⁴⁷; greater attention to external validity in research design, following Glasgow’s RE-AIM model^{45,46,48}; consistent reporting of core intervention elements; and systematic assessment of intervention harms, benefits, and costs. Once a larger base of rigorous research evidence is available, an updated USPSTF review should be requested so that evidence-based guidelines can be developed and promoted.

Building Capacity

The U.S. Public Health Service (USPHS) tobacco-cessation guidelines pointed out that “the success of

any tobacco dependence treatment strategy cannot be divorced from the healthcare system in which it is embedded.”³⁹ The guidelines recognized that building capacity required not just provider-oriented training and technical assistance, but also serious work to redesign office practices and healthcare systems to make them better delivery channels (see [Figure 1](#)). They recommended creating a culture in which failure to treat tobacco use constitutes an inappropriate standard of care and suggested a number of office- and health plan-level system supports to improve routine delivery of the 5A’s. These include instituting a tobacco-user identification system; providing education, resources, and feedback to support provider intervention; adding dedicated staff to provide tobacco-dependence treatment and assessing delivery of this treatment in staff performance evaluations; and reimbursing primary care practitioners for their counseling activities. These recommendations are consistent with what Crabtree and colleagues⁴⁶ later described as a practice ecology model, which focuses on improving the powerful healthcare systems as well as individual primary care providers. They also anticipated the 2001 Institute of Medicine (IOM) *Crossing the Quality Chasm* report, which concluded that comprehensive systems changes were needed to enable providers to deliver high-quality (evidence-based) care.⁴²

Clear recognition of the need for combined educational and systems changes to spread effective primary care tobacco interventions spawned national efforts to develop and disseminate provider training and implementation tools, to create mechanisms for providing hands-on technical assistance to providers working in a variety of real-world settings, and for research (especially in managed care settings) to identify effective healthcare systems and policy changes.^{35,49}

The Centers for Disease Control and Prevention (CDC)’s Task Force on Community Preventive Services (the Task Force) recommended reminder systems to help providers screen for tobacco-use dependence and prompt them to deliver the remaining four A’s.⁵⁰ Provider training (through continuing medical education seminars, lectures, videos, and written materials for providers and patients) was recommended in conjunction with reminder systems. The CDC Task Force found insufficient evidence for provider training alone, but strong evidence for the effectiveness of telephone counseling.

Related reviews of research conducted chiefly in managed care settings found that multicomponent systems changes consistent with Wagner’s planned or chronic care model can facilitate delivery of the 5A’s and improve population quit rates.⁵¹ Helpful systems-level changes included a registry of tobacco users, measurement and performance reports, incentives for provider adherence to practice guidelines, computer-generated provider prompts, and patient post-visit tele-

phone counseling calls, cessation specialist office staff, referral to community resources for additional patient support, and clinician/health plan advocacy for community policies that motivate and support quitting. Using a combination of such strategies to re-engineer office and health plan practice systems, several health plans and federally qualified health centers serving a low-income minority population have achieved dramatic success.^{52–55} Having evidence-based guidelines both for clinical interventions and for systems change and policy interventions has enabled healthcare and tobacco-control leaders to advocate for and achieve the major advances outlined below:

The IOM selected primary care tobacco dependence treatment for adults as one of 20 top priorities for national healthcare quality improvement because it was effective and cost effective, and there was evidence for systems changes that improved treatment delivery.⁴² Identification and assistance of smokers has been adopted as a managed care Health Plan Employer Data and Information Set (HEDIS) quality measure and as a metric in several national and regional quality improvement, pay for performance, and provider recertification in 262 initiatives.^{29,41,42}

With strong leadership from the American Association of Health Plans (now America’s Health Insurance Plans) and the Robert Wood Johnson Foundation’s Addressing Tobacco in Managed Care national program, the proportion of U.S. health plans using some system to identify smokers rose from 14% in 1997 to 71% in 2002.⁵⁶

Advances in interactive behavior-change technology and health information technology are rapidly expanding the capacity for computerized provider reminders and prompts and for delivering individually tailored patient behavior-change interventions.⁵⁷

Telephone quit lines now available in 45 states give providers an effective, barrier-free counseling referral source, and can be reached by a single toll-free number (1-800-QUIT-NOW).⁵⁴

In large part because of absence of evidence-based guidelines with external validity, educational, technical assistance, and healthcare systems and policy change efforts to promote primary care physical activity counseling have lagged. However, given the commonalities in systems and policy barriers facing primary care health behavior-change interventions and in likely solutions,^{40,51,58} there is an opportunity not only to apply lessons learned from tobacco cessation for physical activity promotion, but also to leverage the actual systems supports and infrastructure that have been put in place to deliver best practice tobacco interventions.⁵⁹

Boosting Demand

A final lesson learned from tobacco-cessation interventions is that without consumer demand, or market pull,

neither strengthening the science base nor increasing delivery capacity will produce optimal dissemination of evidence-based primary care health behavior-change strategies. All of the activities outlined in [Figure 1](#) can build demand for proven interventions—demand among patients, providers, and health plans. They include: implementing broad policies such as tax increases, smoking restrictions, cessation media campaigns, and reduction in out-of-pocket treatment costs that build consumer demand and support for quitting, as well as making the business case for purchasers and payers (demonstrating that best practice treatments are not just effective but cost effective). Understanding and building consumer demand, and developing even better products, may prove to be the most important part of building demand for physical activity programs and interventions.

Just as building capacity requires altering the broader cultural, environmental, and policy influences on provider behavior, building demand requires altering the broader social, environmental, and policy influences on patient health behavior. Adopting a broad social-ecologic model of health behavior change,³⁸ the CDC Task Force conducted a systematic review of community-based environmental and policy interventions to reduce exposure to environmental tobacco smoke, prevent tobacco use initiation, and increase quitting and treatment use.⁶⁰ It recommended smoking bans and restrictions, tobacco tax and price increases, mass media cessation campaigns, and reductions in patient out-of-pocket treatment costs to increase cessation efforts and/or treatment demand. The CDC guidelines have provided a critical platform for effective advocacy to expand public and policymaker support for comprehensive clean indoor air laws (which now protect over 25% of the population) and for further increases in cigarette taxes (which now average \$1.30 per pack).^{50,61}

Similarly, as a result of effective tobacco-control advocacy and healthcare leadership, today, 41 state Medicaid programs and 98% of U.S. health plans provide coverage for at least one form of recommended tobacco counseling or pharmacotherapy, and both Medicare and the Veteran's Administration cover cessation counseling.^{56,62} Unfortunately, use of these benefits has been much more limited than expected. Only 30% to 40% of quitters make use of one or more evidence-based treatments in their quitting efforts.⁶³ Lack of awareness is part of the reason.⁶⁴ Fortunately, direct-to-consumer marketing of specific services, like telephone quit lines, can dramatically raise treatment use and quit rates, overall and within targeted high-risk and underserved populations.⁶⁵

Cessation-treatment marketing and media campaigns are especially powerful when they coincide with policy or environmental changes that boost smokers' interest in quitting and spur quit attempts. In addition to better marketing, innovation is needed to make

effective products and services more accessible and appealing to smokers, especially in the face of increasingly stiff competition from the tobacco industry, its powerful new "viral" marketing techniques, and its marketing of products to health-conscious consumers as "reduced harm" products.^{29,59,66}

Making the business case is critical to building market demand among healthcare purchasers and policymakers, the other consumers of evidence-based tobacco dependence treatments and services.⁶⁷ Tobacco-dependence treatment has been labeled the gold standard for prevention cost effectiveness based on detailed analyses of health plan cost savings/return on investment and enhanced worker productivity.^{27,39} New efforts are translating these studies into tools that can customize costs, cost savings, and returns on investment for purchasers and employers.⁶⁸

While clinical current practice guidelines for physical activity promotion are weak, the community practice guidelines are much stronger. The CDC Task Force found evidence to recommend multiple community interventions to motivate, support, and increase activity levels among adults, ranging from community media campaigns and supports for physical activity and exercise (e.g., walking clubs) and point-of-decision prompts on elevators and escalators encouraging people to use nearby stairs, to efforts to create, or increase access to, safe, attractive, and convenient places for physical activity (e.g., parks, trails, bike lanes, sidewalks) along with informational outreach to help assure that "if you build them, they will come."⁶⁰ More recent CDC Task Force physical activity recommendations will recommend transportation and land-use policies—ranging from zoning guidelines to improved federal, state, and community policies for walking and bicycling projects. Together the CDC guidelines provide a science-based blueprint for multisectoral efforts (e.g., public health, urban planners, transportation agencies, parks and recreation, architects and landscape designers, public safety, local government, mass media) both to close the gaps between recommended and actual physical activity levels and to address pervasive environmental disparities.⁶⁹ Getting these into practice will require focused advocacy like that required for tobacco control. Primary care clinicians and health plan leaders can play an important role in advocating for local and national policy.

Presenting a strong business case to purchasers, employers, health plans, and policymakers will be as important for physical activity promotion as for tobacco cessation. This has led researchers and public health advocates to develop tools that states, communities, employers, and health plans can use to estimate the costs of physical inactivity and to predict cost benefits of increased physical activity for medical care, lost productivity, and workman's compensation.

Lessons Learned and Challenges Ahead

Closing the gaps for patients and providers takes a combination of improving the scientific basis for, and knowledge of, effective clinical strategies, building the capacity of the healthcare system to deliver proven best practices, and building a market and demand for them. For tobacco, there has been encouraging progress and even some dramatic progress on each front. But further success will require sustained coordinated efforts across the board. What we have learned from tobacco is already accelerating the progress in increasing physical activity levels, and in modifying other lifestyle behaviors as well (e.g., unhealthful diet, risky drinking). The significance of the lessons regarding higher levels of organization are further analyzed in the next sections on the statewide experience of California and national experience of Canada with tobacco control.

California's Statewide Tobacco-Control Program

In 1988, following success in other countries,^{70,71} California successfully passed a voter initiative increasing the excise tax on tobacco products by \$0.25/pack, with some of the proceeds earmarked for the largest comprehensive tobacco-control program ever undertaken.⁷² The stated prime objective of this program was to reduce smoking initiation. This was conceived as being most likely to be successful if the program changed social norms.⁷³

The passage of the voter initiative had the status of a constitutional amendment and was conceived as providing consistent funding for a major health promotion campaign over a long horizon. However, the annual allocation to the tobacco-control program varied widely from year to year, and the Governor of California decided to remove the media campaign, one of the key components of the program. Tobacco-control advocates fought a very public and successful campaign⁷⁴ to reinstate the media budget after the surveillance program indicated its success.⁷⁵ Nevertheless, the budget fell consistently, until the voluntary health agencies successfully sued the California Governor for reinstatement of the monies. In 1999, the excise tax was further increased (\$0.50/pack) with additional monies earmarked for the tobacco-control program. Over the 13 years from 1990 to 2002, California spent an average of \$3 per person per year on the tobacco-control program (compared with less than \$1 per capita that was being spent nationally, with the notable exceptions of Massachusetts, Oregon, and Arizona). Without question, the California program is the largest and longest-running public health program ever undertaken to change personal behavior. One lesson from the California experience of fighting back successfully against political efforts to undercut the budget is the value of having

a legislative or referendum mandate to protect the budget through the courts.

Surveillance System

The California program established a comprehensive surveillance system to evaluate the success of this large project. The basis of this system was the performance of very large (34,000 households) random-digit-dialed California Tobacco Surveys, with data collected over 4 months every 3 years. These surveys were designed to identify differential changes that may have occurred within the top ten counties in the state, as well as the remainder of the counties. These surveys coincided with the very large state-specific Current Population Surveys–Tobacco Use Supplements. They were supplemented by an extension to the Behavioral Risk Factor Surveys (conducted by each state's department of health), so that tobacco information was obtained on approximately 10,000 households each year. In addition, the California Department of Health Services funded multiple surveys to address details of interventional changes. Large school surveys were also undertaken to provide a different mode for estimates of youth smoking.

Media Program

Initially, the media program was designed to be in the field consistently at a low level, the rationale being that this would be the most appropriate way to change norms, in contrast to other major health promotion campaigns that focused on saturation advertising within a confined time window once or twice a year.⁷⁰ However, over time, the California media program changed to follow the more usual strategy. Media emphasis was fairly well distributed, with cessation messages making up 23% of the total; other messages included secondhand smoke messages (20%), manipulative practices of the tobacco industry (19%), general health consequences messages (19%), and youth messages (12%).⁷⁶ The initial messages were demonstrated to have affected adolescents.⁷⁷

Local Programs at County and City Level

The California tobacco-control program concentrated efforts beyond the statewide mass media campaign at the city and county levels through 58 local-led agencies. This has been cited as one of the highlights of the California program and a major reason for its success.⁷⁸ Early in the program, these activities focused on implementing local ordinances to protect nonsmokers from second-hand smoke. By the mid-to-late 1990s, they focused on implementing and enforcing laws restricting minors, limiting youth access to tobacco, and counteracting the local promotional campaigns of the tobacco industry.

State Law Mandating a Smoke-Free Workplace

Following the rapid proliferation of local ordinances that restricted smoking, the state legislature passed a law mandating workplaces be smoke-free. This law came into effect in 1995 for most workplaces, with adoption by bars and gaming establishments delayed until 1998. This was the first law of its type in the nation. By 1996, 91% of California indoor workers reported having a smoke-free workplace, up from 46% in 1992. This percentage appeared to plateau at around 95% through 2002. Importantly, this law was implemented with equal fidelity in small as well as large workplaces.

Schools Program

Although California state education code had banned all smoking on the grounds of junior and middle schools since 1952,⁷⁹ the initial 1988 proposition mandated that schools eventually become smoke-free, and 1995 became the deadline. Additionally, in 1994, the department of education continued entitlement funding for Tobacco Use Prevention Education in grades 4 to 8 and introduced funding for high schools using a competitive process.⁸⁰ Adolescents who reported that most or all students obeyed the rule not to smoke on school property increased from 41% in the early 1990s to 72% in 2002, with only 22% of students indicating in 2002 that they had seen someone smoking at school in the past 2 weeks.

Tobacco Industry Advertising and Promotions

From the beginning, the surveillance data highlighted the importance of tobacco industry advertising and promotions in influencing adolescents to start smoking.^{70,81} These data led to city ordinances in San Francisco, Los Angeles, and San Diego that restricted tobacco-industry advertising near schools. This occurred shortly before the issue was addressed for the country in the 1998 Master Settlement Agreement between the tobacco industry and states' attorneys general. These changes meant that the proportion of Californians aged 12 to 14 years who expressed no favorite cigarette advertisement increased from 37% in 1993 to 65% in 2002.⁸²

Evaluation of Changes in Smoking Behavior

The California program has resulted in marked changes in tobacco behavior that have not been observed in other states.^{83,84} In particular, these changes have led to a dramatic reduction in per capita tobacco consumption, a major reduction in smoking prevalence, and a major reduction in the number of young people who experiment with cigarettes.⁸⁵

Issues of Diffusion of Tobacco-Control Activities Across the United States

The introduction of a comprehensive program in California was followed by similar programs in other states, most notably Massachusetts in 1993. However, even though the California ballot initiative process specified a super majority of the legislature to change funding allocations, money quickly was diverted from the program. In other states (e.g., Massachusetts, Florida, Oregon), such legislative action led to the demise of their program. California escaped this fate only because of successful lawsuits against the government, which were won because the ballot initiative mandated the allocation to the program and because a strong coalition of voluntary agencies and others pressed the issue.

Smoke-free workplace laws have now been passed in nine other states, with additional states considering such a measure. By 2002, 72% of indoor workers in other states reported having smoke-free workplaces, and 67% of residents reported having smoke-free homes (compared to 79% in California). It is clear that the initiatives that were so difficult to introduce in California quickly diffused to other states, even the tobacco-growing states. The period of the 1990s was unprecedented in the change in social norms surrounding smoking in the United States. The existence of the California and Massachusetts programs, in particular, provided models for other states that could be disseminated in federal guidance to the other states as they sought to support the growing public interest in tobacco control and to allocate their Master Settlement funds.⁸⁶

Making a major change in health behavior can most effectively be undertaken by changing social norms relating to this behavior. Leadership of such an effort by a "vanguard" state increases the likelihood of considerable diffusion across the country. The major impetus for voter willingness to implement such a program in California was its focus on preventing children from starting to smoke, and its major successes came from a desire to protect nonsmokers from the harmful effects of second-hand smoke. Whether similar appeals can be attached successfully to the physical activity promotion effort might determine whether the lessons from tobacco control can be applied. Clearly, the multiple industries whose products produce a more sedentary society cannot be as readily vilified as the tobacco industry was, and obesity cannot (or should not) be as readily stigmatized as smoking was, but the more-specific sedentary behaviors associated with obesity might lend themselves to a similar denormalization strategy.

Infrastructure to Link Research, Policy, and Practice: The Canadian Experience

For a still higher (national) level of perspective on the dissemination question, we turn to the Canadian experience.

rience in developing infrastructure to link research to policies, programs, and practices. Dealing with a major public health problem, like tobacco or obesity, requires the alignment of research with policy and practice if they are to be informed by evidence; this alignment should be deliberately developed. The current system for supporting research in Canada, as in the United States, is resulting in misalignment between the research that is done and the research that is needed by practitioners, program planners, and policymakers.⁴⁵

Here is a small example. The Canadian Cancer Society (CCS) was considering offering group smoking-cessation programs. CCS commissioned a review of 20 years of research to inform this decision. Four questions were to be addressed: one concerned efficacy (do the programs work?), and three pertained to program design and delivery (what are the essential program elements, how much contact is required, and could lay volunteers lead groups?). Efficacy was well studied: programs worked. But not a single study was found that systematically examined program design or delivery, issues of vital concern to an organization considering program implementation.⁸⁷

Context and Perspective

The CCS and the National Cancer Institute of Canada (NCIC) are leading the development of national capacity to link research, policy, and practice related to population-level interventions in relation to cancer, and particularly in relation to tobacco control. They established the CCS/NCIC Centre for Behavioural Research and Program Evaluation, located at the University of Waterloo (CBRPE; www.cbrpe.uwaterloo.ca), its mission being “to build capacity for and to conduct social and behavioral studies that contribute to improved cancer prevention and care at a population level.” CBRPE is creating an analogue to a clinical trials network to support population-level intervention research and related knowledge translation.

At the most fundamental level, CBRPE is helping to create capacity to support the “new” science of population-level interventions to stimulate relevant, timely, and affordable research in this field. Impetus to accelerate the development of research capacity for population intervention comes from at least two sources. First, seminal thinking about risk at a population level suggests that a large number of individuals at moderate risk often collectively account for a greater burden of illness and premature death than a smaller number of individuals at high risk.⁸⁸ This implies that optimal prevention impact requires shifting the risk profile of the entire population, not just that of individuals at highest risk. Second, a substantial proportion of the population smokes, and it is not enough to help individual smokers quit (clinical approach). Instead, it

is crucial to reduce the number of smokers in the population as fast as possible (population approach).

What model should guide the development of such infrastructure? Different models may be required in different jurisdictional contexts. In the Canadian context, the Canadian Strategy for Cancer Control called for creation of an integrated (cancer, cardiovascular disease, diabetes) chronic disease prevention system. The Chronic Disease Prevention Alliance of Canada (CDPAC; www.cdpac.ca), consisting of major nongovernmental organizations (NGOs) and government partners, was established to help drive the development of this system. CBRPE has close ties to CDPAC, and the guiding vision is that CBRPE is helping to create a research arm for the prevention system, and indeed to integrate research with policy and practice within this system (see below).

An organic approach has been used in developing capacity. Barriers to linking research, policy, and practice are identified, and infrastructure built to surmount these. CBRPE began by creating a national network of investigators who were eager to work with each other and with those involved in tobacco-control policy and practice. The people who got involved were interested in more than getting grants and publications (even though these are still the coin of the realm with universities and research funders). They wanted to contribute to improved population health via better tobacco-control policies and programs, a focus in line with CBRPE’s mission. Colleagues associated with CBRPE are taking the lead in extending networking internationally. CBRPE’s legitimacy in this role is derived from the fact that the Centre is a vehicle created by CCS, a CDPAC partner, for this purpose. This is a crucial point. It would be difficult for an independent research group to assume such a role. CBRPE enables researchers across the country to work together as a team, as insiders in the system.

The national network serves numerous functions. It establishes capacity to collect data across the country. It nurtures relationships efficiently between the research community and those engaged in policy and practice in various jurisdictions. Insofar as it brings together diverse disciplines and personalities, the network creates a talent pool encompassing many conceptual models, methodologies, perspectives, and skills (e.g., research, relationship building, leadership). It also fosters a culture of collaboration and cooperation, vital to corporate success, but often foreign to the scientific ethos of competition. Colleagues with access to key decision makers and with a grounded sense of how to work with communities have been invaluable. Thus, CBRPE should be understood to refer to the many people affiliated with this network, even though few are on its payroll.

When the network was formed, it became clear that its enterprise would be advanced by creating a capacity

to study natural experiments (in the same sense as the previous section reported the analyses of the California experience). Those responsible for policy and practice regularly move ahead of researchers, mounting untested, innovative interventions, sometimes with spectacular results. For instance, Florida used an innovative approach, driven largely by youth, to reduce youth smoking rates statewide by as much as 40% over 2 years.⁸⁹

It is crucial to study these natural experiments, since this is the only way to study many key population interventions (e.g., public policy interventions). Green's assertion that "if we want more evidence-based practice, we need more practice-based evidence"^{90,91} applies here. What specific capacity is required to study natural experiments? First, there is a need for appropriate funding mechanisms, for it is unusual to get funding to study natural experiments. They tend to occur with limited advanced notice, so it is often impossible to get a grant in time to collect baseline data. When proposals are submitted, there is often bias in favor of randomized studies over quasi-experimental studies. The latter are sometimes dismissed as evaluations, even though they often represent the only way to study, and they guide critical population-level interventions. There is no way to randomly assign large jurisdictions (e.g., provinces, states, countries) to experimental conditions, or require them to adhere to a standard protocol. CBRPE addressed the need for new research funding approaches by proposing and leading (with CCS) development of the Canadian Tobacco Control Research Initiative (CTCRI; see <http://ctcri.ca>). CTCRI initiated funding mechanisms and peer review both hospitable to the quasi-experimental study of natural experiments and more responsive to fleeting opportunities to study natural experiments. Primary funders (in addition to CCS and NCIC) now include the Canadian Institutes of Health Research and Health Canada's Tobacco Control Programme. The CTCRI model may be useful for supporting population intervention research in fields beyond tobacco such as physical activity.

Next, consistent with the California experience with the value of building a surveillance system, CBRPE saw the potential value of local data-collection and feedback systems to enhance the study of natural experiments and to better integrate research with policy and practice. For example, it worked through its national network to develop the School Health Action Planning and Evaluation System (SHAPES). SHAPES enables rapid, low-cost data collection (using a machine-readable questionnaire) from every student in a school. Such systems can transform the relationship among public health research, policy, and practice. This transformation occurs because they yield a stream of data that simultaneously supports public health planning, evaluation, and field research at macro and local levels.

It is possible to create a national database of school profiles, yielding capacity to see, year to year, which schools, communities, or provinces are showing greatest improvement in risk behavior profiles, and generating practice-based evidence about what is working and in what context. SHAPES has tobacco and physical activity modules; a nutrition module is in development.⁹²

From a big-picture point of view, it is noteworthy that work described here was instigated by a mission-driven health charity (CCS) in the policy-practice business, in partnership with a highly respected research funding agency (NCIC). Whether this partnership approach can be a model for advancing capacity development in other jurisdictions or fields such as physical activity might depend on the size of the jurisdiction and complexity of the science, policy, programs, and practices to be developed and disseminated. Canada is one tenth the size of the United States, and smoking is a more discrete behavior than physical activity in all of its many forms. But the Canadian experience has already cut across multiple risk factors for various chronic diseases. Moreover, the infrastructure described above is starting to support population-level intervention studies related to obesity that include physical activity and nutrition (e.g., SHAPES is adding physical activity and nutrition modules).

Some Conclusions

We have suggested first that dissemination of findings from science to policy or practice, or from innovation in tobacco control to innovation in physical activity promotion, can be viewed through various conceptual lenses. For some, the dissemination question has been one of transfer of knowledge or practice in a more or less rigidly defined form. Others have laid their emphasis variously on formally defined concepts and theories of knowledge utilization, application, diffusion, and implementation. The term *dissemination* here encompasses all of these, with an emphasis on the planned facilitation and acceleration of diffusion of innovations, transfer and utilization of knowledge, and implementation of the resulting adaptations in local circumstances. By the organization of our review of the tobacco-control experience (Table 1), we have suggested, secondly, that the evidence tends to be strongest (by scientific standards) at the individual level of behavioral change, and such rigorous evidence has accumulated most extensively on primary care practices and individual smokers as patients because such settings and individuals can be structured more readily into randomized controlled trials. Despite the impressive accumulation of literally thousands of such controlled trials pointing to clear pathways for activating, counseling, and supporting patients in the process of smoking cessation, great dissemination and implemen-

Table 1. Summary of generalizations from tobacco control to physical activity

Principle or strategy	Tobacco-control success	Implication for physical activity dissemination
Comprehensiveness	Multiple levels, multiple strategies of intervention	Apply ecologic models. Ensure interlocking policies, programs and practices
Surveillance	Tracking population-level progress over time and across jurisdictions	Increase coverage of physical activity items in BRFSS and other surveys at state and local level
Evaluation	Using survey and other data to adjust program activity and policy focus	Clarify objectives for physical activity and measure processes and impact on those objectives
Intersectoral	Engaged education, industry, workplaces, restaurants, and other sectors in collaboration	Engage recreational, park, sports, urban planning and other sectors in collaboration with health sector
Simplify and support medical interventions	The 5A's for smoking cessation; supporting policy and training for their use	Adapt the 5A's to support health care professionals in intervening on physical activity
Legislative or ballot initiative mandate	Legal mandate protected program from budgetary undercutting by governor	Build an advocacy coalition and constituency to provide a legislative or voter mandate
Mass-media support	State-level media built public support, changed social norm regarding smoking	Build media at state level to support local and organizational level programs
Support for local programs	State supported local efforts through local lead agencies	Complement broad policy and state-level initiatives with local support
School and worksite programs or policies at local level	Schools and worksites reduced smoking on premises	Schools and worksites cover a large proportion of daily time and place for physical activity
Build infrastructure to support development and translation of science to policy and practice	Clinical trials plus natural experiments on larger jurisdictions influenced policy and practice	Build the field of physical activity promotion on a combination of controlled trials and natural experiments

BRFSS, Behavioral Risk Factor Surveillance System.

tation gaps still persist. Where these pathways have been most successful, they have had the support of organizational, community, and statewide programs, and of policies. This leads to the second level of consideration for physical activity promotion—the broader organizational supports that are mobilized through community and statewide policies and programs. What the evaluation of statewide programs lacks in strength of evidence (as gauged by the internal validity of randomized controlled trials), they gain in the weight of evidence as gauged from the compelling associations in large population databases and in time-lagged relationships between policies or programs and changes in rates of smoking.⁴⁵ These gained greater credibility and dissemination in part because they reflected data collected in real-time and in real-life settings, as distinct from the sometimes artificial circumstances created in academic research.

Three lessons from our review of the California experience (and mirrored in several other states) would commend to physical activity programmers their need to seek or provide for (1) a funded mandate, (2) mass media to frame the public policy debate and to help denormalize negative behavior, (3) comprehensiveness of programs at statewide and local levels to synergize and mutually reinforce each other, (4) sys-

tematic evaluation, (5) policy and funding to support programs, and (6) coordinated programs to support individuals. The California experience most notably demonstrates a dissemination-relevant concept in its use of the mass media and policy-regulatory interventions to denormalize smoking behavior. The variety of ways in which this framing and norm-setting process was pursued can be most instructive to those who would promote physical activity, but important differences also must be considered. Physical activity is a positive behavior to be promoted and normalized, whereas smoking is a negative behavior that could be marginalized, denormalized, and even stigmatized. Sedentary behavior needs to be denormalized, but will be more difficult to associate with social responsibility than smoking.

The final section examined the Canadian experience from the standpoint of building a national infrastructure in support of tobacco control and extending this to encompass the translation of research to other areas of population-based chronic disease prevention. This integrated (cancer, cardiovascular disease, diabetes) chronic disease prevention system was built through the Chronic Disease Prevention Alliance of Canada (www.cdpc.ca). This alliance consisted of major NGOs, government, and academic partners with a

mandate to drive the growth of an infrastructure for the development, dissemination, and translation of research to policy and practice that would be more relevant to the needs of practitioners and policymakers.

In summary, research has undeniably stimulated and guided the tobacco-control “movement” as expressed in policy, programs, and practices. The biological and epidemiologic evidence summarized in the first Surgeon General’s Report on Smoking and Health⁹³ set in motion the reversal of the upward trend in smoking of the first two thirds of the century and led to public support for policies and programs that produced an inexorable decline in per capita tobacco consumption during the last third of the century. Experience with highly controlled randomized trials in smoking cessation accumulated an impressive scientific basis for cessation interventions with individual smokers, ideally in clinical settings. But large gaps persist in applying this knowledge in primary care settings, especially where practitioners are not supported by organizational, community, and statewide policies, programs, and resources. Integrating cessation programs with community and statewide policies and programs has been demonstrated by California and now numerous other states to achieve the synergy needed to reverse social norms and shape industry practices. The dissemination of these comprehensive approaches across communities and states was accelerated by systematic evaluations of the natural experiments provided by California and other vanguard states.

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References

1. Institute for Health and Aging. chronic care in America: a 21st century challenge. San Francisco: University of California; 1996.
2. McGinnis JM, Foege W. Actual causes of death in the United States. *AMA* 1993;270:2207–12.
3. Mokdad AH, Marks JS, Stroup DF, Gerberding JL. Actual causes of death in the United States, 2000. *JAMA* 2004;291:1238–45.
4. Orleans CT, Ulmer C, Gruman J. The role of behavioral factors in achieving national health outcomes. In: Frank RG, Baum A, Wallander JL, eds. *Handbook of clinical health psychology*, volume 3: models and perspectives in health psychology. Washington DC: American Psychological Association; 2004.
5. Brownson R, Haire-Joshu D, Luke DA. Shaping the context of health: a review of environmental and policy approaches in the prevention of chronic diseases. *Annu Rev Public Health* 2006;27:341–70.
6. Dorfman L, Wilbur P, Lingas EO, Woodruff K, Wallack L. Accelerating policy on nutrition: lessons from tobacco, alcohol, firearms, and traffic safety. Berkeley: Berkeley Media Studies Group; 2005.
7. Daynard RA. Lessons from tobacco control for the obesity control movement. *J Public Health Policy* 2003;24:291–5.
8. Mercer SL, Green LW, Rosenthal AC, Husten CG, Khan LK, Dietz WH. Possible lessons from the tobacco experience for obesity control. *Am J Clin Nutr* 2003;77:1073S–1082S.
9. Green LW, Mercer SL, Rosenthal AC, Dietz WC, Husten CC. Possible lessons for physician counseling on obesity from the progress in smoking cessation in primary care. *Proceedings of the International Union for Nutrition Science*, Vienna: IUNS, 2001. Modern aspects of nutrition—present knowledge and future perspectives in the book series Forum Nutrition (formerly *Bibliotheca Nutritio et Dieta*), vol 56. Basel Switzerland: S. Karger Publishers; 2003.
10. Eriksen MP. Lessons learned from public health efforts and their relevance to preventing childhood obesity [appendix D]. In: *Preventing childhood obesity*. Washington DC: National Academies Press; 2005.
11. Green LW, Nathan R, Mercer S. The health of health promotion in public policy: drawing inspiration from the tobacco control movement. *Health Prom J Austral* 2001;12(2):12–8.
12. Baldwin TT, Ford JK. Transfer of training: a review and directions for future research. *Personnel Psychol* 1988;41:63–105.
13. Annett J, Sparrow J. Transfer of training: a review of research and practical implications. *J Sch Health* 1985;22:116–24.
14. Patton MQ. *Utilization-focused evaluation*. Beverly Hills: Sage; 1978. p. 12.
15. Blumer M. *The use of social research*. Boston MA: Allen & Unwin; 1982.
16. Weiss CH, Bucuvalas MJ. *Social science research and decision-making*. New York: Columbia University Press; 1980.
17. Ottoson JM. Reclaiming the concept of application: from social to technological process and back again. *Adult Educ Q* 1995;46:1–30.
18. van Fraassen B. The pragmatics of explanation. In: Boyd R, Gasper P, Trout JD, eds. *The philosophy of science*. Cambridge MA: MIT Press; 1991. p. 324.
19. Rogers EM. *Diffusion of innovations*. 4th ed. New York: The Free Press; 1995.
20. Green LW. From research to “best practices” in other settings and populations (Research Laureate address). *Am J Health Behav* 2001;25:165–78.
21. Pressman JL, Wildavsky A. *Implementation*. 2nd ed.. Berkeley CA: University of California Press; 1979.
22. Ottoson JM, Green LW. Reconciling concept and context: a theory of implementation. *Adv Health Educ Promot* 1987;2:353–82.
23. National Center for Health Statistics. *Health, United States, 2003*. Hyattsville MD: National Center for Health Statistics; 2003.
24. Kreuter MW, Chheda SG, Bull FC. How does physician advice influence patient behavior? Evidence for a priming effect. *Arch Fam Med* 2000;9:426–33.
25. Powell LM, Slater S, Chaloupka FJ. The relationship between community physical activity settings and race, ethnicity, and socioeconomic status. *Evid Based Prev Med* 2004;1:135–44.
26. Fiore MC, Croyle RT, Curry SJ, et al. Preventing 3 million premature deaths and helping 5 million smokers quit: A national action plan for tobacco cessation. *Am J Public Health* 2004;94:205–10.
27. Maciosek MV, Coffield AB, Edwards NM, Flottesmesch TJ, Goodman MJ, Solberg LI. Priorities among effective clinical preventive services: results of a systematic review and analysis. *Am J Prev Med* 2006;31:52–61.
28. Solberg LI, Maciosek MV, Edwards NM, Khanchandani HS, Goodman MJ. Repeated tobacco use screening and intervention in clinical practice: health impact and cost effectiveness. *Am J Prev Med* 2006;31:62–71.
29. Orleans CT, Alper J. Helping addicted smokers quit. In: Isaacs SL, Knickman JR, eds. *To improve health and health care*. Vol. VI. San Francisco: Jossey-Bass, 2003:125–48.
30. National Committee for Quality Assurance. *The state of health care quality: 2005. Industry trends and analysis*. Washington DC: National Committee for Quality Assurance; 2005.
31. Quinn VP, Stevens VJ, Hollis JF, et al. Tobacco-cessation services and patient satisfaction in nine nonprofit HMOs. *Am J Prev Med* 2005;29:77–84.
32. Coups EJ, Gaba A, Orleans CT. Physician screening for multiple behavioral health risk factors. *Am J Prev Med* 2004;27(suppl 2):34–41.
33. Fine L, Phiogene GS, Gramling R, Coups EJ, Sinha S. Prevalence of multiple chronic disease risk factors: 2001. *National Health Interview Survey* 2004;27(2S):18–24.
34. Cokkinides VE, Ward E, Jemal A, Thune MJ. Under-use of smoking-cessation treatments. *Am J Prev Med* 2005;28:119–22.
35. Orleans CT, Barker DC, Kaufman NJ, Marx JF. Helping pregnant smokers quit: meeting the challenge of the decade. *Tob Control* 2000;9(suppl 11):6–11.
36. Kerner, J, Rimer BK, Emmons K. Introduction to the special section on dissemination—dissemination research and research dissemination: how can we close the gap? *Health Psychol* 2005;24:443–7.
37. Orleans CT, Cassidy E. Health-related behaviors: a prime target for improving national health and health care. In: Kovner A, Knickman JR, eds. *Health care delivery in the United States*. 8th ed. New York: Springer Press; 2005:326–74.

38. Sallis JF, Owen N. Ecological models of health behavior. In: Glanz K, Rimer BK, Lewis FM, eds. *Health behavior and health education: theory research and practice*. 3rd ed. San Francisco: Jossey-Bass; 2004. p. 462–84.
39. Fiore MC, Bailey WC, Cohen SJ. *Treating tobacco use and dependence: clinical practice guideline*. Rockville MD: U.S. Department of Health and Human Services, Public Health Service; 2000.
40. Whitlock EP, Orleans CT, Pender N, Allan J. Evaluating primary care behavioral counseling interventions: an evidence-based approach. *Am J Prev Med* 2002;22:267–84.
41. Orleans CT, Woolf SH, Rothenich SF, Marks JS, Isham GJ. The top priority: building a better system for tobacco cessation counseling. *Am J Prev Med*. 2006;31:103–6.
42. Institute of Medicine Committee on Identifying Priority Areas for Quality Improvement. *Priority Areas for National Action. Transforming health care*. Washington DC: National Academies Press; 2003.
43. Eden KB, Orleans CT, Mulrow CD, Pender NJ, Teutsch SM. Does counseling by clinicians improve physical activity? A summary of the evidence for the U.S. Preventive Services Task Force. *Ann Intern Med* 2002;137:208–15.
44. U.S. Preventive Services Task Force. Behavioral counseling in primary care to promote physical activity: recommendations and rationale. *Ann Intern Med* 2002;137:205–7.
45. Green LW, Glasgow R. Evaluating the relevance, generalization, and applicability of research: issues in external validity and translation methodology. *Preventive Services Task Force. Eval Health Prof* 2006;29:126–53.
46. Crabtree BF, Miller WL, Stange KC. Understanding practice from the ground up. *J Fam Pract* 2001;50:881–7.
47. Glasgow RE, Ory MG, Klesges LM, Cifuentes M, Fernald DH, Green LA. Practical and relevant self-report measures of patient health behaviors for primary care research. *Ann Fam Med* 2005;3:73–81.
48. Glasgow RE. Evaluation of theory-based interventions: the RE-AIM model. In: Glanz K, Lewis FM, Rimer BK, eds. *Health behavior and health education*. 3rd ed.. San Francisco: Jossey-Bass, John Wiley & Sons; 2002. p. 531–44.
49. Keller PA, Fiore MC, Curry SJ, Orleans CT. Systems change to improve health and health care: lessons from addressing tobacco in managed care. *Nicotine Tob Res* 2005;5:5–S9.
50. Hopkins DP, Briss PA, Ricard CJ, et al. Reviews of evidence regarding interventions to reduce tobacco use and exposure to environmental tobacco smoke. *Am J Prev Med* 2001;20(suppl 2):16–66.
51. Glasgow RE, Orleans CT, Wagner EH, Curry SJ, Solberg LI. Does the chronic care model serve also as a template for improving prevention? *Milbank Q* 2001;79:579–612.
52. McAfee T, Sofian NS, Wilson J, Hindmarsh M. The role of tobacco intervention in population-based health care: a case study. *Am J Prev Med* 1998;14(suppl 3):46–52.
53. Bentz CJ. Implementing tobacco tracking codes in an individual practice association or a network model health maintenance organization. *Tob Control* 2000;9(suppl 1):142–5.
54. Schroeder SA. What to do with a patient who smokes. *JAMA* 2005;294:482–7.
55. Fisher E, Musick J, Scott C, et al. Improving clinic- and neighborhood-based smoking cessation services within federally qualified health centers serving low-income, minority neighborhoods. *Nicotine Tob Res* 2005;7(suppl 1):S45–56.
56. McPhillips-Tangum C, Bocchino C, Carreon R, Erceg C, Rehm B. Addressing tobacco in managed care: results of the 2002 survey. *Prev Chronic Dis* 2004;1:A04. Epub 2004 Sep 15.
57. Glasgow RE, Bull SS, Piette JD, Steiner JF. Interactive behavior change technology. A partial solution to the competing demands of primary care. *Am J Prev Med* 2004;27(suppl 2):80–7.
58. Glasgow RE, Goldstein MG, Orleans JK, Pronk NP. Translating what we have learned into practice: principles and hypotheses for interventions addressing multiple behaviors in primary care. *Am J Prev Med* 2004; 27(suppl 2):88–101.
59. Orleans CT. Addressing multiple behavioral health risks in primary care: broadening the focus of health behavior change research and practice. *Am J Prev Med* 2004;27(2S):1–4.
60. Centers for Disease Control and Prevention. Increasing physical activity: a report on recommendations of the Task Force on Community Preventive Services. *MMWR Recomm Rep* 2001;50(RR-18):1–14.
61. American Nonsmokers' Rights Foundation. Percent of U.S. State Populations Covered by Local or State 100% Smoke-free Air Laws, October 4, 2005. Available at: www.no-smoke.org/pdf/percentstatepops.pdf
62. Halpin HA, McMenamin SB, Orleans CT, Husten CG. State Medicaid coverage for tobacco dependence treatments—United States, 1994–2002. *MMWR Morb Mortal Wkly Rep* 2004;53(3):54–7.
63. McMenamin SB, Halpin H, Ibrahim JK, Orleans CT. Physician and enrollee knowledge of Medicaid coverage and tobacco dependence treatments. *Am J Prev Med* 2004;26:99–104.
64. Boyd NR, Sutton C, Orleans CT, et al. “Quit Today”—A targeted communications campaign to increase use of the Cancer Information Services as a quit smoking resource among African American smokers. *Prev Med* 1998;27:S50–60.
65. Orleans CT. Is the target hardening: are smokers less likely to quit now than in the past? In: *Those who continue to smoke: is achieving abstinence harder and do we need to change our interventions? Smoking and tobacco control monograph no. 15*. Bethesda MD: U.S. Department of Health and Human Services, National Institutes of Health, National Cancer Institute, NIH Pub. No. 035370; April 2003. p. 1–10.
66. Byrnes N. Leader of the packs: Marlboro is still smokin' at 50, thanks to buzz marketing. *Bus Week* October 31, 2005. p. 44–6.
67. Bondi MA, Harris JR, Atkins D, French ME, Umland B. Employer coverage of clinical preventive services in the United States. *Am J Health Promot* 2006;20:214–22.
68. *America's Health Insurance Plans. Addressing tobacco in managed care: The National Technical Assistance Office 1997–2005*. Washington DC: America's Health Insurance Plans; 2005.
69. Lavizzo-Mourey R, McGinnis JM. Making the case for active living communities. *Am J Public Health* 2003;93:1386–8.
70. Pierce JP, Dwyer T, Frape G, Chapman S, Chamberlain A, Burke N. Evaluation of the Sydney “Quit For Life” anti-smoking campaign: part I. Achievement of intermediate goals. *Med J Aust* 1986;144:341–4.
71. Dwyer T, Pierce JP, Hannam CD, Burke N. Evaluation of the Sydney “Quit For Life” anti-smoking campaign. Part II. Changes in smoking prevalence. *Med J Aust* 1986;144:344–7.
72. Bal DG, Kizer KW, Felten PG, Mozar HN, Niemeyer D. Reducing tobacco consumption in California. Development of a statewide anti-tobacco use campaign. *JAMA* 1990;264:1570–4.
73. *Toward a Tobacco Free California. A status report to the California legislature on the first fifteen months of California's tobacco control program*. Sacramento CA: California Department of Health Services; 1990.
74. Glantz SA, Balbach ED. *Tobacco war: inside the California battles*. Berkeley: University of California Press; 2000.
75. Pierce JP, Farkas A, Evans N, et al. Tobacco use in California 1992. A focus on preventing uptake in adolescents. Sacramento: California Department of Health Services; 1993. Available at: <http://ssdc.ucsd.edu/tobacco/.com>
76. Ibrahim JK, Glantz SA. Tobacco policy making in California 2001–2003: no longer finishing first, 2003. Available at: <http://repositories.cdlib.org/ctcre/tcpmus/CAPolicy2003>.
77. Popham WJ, Potter LD, Bal DG, Johnson MD, Duerr JM, Quinn V. Do anti-smoking media campaigns help smokers quit? *Public Health Rep* 1993;108:510–3.
78. Jacobson PD, Wasserman J. The implementation and enforcement of tobacco control laws: policy implications for activists and the industry. *J Health Polit Policy Law* 1999;24:567–98.
79. Pentz MA, Brannon BR, Charlin VL, Barrett EJ, MacKinnon DP, Flay BR. The power of policy: the relationship of smoking policy to adolescent smoking. *Am J Public Health* 1989;79:857–62.
80. Independent Evaluation Consortium. *Final Report. Independent Evaluation of the California Tobacco Control Prevention and Education Program: Wave 2 Data, 1998; Wave 1 and Wave 2 Data Comparisons, 1996–1998*. Rockville MD: The Gallup Organization; 1998. Available at: www.dhs.ca.gov/tobacco/html/publications/htm
81. Pierce JP, Choi WS, Gilpin EA, Farkas AJ, Berry CC. Tobacco industry promotion of cigarettes and adolescent smoking. *JAMA* 1998;279:511–5.
82. Gilpin EA, Distefan JM, Pierce JP. Population receptivity to tobacco advertising/promotions and exposure to anti-tobacco media: effect of Master Settlement Agreement in California: 1992–2002. *Health Promot Pract* 2004;5(1S):91S–98S.
83. Pierce JP, Gilpin EA, Emery SL, et al. Has the California Tobacco Control Program reduced smoking? *JAMA* 1998;280:893–9.
84. Gilpin EA, White MM, White VM, et al. Tobacco control successes in California: a focus on young people, results from the California Tobacco Surveys, 1990–2002. La Jolla CA: University of California, San Diego, 2004.
85. Pierce JP, White MM, Gilpin EA. Adolescent smoking decline during California's Tobacco Control Program. *Tob Control* 2005;14:207–12.

86. Centers for Disease Control and Prevention. Best practices for comprehensive tobacco control programs. Atlanta GA: Office of Smoking and Health; 1999.
87. Manske SR, Miller S, Moyer C, Phaneuf MR, Cameron R. Best practice in group-based smoking cessation: results of a literature review applying effectiveness, plausibility and practicality criteria. *Am J Health Promot* 2004;18:409–23.
88. Rose G. The strategy of preventive medicine. Oxford: Oxford University Press; 1992
89. Bauer UE, Johnson TM, Hopkins RS, Brooks RG. Changes in youth cigarette use and intentions following implementation of a tobacco control program: findings from the Florida Youth Tobacco Survey. 1998–2000. *JAMA* 2000;284:723–8.
90. Green LW. Public health asks of systems science: to advance our evidence-based practice, can you help us get more practice-based evidence? *Am J Public Health* 2006;96:406–9.
91. Green LW, Ottoson JM. From efficacy to effectiveness to community and back: evidence-based practice versus practice-based evidence. In: Hiss R, Green L, Glasgow R, et al., eds. From clinical trials to community: the science of translating diabetes and obesity research. Bethesda MD: National Institutes of Health; 2004. p. 15–8.
92. Cameron R, Manske S, Brown KS, Jolin MA, Murnaghan D, Lovato C. Integrating public health policy, practice, evaluation, surveillance, and research using local data collection and feedback systems: the example of the School Health Action Planning and Evaluation System (SHAPES). *Am J Public Health*. In press
93. U.S. Public Health Service. Office of the Surgeon General. Smoking and health: report of the Advisory Committee to the Surgeon General of the Public Health Service. Washington DC: U.S. Public Health Service; 1964.