Milbank Memorial Fund

# Improving Population Health:
## The Uses of Systematic Reviews

*by Melissa Sweet and Ray Moynihan*

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Centers for Disease Control and Prevention (CDC)

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This report describes the methods, applications, and value for policymakers of systematic reviews that evaluate interventions intended to improve population health. These reviews are the best available scientific guidance for choosing among alternative policies. Systematic reviews apply the methods of research (sometimes called "evidence") synthesis, a rapidly developing area of inquiry that merges the biomedical and social sciences.

Policymakers and scientists collaborated in planning this report. They also reviewed it in draft, giving particular attention to its accuracy, balance, and accessibility. These colleagues, as well as persons the authors interviewed, are listed in the Acknowledgments.

Considerable evidence suggests that systematic reviews are informing policymakers' decisions about policy for health, social services, education, and criminal justice. Such evidence can be seen in three examples from one systematic review group based at the Centers for Disease Control and Prevention (CDC) and known as the Guide to Community Preventive Services (Community Guide). In many jurisdictions, policymakers have cited a Community Guide systematic review demonstrating the harmful effects of second-hand cigarette smoke as part of their rationale for enacting laws to ban smoking in public places. Another example is a 2007 Connecticut law ending the automatic assignment of sixteen and seventeen year olds to the adult criminal justice system. This decision took account of a Community Guide systematic review published a few months earlier. The review found that prosecuting youth as adults leads to increased violence. Similarly, in June 2007, a member of the United States House of Representatives told his colleagues that a Community Guide systematic review had "found conclusively that moving the drinking age up to twenty-one decreases alcohol-involved crash fatalities by 16 percent and lowering it increases fatalities by 10 percent."

The CDC and the Milbank Memorial Fund commissioned this report in order to explain the methods and uses of systematic reviews to a broad audience. Incomplete or erroneous information about systematic reviews continues to be published in the media and distributed by groups trying to influence policy. Some of the misinformation that is circulated by researchers in other fields and health journalists can be attributed to their not understanding the rapidity with which the field is advancing. According to a recent article in *Plos Medicine*, peer-reviewed journals published approximately 2,500 systematic reviews in 2005—up from 87 the first time they were counted in 1987. Misinformation can also result from the complex interactions of science and policy, as well as commercial and nonprofit advocacy.

The CDC and the Fund are longtime participants in international activities to advance and apply the science of research synthesis. The CDC is the U.S. federal public health agency whose mission is "to promote health and quality of life by preventing and controlling disease, injury, and disability." A core function of the CDC is to be a credible source of health information. The Fund is an endowed operating foundation that works to improve health by helping decision makers in the public and private sectors acquire and use the best available evidence to inform policy for health care and population health. This report completes a project begun with the

publication in 2004 of a report by Ray Moynihan, *Evaluating Health Services: A Reporter Covers the Science of Research Synthesis*, available at http://www.milbank.org/reports/2004Moynihan/ 040330Moynihan.html.

The authors asked us to include the following statement about their qualifications and methods: This is a piece of journalism from two respected health writers, informed by discussions with, and literature from, some of the key figures in the field. The authors have attempted to reflect a diversity of voices in the storytelling, including researchers who conduct systematic reviews, policymakers who use them, and critical thinkers who are imagining ways of enhancing the utility of systematic reviews. The authors use storytelling and anecdote to raise broad issues and case studies to help identify key themes.

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## ACKNOWLEDGMENTS

Efforts to improve population health will yield better returns if there is more effective integration of reliable scientific evidence into policymaking. Increasing the use and usefulness of systematic reviews is one powerful mechanism for improving the evidence available to inform population health decision making.

Systematic reviews provide a systematic, transparent means for gathering, synthesizing, and appraising the findings of studies on a particular topic or question. They aim to minimize the bias associated with single studies and nonsystematic reviews. They can include many types of studies from diverse disciplines.

Systematic reviews can help provide information useful to policymakers, practitioners, and researchers, including the extent of a health problem and whether interventions work, at what cost, and for whom. They can help policymakers make the most efficient use of scarce resources and evaluate the relative merits of competing policies or programs—though for the most part current reviews compare an innovative intervention with some sort of "usual care" scenario rather than compare two different interventions or strategies. Systematic reviews can also help policymakers resist pressures from vested or competing interests, and they can help identify gaps in the evidence and priorities for future research.

Population health is affected by policymaking in many areas, including both government and nongovernment enterprises, as well as sectors other than health. Therefore, a broad perspective should be taken in considering the scope of systematic reviews and their potential users. In this report, policymakers are considered to include public and private sector organizations whose decisions influence health, whether they sit in the health sector or elsewhere.

Moves are under way to improve policymakers' access to and use of relevant, reliable information from systematic reviews. However, scientific evidence is only one of many forces and many types of information that influence policymaking. Systematic reviews face tough competition for policymakers' attention. They cannot always provide information that is useful or relevant to policymakers' needs, and policymakers often must make decisions on the basis of incomplete evidence within a very short time frame.

Evidence-based public/population health differs from evidence-based medicine because it bridges complex systems and populations rather than homogenous patient populations. Many methodological issues confront those who produce and use systematic reviews relevant to public/population health, and concerted efforts are under way to improve the quality of systematic reviews in this area. David MacLean, professor and dean of the faculty of health sciences at Simon Fraser University in British Columbia, has expressed concerns that overreliance on systematic reviews or unquestioning use of them might stifle creativity and innovation or lead to useful programs being sidelined because of their inadequate evidence base.

This report includes case studies—ranging from tobacco control to binge drinking among college students to the mental health challenges of the Indian Ocean tsunami—that bear many lessons for those seeking to improve population health. First and foremost they suggest there is significant room

to enhance the role of evidence in policymaking. They also reveal the importance of

- taking a systems, environmental, or policy approach to changing human behavior, rather than strategies focused solely on individuals,
- the role of social norms in influencing behavior,
- the power of legislative, regulatory, and financial incentives to encourage the implementation of evidence-based policies,
- and the value of a reliable and relevant evidence base to help set political and public agendas and to shape interventions.

These themes are also instructive for those seeking to boost the role of evidence in population health decision making. Improving the use and usefulness of systematic reviews will require individual researchers, policymakers, advocates, and other relevant groups to modify the way they work. Success in this endeavor is most likely to be achieved if systemic, environmental, and cultural changes promote and support them.

As the case studies demonstrate, the real-world interaction between evidence and action is complex, and while each serves to improve the other over time, the ease and speed of this process can be improved. The case studies also highlight the importance of fearless and prominent champions in influencing political and professional agendas. They show the value of collaboration, perseverance, and pragmatism.

Those who seek to improve the use and usefulness of systematic reviews must recognize that policymaking is not a linear process and that a comprehensive array of interventions is more likely to have an impact than any single intervention. They must also be systematic by making deliberate, strategic efforts to disseminate and implement review findings, as well as ready and willing to seize moments of opportunity. Timeliness is often crucial in the policy environment.

This report makes recommendations for a comprehensive range of strategies, involving researchers, policymakers, the media, interest groups, and the broader community, in order to make systematic reviews both more useful and utilized. Recommendations include organizational and cultural changes to improve the translation and dissemination of systematic reviews; collaboration across sectors and disciplines to improve the quality, timeliness, accessibility, and relevance of systematic reviews; and incentives to encourage researchers, policymakers, and interest groups to work towards better integration of evidence into policy.

The importance of the media should not be overlooked. Just as effective media advocacy contributed to many of the public health advances outlined in this report, so can it contribute to efforts to promote both demand for and supply of useful, relevant systematic reviews. *Media advocacy* has been defined as the "strategic use of mass media to advance a social or public policy initiative."

The final message from this report is that efforts to improve the use and usefulness of systematic reviews must be evaluated, and these findings must themselves be disseminated and implemented.

## HOW SYSTEMATIC REVIEWS CAN HELP

- Efforts to improve population health will yield better returns if there is more effective integration into policymaking of reliable scientific evidence, including systematic reviews.
- Increasing the use and usefulness of systematic reviews is one powerful mechanism for improving population health.
- Systematic reviews provide a systematic, transparent means for gathering, synthesizing, and appraising the findings of studies on a particular topic or question.
- Policymakers can be more confident about the findings of systematic reviews because such reviews aim to minimize the bias associated with single studies and nonsystematic reviews.
- Systematic reviews can help provide many types of information useful to policymakers and researchers, including the extent of a health problem and whether interventions work, at what cost, and for whom.
- Systematic reviews can help policymakers to make the most efficient use of scarce resources and to resist pressures from vested interests. They can also help identify gaps in the evidence and priorities for future research.

## IMPROVING THE USE AND USEFULNESS OF SYSTEMATIC REVIEWS

- Improving the use and usefulness of systematic reviews will require researchers, policymakers, advocates, and other relevant groups to make changes to the way they work, which are most likely to be achieved if systemic, environmental, and cultural changes promote and support them.
- Those seeking to improve the use and usefulness of systematic reviews must make deliberate, strategic efforts to disseminate and implement review findings as well as be ready and willing to seize the moment when opportunities arise.
- Fearless and prominent champions are needed to influence political, professional, and public agendas around the use of systematic reviews in policymaking.
- Enhancing the "literacy" of decision makers and the public about the strengths and weaknesses of different types of evidence may help inform and improve population health policy.
- Educating journalists about the principles of an evidence-based approach within health may help improve the public's understanding of evidence-based issues, including systematic reviews.
- Collaboration across sectors and disciplines will help improve the quality, timeliness, accessibility, and relevance of systematic reviews, and thereby promote the acceptability of their findings. The reverse is also true: having a solid evidence base to guide best practice can also facilitate collaboration.
- Incentives are needed to encourage researchers, policymakers, and interest groups to better integrate evidence into policy.
- Efforts to improve the use and usefulness of systematic reviews must be evaluated.

- Key weaknesses of systematic reviews can include limited relevance or applicability and generalizability of the original studies being reviewed. Advocating an unquestioning or inappropriate overreliance on systematic reviews might discourage innovation or promising practices.
- The real-world interaction between evidence and action is complex, and while each serves to improve the other over time, the process can be made more efficient.

The rise of the evidence-based public/population health policy movement signals a growing awareness of the potential benefits of making better use of reliable scientific evidence in the policymaking process. The term *evidence-based public health* has been defined as "the process of integrating science-based interventions with community preferences to improve the health of populations." The term *evidence-informed public health* is gaining currency, acknowledging that factors other than evidence influence policymaking. Population health is affected by policymaking in many areas, including both government and nongovernment sectors, as well as fields other than health. Better integration of evidence into the policy process has the potential not only to improve health and well-being, but also to maximize the return on investment in interventions and policies promoting population health.

As the case studies in this report demonstrate, there is significant potential to improve both the use and usefulness of systematic reviews in population health policymaking. The case studies, which cover major population health challenges, including drug and alcohol abuse, tobacco control, traffic safety, and obesity, help illuminate the subtle, complex, and often invisible interactions between research evidence and policymaking. As such, they will be of enormous interest to anyone wanting to improve traffic flow on the bridges between research and action.

Systematic reviews are a methodology using a systematic, transparent process for gathering, synthesizing, and appraising the findings of studies on a particular topic or question. They aim to minimize the bias associated with single studies and nonsystematic reviews. Policymakers can be more confident relying on the results of systematic reviews than those of single studies because they are less likely to be biased or misleading. Systematic reviews have been used for some decades in social sciences and other disciplines, and in recent years they have become prominent in clinical medicine, fostered by the emergence of the evidence-based medicine movement.

Sometimes the terms *systematic review* and *meta-analysis* are used interchangeably, but it is more correct to view the meta-analysis as a subset of a systematic review. A meta-analysis involves mathematically aggregating data from independent studies to produce a more statistically powerful estimate. Not all systematic reviews are meta-analyses. Key elements of a systematic review include an explicit question; a comprehensive statement about what types of research evidence were included and excluded in the review; a thorough examination of the quality of the studies included; and a critical and transparent process of interpretation of the findings. Those interested in a more detailed understanding of the methods of a systematic review are advised to refer to the Centre for Reviews and Dissemination at the University of York, the Cochrane Collaboration, the Campbell Collaboration, or the Task Force on Community Preventive Services and the Guide to Community Preventive Services (Community Guide).

Some of the forces encouraging the use of systematic reviews in clinical decision making are also promoting their use in population health. These include the ever increasing volume and complexity of knowledge and the pressures to maximize transparency, accountability, and efficiency. Methodological developments in community research, program evaluation, and data synthesis, as well as an "explosion"

of community studies of health promotion and disease prevention programs are also factors. One of the most important drivers, however, is widespread evidence that the interventions and policies proven to be effective in promoting public health are not always put into practice. Conversely, interventions and policies are sometimes implemented despite evidence of ineffectiveness or lack of evidence of effectiveness. "In public health, we have discovered much, not yet applied, that holds the promise of important change in health," leading public health experts wrote recently.

Systematic reviews are a useful tool for those seeking to promote the translation of knowledge into action. They can help researchers and policymakers to identify gaps in knowledge, as well as areas where further research is not needed.

As we will see in this report's case studies, systematic reviews can help provide many types of information useful to policymakers, including information about the nature and extent of a problem, and the potential benefits, harms, uncertainties, and costs of interventions and policies. Policymakers may also want to know about the impact on different groups in various settings. Systematic reviews can also help answer questions about how best to disseminate information and innovations; about a particular community's receptiveness to proposed interventions—whether the interventions are appropriate to local culture and context; and about the factors influencing study outcomes. For example, a systematic review of studies examining the economic impact of tobacco laws revealed the influence of tobacco industry funding on study outcomes: industry-funded studies were more favorable towards industry's products.

Furthermore, the transparency of the systematic review process offers policymakers the opportunity to scrutinize the evidence base rather than simply rely on the final conclusions, according to internationally recognized authority on the relationship between evidence and policy John Lavis, the Canada Research Chair in Knowledge Transfer and Exchange and associate professor at McMaster University. "The nice thing about systematic reviews is that they don't take the next step like a guideline where they put in the values and all kinds of assumptions that experts often bring to the table," he says. "They just say this is the global pool of knowledge, synthesized in a transparent way. If you disagree with any of the steps that were followed, here are the building blocks so you can go out and build your own."

Systematic reviews can also help policymakers resist pressures from vested or competing interests. Jonathan Fielding, director of public health and health officer, Los Angeles County Department of Health Services, and professor at the University of California, says this is one of many factors contributing to public health leaders' growing interest in the quality of evidence available to guide decision making. His department's decisions are based on evidence, he says. "It doesn't mean evidence is always going to drive the decisions; there has to be a social context taken into account and also timing is important. But I think that having the evidence is really the most important weapon we have against ideologues on every side."

In clinical medicine, randomized controlled trials have until recently been the dominant type of study included in systematic reviews. In population health, however, many argue that systematic

reviews need to accommodate a wider range of study designs in recognition of the complexity of population health interventions and research. Many of the questions facing policymakers cannot be answered by randomized controlled trials. In population-based interventions, it is often not feasible, for example, to measure the effect of an intervention in a truly controlled environment. At least partly because of these concerns, methodology has been developed to allow for systematic reviews of qualitative and quantitative research, as well as of studies undertaken in disciplines other than the health and medical sciences.

Common myths and misconceptions about systematic reviews include that they can cover only randomized controlled trials; that they are of value only for assessing effectiveness of health care interventions; that they must adopt a biomedical model; and that they always entail some form of statistical synthesis. In reality, systematic reviews frequently include a wide range of study designs and study questions, have no preferred biomedical model, and have methodologies that are more flexible than is sometime realized. "Several arguments are commonly used to reject a wider role for systematic reviews, and these arguments are often based on major misconceptions about the history, purpose, methods, and uses of systematic reviews," according to an article by Mark Petticrew, associate director of the Social and Public Health Sciences Unit at the University of Glasgow. "Their potential role beyond the world of evidence-based medicine is more wide ranging than is often realized."

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### KEY ORGANIZATIONS AND RECENT DEVELOPMENTS

The work of several key organizations and some recent developments, in the United States and elsewhere, reflect growing interest in the role of systematic reviews in policymaking. These include:

*The Task Force on Community Preventive Services and the Community Guide*
(www.thecommunityguide.org; accessed July 9, 2007)
The Task Force on Community Preventive Services (Task Force) is an independent non-federal body formed in 1996 to oversee the conduct of systematic reviews of population health interventions and to make recommendations for policy and practice. The work of the Task Force is staffed by the Centers for Disease Control and Prevention. While the Task Force is convened by the U.S. Department of Health and Human Services and its members are appointed by the director of the Centers for Disease Control and Prevention, the Task Force is an independent decision making body.

The more than 180 Task Force recommendations made to date and the systematic reviews on which they are based are known collectively as the Guide to Community

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Preventive Services or Community Guide. The Community Guide summarizes what is known about the effectiveness, economic efficiency, and feasibility of interventions to promote community health and prevent disease, and highlights gaps in the body of evidence across topics and interventions and ways in which the research might be improved. The body of work reveals that some program effectiveness questions are easier to answer than others and that interventions shown to work in specific settings or populations may prove difficult to evaluate when implemented on a broader community scale when more complex processes of social change must be taken into account. As a result, the Task Force stresses that a finding of insufficient evidence of effectiveness should not be regarded as evidence of ineffectiveness. The Community Guide has therefore spent considerable effort on methods development and refinement, and its methods and updates are peer reviewed, published, and available online.

The Task Force promotes the Community Guide as relevant to policymakers because it can help them to make the most efficient use of limited resources for public health, to demonstrate accountability for resource allocation choices, and to make stronger arguments in funding requests. It helps researchers identify areas needing further study and ways to improve the quality of research, and helps practitioners, employers, and other health care service purchasers be more efficient in enhancing the health of their employees or members.

*The Cochrane Collaboration*
(www.cochrane.org; accessed July 9, 2007)
The Cochrane Collaboration, an international not-for-profit organization, was initially established in 1993 to prepare and maintain systematic reviews of the effects of health care interventions but has since expanded its focus to include health promotion and public health. Its major product is the Cochrane Database of Systematic Reviews, published quarterly as part of the Cochrane Library. A history of the Cochrane Health Promotion and Public Health Field is available at: www.vichealth.vic.gov.au/cochrane (accessed July 9, 2007).

Cochrane methodology and reviews have been the basis for many reviews by Evidence-based Practice Centers (EPCs, see www.ahrq.gov/clinic/epc; accessed July 9, 2007) and the Drug Effectiveness Review Project (DERP, see www.ohsu.edu/drugeffectiveness; accessed July 9, 2007). Cochrane reviews are commonly used by the committees that prepare guidelines for specialty societies, and they are also frequently reported in national news media.

Currently far fewer Cochrane reviews relate to public health, as compared with clinical medicine.

*The Campbell Collaboration*

(www.campbellcollaboration.org; accessed July 9, 2007)

The Campbell Collaboration was established in 2000 to prepare and maintain systematic reviews on the effects of social, behavioral, and educational policies and practices. It collaborates closely with the Cochrane Collaboration. Members of the Methods Groups in Campbell and Cochrane work together with the aim of stimulating the empirical methodological research required to improve the validity, relevance, and precision of systematic reviews and the randomized trials and nonrandomized trials on which they are based.

Robert Boruch, co-chair of the Campbell Steering Group, University Trustee Chair Professor of Education and professor of statistics at the University of Pennsylvania in Philadelphia, says Collaboration participants and partner organizations have substantially assisted the U.S. Department of Education's Institute of Education Sciences in producing high-quality systematic reviews of evidence on the effectiveness of education interventions. These reviews are designed to help decision makers and are published by the What Works Clearinghouse, established in 2002 to provide educators, policymakers, researchers, and the public with a central, trusted source of scientific evidence of what works in education (www.whatworks.ed.gov; accessed July 9, 2007). Boruch says the reviews have encouraged some publishers of commercial curriculum packages to fund randomized controlled trials comparing their products against those of their competitors.

*The Agency for Healthcare Research and Quality*

(www.ahrq.gov; accessed July 9, 2007)

The Agency for Healthcare Research and Quality (AHRQ) is the lead federal agency charged with improving the quality, safety, efficiency, and effectiveness of health care. As one of twelve agencies within the U.S. Department of Health and Human Services, the AHRQ supports health services research that will improve the quality of health care and promote evidence-based decision making. The AHRQ works with partners, including thirteen Evidence-based Practice Centers (ten in the United States and three in Canada), to conduct systematic reviews on a wide range of health topics, including both clinical and public health interventions. In addition, the AHRQ supports the Guide to Clinical Preventive Services, the clinical companion to the Community Guide.

*Translation and Other Projects*

Efforts are under way to translate the evidence from systematic reviews into action plans to assist implementation of effective interventions. For example, the Centers for Disease Control

and Prevention (CDC) (www.cdc.gov; accessed July 9, 2007) is funding the Partnership for Prevention (www.prevent.org; accessed July 9, 2007) to develop manuals for public health workers on how to implement evidence-based interventions. These are based both on the results of systematic reviews as well as interviews with key informants. "Systematic reviews are a great starting point in letting you know what works but often don't provide the level of information that you need to implement interventions," says Alyson Hazen, a fellow at the Partnership for Prevention. The manuals, called *The Community Health Promotion Handbook: Action Guides to Improve Community Health*, are expected to be available on the Partnership for Prevention's website by late 2007. They include steps for implementing an intervention, suggest partners to engage in the process, and offer advice on how to overcome likely barriers and the personnel, financial, and material resources required in order to do so.

Other examples of efforts to better integrate evidence into policy include the European Observatory on Health Systems and Policies (www.euro.who.int/observatory; accessed July 9, 2007), the Canadian Health Services Research Foundation (www.chsrf.ca/home _e.php; accessed July 9, 2007), the National Institute for Health and Clinical Excellence (www.nice.org.uk; accessed September 4, 2007), the Association of Public Health Observatories (www.apho.org.uk/apho/index.htm; accessed July 27, 2007), and the Health Evidence Network (www.euro.who.int/HEN; accessed July 9, 2007) recently set up by the World Health Organization (WHO). The Society for Prevention Research (SPR) (www.preventionresearch.org; accessed July 9, 2007) is also working to improve the evidence base of policy and practice. In 2004, the SPR adopted standards of evidence for prevention practices, which cover efficacy, effectiveness, and dissemination.

Many factors other than scientific evidence influence the policy process, including political and economic imperatives, vested interests and advocacy groups, crises, the media, public opinion, ideology, intuition, emotion, values, and beliefs. Happenstance and timing can also be important. Other influences are policymakers' experience, expertise, and judgment, as well as the pragmatics of political life, including electoral cycles and timetables, procedures, and unanticipated contingencies.

Policymakers are influenced by information from many sources, including anecdotal evidence, single studies, commercial interests, disease-specific advocacy groups, and media reports. Reliable scientific evidence such as that from systematic reviews is only one player in the process and often not the most visible or influential. Policymakers are not necessarily familiar with the concept of a hierarchy of scientific evidence, in which different forms of evidence are ranked according to their reliability, with most weight accorded to systematic reviews of well-conducted controlled studies and least to individual studies, expert opinion, or anecdotal evidence.

According to Bernard Choi, senior research scientist at the Public Health Agency of Canada's Centre for Chronic Disease Prevention and Control, the hierarchy of scientific evidence is often inverted when policy decisions are made. He cites decision makers' lack of time, ability, or expertise to access and synthesize the evidence from high-quality studies and adds that for policymakers already suffering information overload, systematic reviews can seem more like part of a problem than a solution. Others argue that anecdotal information provided by voters can be a source of valuable information for policymakers, who may be more likely to consider the appropriateness of evidence than where it fits in the scientific hierarchy. Some researchers have put it thus: "How and when evidence is used often depends upon the political agenda and ideology of the government of the day, not on the nature of the evidence, however compelling." Many public health experts say that evidence is sometimes used to justify policy decisions rather than being a driving force in itself. As suggested by a recent systematic review of the literature about how policymakers use evidence, research is often used to legitimate decisions after the fact.

Choi and colleagues note the lack of correlation between the quality of science and the policy derived from it. "Good science does not always guarantee good policy; bad or even no science does not necessarily lead to bad policy," they say. "It is true good policy does not always depend on waiting for good evidence."

Neal Kohatsu, chief of the Cancer Control Branch of the California Department of Health Services, notes that policymaking generally does not happen in a scientific or medical framework. "The political decision making process is not a scientific process but a battle of constituencies who can effectively get their message to decision makers, whether in the executive or legislative branch," he says.

In such an environment, it is a mistake to see systematic reviews as a final outcome when it is more realistic to view them as the beginning of a process, according to Marc Manley, vice president and medical director of population health at the health insurer BlueCross and BlueShield of Minnesota. "Groups come together and write the review and think this problem is solved but it's only started to be solved," he says. In a similar vein, Mark Helfand, director of the Oregon Evidence-Based Practice Center, says the role of systematic reviews is to define the limits and strengths of the evidence but not to tell policymakers what to do.

For Lavis, the most important outcome of strengthening the role of evidence in policymaking is not necessarily the implementation of evidence. "The outcome that matters to me is ensuring that policy debates are informed," he says, "whereas some of my colleagues want evidence used regardless of how it aligns with the many other influences that policymakers have to consider."

Whether and how the results of a review are implemented depend on many factors, including political, financial, and human resources. As the case studies described in this report illustrate, local context, preferences, culture, history, and other considerations can also come into play.

Systematic reviews cannot always provide the answers policymakers require. This may be because the relevant primary studies or systematic reviews have not been conducted; because those

that have been done are not relevant to the particular setting, population, or situation; or because their findings are inconclusive or disputed. Senior policy advisors lament that "policy-free evidence" is common, suggesting that researchers do not always consider the needs of policymakers, and as a result many studies and reviews fail to meet those needs as well.

There are far fewer systematic reviews to guide decision making in population health than in clinical medicine, and policymakers must often make decisions on the basis of incomplete evidence. Jessie Gruman, president of the Center for the Advancement of Health in Washington DC, which promotes the translation of health research into effective policy and practice, says the population health sector has not focused enough on finding answers. "Their focus is more on describing health problems than it is on finding solutions," she says, "because that's easier work to do and there is money to do it."

Gruman also has concerns about the variable quality of systematic reviews, especially those not based on randomized controlled trials (RCTs). "The RCT people are struggling so hard to get a good solid set of standards together that everyone can agree on," she says. "It's a pretty tough row to hoe to put good standards in place for a systematic review that is not based on RCTs."

Indeed, many methodological challenges arise in systematic reviews of population health interventions. Elizabeth Waters, director of the Cochrane Health Promotion and Public Health Field and professor at Deakin University, and colleagues note that retrieval of studies is more complicated in public health than in clinical medicine because of a more diverse literature, a wider range of bibliographical tools of varying coverage and quality, and terminological difficulties. Many studies may not be well indexed or may be indexed differently among different databases. Research on public health interventions is often difficult to synthesize because of the complexity of the interventions, the study populations, and the outcomes measured, to name just some of the methodological challenges involved.

The effect of context on intervention design, implementation, and effectiveness is another challenge, while the benefits of many public health interventions may not be evenly distributed, and in some cases interventions may unintentionally exacerbate health inequalities. For example, broad public health educational interventions can sometimes be most effective in people who are best educated and already least affected by health problems.

The many forms of bias that afflict primary studies, and sometimes whole bodies of evidence, are also a limitation of systematic reviews. Choi characterizes these as publication bias (wherein studies producing positive results are more likely to be published), the false positive research cycle (in which one false positive finding can generate further research and further false positive results), circular epidemiology (or repetitive publications), and the impact of fashions (wherein some important topics are understudied).

Alice Ammerman, professor in the Department of Nutrition and director of the Center for Health Promotion and Disease Prevention, University of North Carolina at Chapel Hill, has learned from her

own involvement in systematic reviews of dietary interventions that many judgments and assumptions are involved. "I know from my own experience that many assumptions are made in manipulating the data to synthesize the findings from numerous papers," she says. "The danger is that the resulting numbers can look so solid and objective when they may be based on a large number of assumptions." In short, systematic reviews require judgments as do all scientific activities; they are not of themselves perfect; and they cannot compensate for all of the weaknesses or gaps in the primary literature.

Questions about the implementation of systematic reviews trouble many public health professionals. Several persons interviewed noted the difficulty of assessing whether an intervention shown to be effective in a systematic review will also work in other situations and contexts. Others said that there is often a discrepancy between the artificial conditions of a trial and the real-world conditions in which an intervention is implemented. "A critical issue in public health is, can you translate this finding to different settings with different levels of resources?" says David Atkins, chief medical officer at the Center for Outcomes and Evidence at the Agency for Healthcare Research and Quality. "It's problematic with clinical interventions too but more so with public health." Hazen agrees: "The studies that go into a systematic review are usually well funded and staffed; they have resources that many communities don't have," she says. "When you move that into a community, there is a chance that you won't have the same impact."

Local context and culture are often important. Ammerman says it can't always be assumed that an intervention of proven benefit in one setting will work in another. "Often the intervention staff and study population vary widely, making it impossible to generalize from one setting to another," she says." Notwithstanding these concerns, it's important to remember that systematic reviews offer stronger evidence than single studies can that an intervention proven successful over a broad range of contexts is likely to work in other settings.

Systematic reviews and the studies they include have been criticized for not containing enough information about their external validity—including factors such as how representative was the population involved—to enable judgments to be made about their applicability elsewhere. Lawrence Green, adjunct professor in the Department of Epidemiology and Biostatistics at the University of California, San Francisco, and others say many systematic reviews have been "sterile" in producing studies that are high on internal validity—to help maximize their chances of demonstrating effectiveness—but low on external validity, meaning their relevance, generalizability, and applicability to real-world situations are questionable. A method of evaluating the extent to which a trial or a review incorporates these factors, called RE-AIM, has been developed.

Meanwhile, concerns have been raised that supporting only scientifically proven interventions and policies may limit action or stifle innovation. "It is unrealistic to demand that every decision be based on robust scientific evidence from systematic reviews when we know we are far from having all the information we need," researchers have noted.

Green is also concerned that the push to entrench systematic reviews in policymaking may be used as an excuse to quash programs. "There are a lot of good programs for which we may not

have the systematic reviews required to get special funding," he says. "So it becomes a very fatal conservative tool for cutting back programs. I don't want to sound like a scientific nihilist, but I think we've painted ourselves into a rather awkward scientific position by trumpeting the importance of a particular tradition of systematic reviews. They've served medicine well, but they're serving population health poorly."

Many of these pointed concerns about the potential limitations of systematic reviews in public/population health policy have been raised by researchers working to refine and develop the methodology of systematic reviews. Their comments highlight areas for consideration and further work by those individuals and organizations seeking to enhance the usefulness of systematic reviews in policymaking and thus in improving population health outcomes.

*Summary: The traffic safety field has developed an extensive evidence base, including many systematic reviews, to guide policymakers. The implementation of effective interventions has prevented many thousands of deaths and injuries, but greater gains could be achieved through more widespread and consistent implementation of proven, cost-effective interventions. Advocacy groups have had a powerful impact on policymaking.*

When traffic safety experts tally up their policy wins and losses, they inevitably point to the introduction of 0.08 blood alcohol concentration laws as a critical victory. It is also widely cited as a key example of how one systematic review had a marked impact on policy, leading to the prevention of thousands of deaths and injuries.

In the late 1990s when Congress was considering whether to introduce financial incentives to push states towards 0.08 blood alcohol concentration (BAC) laws, the General Accounting Office (GAO) released a report questioning the merits of such laws. "Overall, the evidence does not conclusively establish that .08 BAC laws, by themselves, result in reductions in the number and severity of alcohol-related crashes," it concluded. This report, widely seen as advancing the cause of the alcohol industry, was viewed skeptically by many experts who were then conducting a systematic review, on behalf of the Community Guide, on the impact of 0.08 BAC laws. Their review suggested such laws could be expected to drop alcohol-related traffic fatalities by about 7 percent.

When the systematic review was completed, some of its authors ensured their findings were made available to federal legislators. It is widely believed that this was one important factor influencing Congress's subsequent decision to withhold federal highway construction funds from states that did not pass such laws. Lobbying by advocacy groups was also critical to the congressional sanction, which had a dramatic impact. Before it was introduced, seventeen states had 0.08 BAC laws. By the end of 2004, all fifty states, the District of Columbia, and Puerto Rico had them. It has been estimated that the introduction of the laws in the states that did not previously have them should save at least four hundred to six hundred lives each year.

According to Randy Elder, the scientific director of the Community Guide, the GAO report and the Community Guide's systematic review were based on much of the same literature, but their differing conclusions reflected their differing processes. "The GAO's narrative approach meant they were able to critique each study whereas our review looking at all the studies systematically showed the remarkable level of agreement among them," he says. "When you looked at all of the data, aggregated into the same table, it became very clear that whatever problems the studies had, they were all coming to roughly the same conclusion."

For Peter Briss, former chief of the Community Guide branch at the Centers for Disease Control and Prevention (CDC), this case study illustrates the value of involving opinion leaders in systematic reviews so that they can help spread awareness about a review's findings. It also highlights the potential impact of influencing central policy levers. It was far more effective and timely to have Congress exert a single policy lever to achieve consistent laws across the country, Briss says, than to

attempt to lobby each state legislature individually. "That would have been a much longer, harder process," he adds.

By contrast, the history of motorcycle helmet legislation illustrates the public health challenges that can arise in the absence of a national approach to policy. Jim Nichols, who began his career with the National Highway Traffic Safety Administration (NHTSA) in 1970, remembers back to the mid-1970s, a time when national sanctions meant that most states required motorcycle riders to wear a helmet. Now a private consultant, he also remembers the impact of Congress's subsequent decision, at least partly in response to lobbying by motorcycle riders, to repeal sanctions for states that did not have such laws.

Many state policymakers, when confronted by a group of angry, leather-clad bikers, chose to overlook or ignore the weight of scientific evidence, including a recent systematic review by the Cochrane Collaboration, showing that motorcycle helmets reduce deaths and head injuries. Many states repealed their laws requiring helmets and those that still have such legislation are under ongoing pressure to revoke them. "The people who vote against motorcycle helmet laws are not looking primarily at the evidence but at the intensity of the advocacy," says Nichols.

Jim Hedlund, a traffic safety consultant who has previously worked with the NHTSA, says opponents of the laws base their arguments on civil libertarian principles. "They say that, 'it's my head, it's no business of yours if I crack it up, so get out of my face and let me ride my bike,'" he says. "They are incredibly effective at lobbying state legislatures. You haven't been lobbied until a group of bikers with long hair and black leather jackets and broad shoulders come and stand in your office."

Many public health experts are extremely concerned about the policy backdown, and believe it has contributed to an increase in motorcycle deaths and escalating health costs. The most recent figures show that motorcycle fatalities rose 13 percent from 4,028 in 2004 to 4,553 in 2005 and that almost half of the people who died were not wearing a helmet.

As with the push to ensure motorcyclists wear helmets, the battle for seat belts is a long one. Despite strong systematic review evidence that primary seat belt laws prevent suffering and death, many states still do not have them. Primary laws mean police officers can stop a driver for not wearing a belt. Secondary laws, which exist in the majority of the states, mean police officers can only fine someone for not wearing a belt if he or she has been stopped for another reason. One state, New Hampshire, still has no law at all covering adults.

The traffic safety field has developed a solid evidence base, and dozens of systematic reviews are available to help guide policy decisions. Investment in research reflects concern about the enormous toll of motor vehicle accidents, which killed more than 43,000 people in the United States in 2005.

Ruth Shults, who coordinated the traffic safety systematic review on behalf of the CDC, says traffic safety interventions face fewer methodological issues than many other population health interventions. This is because many traffic safety interventions can have nearly instantaneous effects on the health outcomes of interest, making it fairly straightforward to attribute changes of clear public health relevance to the interventions. Randomized controlled trials are rarely applicable to the

field, but Shults says the Community Guide holds that findings from an observational study with a well-chosen comparison group can be compelling.

Some of the key audiences for traffic safety systematic reviews are outside the traditional public health domain, and therefore great efforts have been made to disseminate findings to traffic safety researchers and practitioners, as well as to engage them in the review process, says Shults.

Shults and other experts believe that scientific evidence has had greatest impact on policy when used to inform the work of advocacy groups and thereby influence public debate. Organizations such as MADD and the Insurance Institute for Highway Safety have referred to the systematic reviews of evidence on sobriety checkpoints in their calls for broader use of sobriety checkpoints throughout the nation. Also, the NHTSA, the CDC, and the AAA Foundation for Traffic Safety are incorporating review findings into their funding proposal guidelines for community-based interventions to reduce alcohol-impaired driving and to increase safety belt use.

Elder cautions that third parties such as interest groups will only be interested in the evidence from systematic reviews if it matches their agenda. "There has to be some level of preparedness to accept the information you're giving and to act on it," he says.

The dramatic decline in traffic fatalities is often held up as an example of a major public health victory, but traffic safety experts note that the introduction of effective interventions, such as primary seat belt enforcement laws and sobriety checkpoints, has been patchy. Scientific evidence is only one of a "whole raft of considerations," which influences policymaking, points out Hedlund. Furthermore, even when policies are introduced, the effectiveness of their implementation can vary. The NHTSA notes that the effectiveness of interventions can fluctuate immensely from state to state or community to community. "*What* is done is often less important than *how* it is done," says the NHTSA. "The best countermeasure may have little effect if it is not implemented vigorously, publicized extensively, and funded satisfactorily."

In particular, many experts are concerned that little progress has been made in reducing alcohol-related traffic fatalities in the past decade. "We haven't been able to break through public concern in the way we did in the 1980s and early '90s," says Nichols. "The public gets used to issues, and it's more difficult to generate interest. Plus 9/11 has had an impact—traffic safety used to compete with crime for police officer attention; now it also competes with security."

The lesson, he says, is that persistence is required. "You have to continue to collect evidence until you have achieved your goal. You can't let your evidence age. You have to put it in the hands of credible spokespeople and you have to persevere."

**KEY MESSAGES**

- Evidence-based traffic safety interventions have saved many lives, prevented much suffering, and reduced health care costs. More could be achieved, however, through more widespread, consistent, and effective implementation of such interventions.

- It is crucial to involve recognized leaders of the target audiences in the entire review process and to broadly disseminate the findings to all segments of the target audiences.
- Dissemination of the findings of systematic reviews is particularly important when the target audiences lie outside the traditional public health field.
- The use of financial incentives and sanctions can encourage the implementation of evidence-based policy.
- Complacency is unwise: effective policies can be repealed and public health messages can lose their impact.
- Commercial interests and advocacy groups, whether basing their arguments on evidence or not, can exert a powerful influence on policy.
- Involving opinion leaders in the development and dissemination of reviews can increase their impact.

*Summary: Binge drinking among college students is a major public health problem upon which prevention campaigns have had little impact. At the University of Nebraska–Lincoln, however, binge drinking rates fell after the introduction of a comprehensive program aimed at creating an environment that supports low-risk drinking. The program, which has been running for several years, was developed and implemented by a broad-based coalition of town and gown interests. Ongoing evaluation of the program is contributing to development of the evidence base for alcohol control policies. While the evidence from systematic reviews is important in shaping such programs, the implementation process is also critical.*

Binge drinking exacts a costly toll upon the health, well-being, and education of college students and also affects others in their orbit. They are more likely to binge drink than their peers who are not college students and are more likely than other adults to drive while under the influence of alcohol. It has been estimated that seventeen hundred college students die each year from alcohol-related causes, including about thirteen hundred deaths due to alcohol-related motor vehicle crashes. Heavy drinking among college students also contributes to tens of thousands of assaults and sexual assaults each year.

Efforts to combat the problem of binge drinking have relied mainly upon educational strategies to encourage individual students to change their behavior and have been largely unsuccessful. A three-year investigation by the Task Force on College Drinking, established by the National Advisory Council on Alcohol Abuse and Alcoholism, identified the need for a three-pronged approach to changing the culture of drinking on campus: prevention programs should target individuals including at risk or alcohol-dependent drinkers; the student population as a whole; and the college and its surrounding community.

The Task Force, reporting its findings in 2002, also urged colleges to base their policies and prevention programs upon scientific evidence. "In general, colleges and universities have not applied the methods, techniques and findings from cutting-edge alcohol prevention research to the problem of college student drinking," it said. The Task Force noted that college administrators had come to see drinking as an insolvable problem. "When schools have made efforts to reduce drinking among their students—and many have made considerable effort—they haven't had significant campus-wide success. With each failed effort, the image of college drinking as an intractable problem is reinforced, administrators are demoralized, and the likelihood that schools will devote resources to prevention programs decreases."

The Task Force also highlighted the dearth of knowledge about what interventions are effective at preventing students from binge drinking and said evaluations of environmentally focused prevention strategies specific to college populations are "sorely needed."

A bright light amid this gloom is a program that has had a marked impact on binge drinking and related harms at the University of Nebraska–Lincoln. It is one of ten universities funded under the Robert Wood Johnson Foundation's Matter of Degree program, administered by the American

Medical Association. Participants identify the environmental factors such as advertising and marketing, institutional policies and practices, local ordinances, and cultural beliefs that converge to encourage alcohol abuse. Most of the universities funded under the program have high-profile athletics programs and large Greek chapters—characteristics associated with increased rates of harmful drinking. The program supports a collaborative approach between participating universities and the communities where they are located.

Since 1998, the NU Directions Campus-Community Coalition at the University of Nebraska−Lincoln (UNL) has been developing and implementing a raft of strategies to create a culture that supports responsible low-risk drinking, including abstinence. These have included legislative reform to reduce the concentration of liquor outlets, media campaigns, a web-based training program for hospitality and retail workers, and projects focusing on fraternity and sorority chapters. The coalition involves community leaders; city, county, and state officials; police officers; hospitality owners; prevention specialists; educators; students; and parents. Between 1997 and 2003, the UNL binge drinking rate fell from 62 percent to 47 percent, but remains above the national rate. At the same time, the student retention rate increased approximately 1 percentage point per year.

The project, which has an onsite evaluator, has been heavily data-driven, according to its director, Linda Major. But the key reason for its success, she adds, is the strong coalition that has been built between the many stakeholders in both the town and gown communities. "Having data available to help guide our strategies and our resource allocation was absolutely critical, but these other process factors were just as critical," she says.

Tom Workman, the program's associate director, agrees that the long, laborious process of developing a coalition of interests that understood the problem and supported action was crucial. "You can't simply present data and assume data cuts across a variety of political considerations," he says. "Here, there was a willingness across the community to say, we believe the data. It takes years to establish relationships that enable people to see the data for what it is and to be willing to work collaboratively."

Responding to stakeholders' concerns was another vital part of the process. For example, when hospitality and liquor outlets opposed a plan for mandatory staff training as expensive and impractical because of their high staff turnover, a free, web-based program was developed. "You will be much more successful in accomplishing the policy once you have worked out the problems of implementation rather than jumping in and fighting resistance," says Workman.

The project also had to be flexible, for example, when it met resistance from the Greek chapters in developing strategies to tackle their risky drinking culture. The project was much more successful after being reframed as a way of helping the chapters tackle problems such as declining membership, negative press, and image problems. "That allowed the alcohol issues to become part of the discovery when fraternity and sorority members analyzed factors contributing to existing problems," says Major. "It took much longer this way, but it was much more effective."

With the project involving dozens of different strategies, Major says it is difficult to know which were the most effective, and she expects it is the "totality" of the approach, with synergistic effects, that counts. But she has no doubt that a critical element was bringing on board a communications professional to engage the media. The five-year evaluation of the project also noted the importance of having a staff member who understands community organizing, uniform messages, and soliciting feedback.

One of the other notable lessons, Major adds, is that such campaigns take years of consistent work and require patience. The grant was originally for five years, but was extended for another four years. Major says it is unusual to win support for such a long-term project: "Rarely do you have these kinds of resources or a funder who actively supports long-term strategic planning to have the opportunity to create thoughtful, intentional strategies based on literature, experience, and intuition that make an impact."

For Toben Nelson, a researcher at the Harvard School of Public Health who has been involved in evaluating the Matter of Degree program, the Nebraska project is a rare example of an effective effort to prevent alcohol-related harms on campuses. While an evaluation of the ten universities involved in the program found it did not result in significant improvements overall, a different picture emerged when considering the five sites, including Nebraska, that most closely implemented the environmental model. These universities reported reduced alcohol consumption and related harms, with benefits both for the drinkers and those around them.

Nelson says there is great potential for policymakers to make better use of the findings of systematic reviews when examining options for reducing alcohol-related harm in the broader community as well as on college campuses. Effective interventions include enforcing the minimum legal drinking age, zoning restrictions to reduce alcohol outlet density, keg registration, mandatory responsible beverage service training, and increased excise taxes.

"My general impression is that the specific policy recommendations tend to be ignored or people seem to think that they are too difficult to implement," Nelson says. This is largely because policymakers often don't have the skills, expertise, authority, or power needed for implementation, he adds.

"What you really need," Nelson continues, "is almost a campaign manager and that's not who these people are—by and large they are people within the bureaucracy and they don't tend to be the leaders with the authority to make those kinds of changes happen, whether that's on a college campus or within a country or a city or a state. Another reason is that it takes a long time to get this stuff to happen and there are lots of barriers along the way. The alcohol industry is pretty active in offering prevention alternatives that are much easier to implement but less effective."

Another hurdle is the misperception that it is the heaviest drinkers causing all the problems—or the "few bad apples" perspective. An understanding of the "prevention paradox" reveals that while extreme drinkers are at highest risk of harm, the majority of harms in a community arise from moderate or low consumption because that involves the largest number of drinkers. Nelson says

policymakers who fail to grasp this concept do not appreciate that the greatest health gains to a community will flow from incrementally changing the drinking patterns of the majority, rather than focusing on the smaller group of heavy drinkers.

Nelson says the program at the University of Nebraska–Lincoln is a "shining example" of an effective program. Its success has hinged on the program's strong leadership as well as its high-level support from the university administration and the city. "That's laid the groundwork for an extremely effective individual with a good team around her that has led a political style campaign," he says.

**KEY MESSAGES**

- Having a solid evidence base is important but is only one of the elements needed for success in community-based interventions.
- Building broad coalitions can be critical for the success of population-based interventions; stakeholders need to be engaged and their concerns addressed.
- Community-based programs need to be flexible and take a long-term approach.
- Leadership is important, both within and outside the program.
- Effective engagement with media is critical.
- Understanding the prevention paradox is vital when designing population-based health strategies.
- Ongoing evaluation helps inform strategy development and implementation.

*Summary: Fearless advocacy and a willingness to experiment with novel approaches drove a groundbreaking tobacco control program in California. It had a dramatic impact in changing community attitudes towards smoking and reducing tobacco consumption in the early 1990s, but has subsequently lost some of its impact. The program, and others that followed elsewhere, contributed to the development of an evidence base, which includes many systematic reviews, on effective tobacco control interventions.*

Public health history was made in November 1988 when Californians voted for a citizen-initiated law called Proposition 99. It increased tobacco taxes and devoted 20 percent of the money raised to tobacco control, creating the world's largest tobacco control program almost overnight. However, this victory marked only the beginning of a long and difficult battle on behalf of what has been described as one of the most intensive, aggressive public health interventions ever undertaken. The challenge for Californian policymakers, who were breaking new ground in the early 1990s, was how best to spend their windfall—about $100 million per year—while fighting ongoing battles with antagonistic political, professional, and industry interests.

Dileep Bal was one of the key tobacco warriors within the California Department of Health Services for fifteen years, until recently moving to his current position as district health officer at the Hawaii State Department of Health. While at the California Department of Health Services, Bal oversaw the distribution of funding to one of the first statewide anti-tobacco media campaigns, as well as to local health departments, community-based organizations, schools, and other agencies to promote tobacco prevention and cessation. Bal says about 30 percent of tobacco control funds was allocated to media campaigns, about 30 percent to local health departments, about 30 percent to competitive grants, and 10 percent to evaluation. The centerpiece was the innovative media campaign, which, rather than taking the traditional health promotion approach of warning that "smoking will kill you," attacked the tobacco industry directly and aimed to change social norms around smoking. The goal was to overturn industry marketing portraying smoking as sexy and cool.

"For a government program, it was very, very atypical," recalls Bal, whose job came under threat many times. "It was very unusual for government to take on what was referred to as a legally constituted industry. I elected to take on the tobacco industry head-on and I have the scars on my back to show for it."

Bal laughs when asked about the role of scientific evidence in guiding policy decisions. "There was no science on how to do a community intervention on something of this global dimension," he says. "Where there is no science, you have to go and be venturesome—you can't use the paucity of science as an excuse to do nothing. We created the science, we did the interventions and then all the scientists came in behind us and analyzed what we did."

Bal is frustrated by colleagues who want to wait for high-level evidence before acting. "Public policy must be propped up by science but must not be a handmaiden of the science," he says. "Most scientists will say you need a randomized controlled trial level of proof to do a community

intervention. That's horse feathers. We tried twenty-five things—twelve worked and we renewed those. Empirical trial and error is the oldest scientific device and we used it to distinction."

Another critical aspect of the program, says Bal, was having advocates outside the bureaucracy who were fearless in speaking out. These included Stanton Glantz, professor of medicine at the University of California, San Francisco, and his colleague John Pierce, a professor at the University of California, San Diego (UCSD). Both Glantz and Pierce documented the program's initial dramatic success in dropping smoking rates between 1989 and 1993, before cutbacks in funding and political support stymied further progress. More recently, the program has been described as stagnant and facing an uncertain future.

Despite the setbacks, there is no doubt the program has had a dramatic impact—and not only because in its first eight years, it is estimated to have prevented 58,900 deaths between 1989 and 1997. Its impact reached beyond California's borders, providing other jurisdictions with confidence that smoking rates could be dropped and guidance about what interventions might work. California's contribution to knowledge about tobacco control was particularly important after the unprecedented, multibillion dollar settlement reached between the tobacco industry and most state governments in 1998.

Not all states used these funds for tobacco control, but the settlement contributed to many new anti-tobacco programs. Tobacco control is one of the most common reasons that policymakers turn to the Community Guide, which lists more than a dozen systematic reviews in the areas of preventing the initiation of tobacco product use, increasing cessation, and reducing exposure to environmental tobacco smoke. The Community Guide also includes economic evaluations for many recommended interventions.

Systematic reviews have also helped policymakers to appreciate the unreliability of research and review articles supported by the tobacco industry. One such investigation found that review articles concluding secondhand smoke was not harmful were about ninety times more likely to be written by authors with financial ties to the tobacco industry rather than those without such ties. Another systematic review found that lower quality studies were much more likely to conclude that smoke-free regulations adversely affect the hospitality industry and were also much more likely to be industry-funded. This review would not have had such an impact on policymakers, according to one of its authors, Michelle Scollo, a researcher with the Cancer Council Victoria in Australia, if the researchers had not been proactive in presenting the findings to politicians and public forums using simple, straightforward language and a graphic PowerPoint presentation. Effective communication of systematic reviews requires "persuasive speech" to help policymakers connect the evidence with their constituency, adds Lisa Bero, a professor and a prominent member of the Cochrane Collaboration, based at the University of California, San Francisco. "It's not so much about spin but about making the numbers come alive," she says.

Many experts believe that reports issued by prominent authorities, such as the U.S. surgeon general, have been more influential in driving policy than systematic reviews, which were scarcely

cited in an online poll by the journal *Tobacco Control* of the most important and influential PubMed papers in tobacco control. Bero says it is unfortunate many of the landmark reports on tobacco control have been consensus documents, rather than the product of the methodology and rigor of a systematic review. "If there's a way we can introduce the systematic review methodology more into these reports, not only would they be more influential, they'd be stronger," she says. There is also room to increase the role of evidence in tobacco control advocacy, she adds.

Bero also points out that systematic reviews played an important role in tobacco control by establishing evidence of the harm caused by secondhand smoke exposure. "Without that evidence of harm, there would have been no need to make policy at all," she says.

A solid evidence base is only one element of effective advocacy, argues Simon Chapman, professor of public health at the University of Sydney, Australia, and editor of *Tobacco Control*. He cites a survey of Australian policymakers and advocates, suggesting that economic, ideological, and anecdotal arguments often outweigh scientific evidence in policy decisions about environmental tobacco smoke. Politicians and political advisors told the researchers doing the survey that evidence has limited power in governmental deliberations. One political advisor said "evidence" presented by any lobbyist is viewed skeptically because lobbyists tend to spin their findings to suit their positions. A politician suggested that anecdotes and "folklore" carry more weight in political conversations than scientific studies and other forms of independent evidence.

In the United States, some of the leading players in tobacco control policy are skeptical about the value of systematic reviews in population health policymaking. Lawrence Green, adjunct professor in the Department of Epidemiology and Biostatistics at the University of California, San Francisco, who was closely involved in evaluating tobacco control programs for the WHO and the CDC, argues that many systematic reviews of population health interventions have been "sterile" and of little help to policymakers. "They've produced a lot of studies that are high in internal validity [to help maximize their chances of demonstrating effectiveness] but relatively low in external validity [their relevance, generalizability, and applicability to real-world situations are questionable]," he says. "This means they screen out a lot of studies that might have greatest relevance for policymakers and leave in highly controlled studies, which as a result of all the experimental controls have become somewhat artificial."

Green says his experience evaluating the California tobacco control program suggests that its comprehensive approach was the reason for its success, rather than the effectiveness of any one intervention. "School-based programs may not have much effect by themselves, but when combined with community efforts, they take on a whole different meaning," he says. "And when they're supported further by the mass media, it takes on even more meaning. And the mass media wouldn't be effective without what's going on in the home. And then effective enforcement of what kids can buy across the counter is also important. Each of these interventions by themselves may have limited effect if not supported by the others but combined you get a synergistic effect."

When Green was working for the CDC, helping to promote a manual called *Best Practices in Comprehensive Tobacco Control*, he says they "took some heat" from headquarters because they broke

rank with the use of the term *best practices* by going beyond controlled trials for evidence. They pushed for the manual to include case studies from California and Massachusetts rather than limiting it to systematic reviews of highly controlled studies. Public health differs from evidence-based medicine because it is intervening across very complex systems and populations rather than across the relatively homogenous biological organisms called patients, he says. "In public health we can't afford to be too precious about our definitions of evidence," he says. "It was the comprehensiveness of the approach that we wanted to represent to the other forty-eight states as best practice. And it was the real-world, real-time experience of the two states that made the manual more credible to other states than if it had been limited to carefully controlled studies in more academic settings and circumstances."

As previously discussed, systematic reviews can include many methodologies other than randomized controlled trials. Pierce, director of the Division of Population Sciences, Moores UCSD Cancer Center, believes randomized controlled trials are best suited to studies of plants and pharmaceuticals and do not provide a useful basis for population health decisions. Their use is particularly limited in communication studies where the intervention cannot be controlled. "In reality, people change their behavior because of social norms, and the rules for systematic reviews frequently leave out studies that address social norms," he says. "Very few people have done good evaluative studies in which social norms were changed."

The ideal tobacco control program doesn't exist and population-based programs are political and unpredictable. "We have some things that work in some places, some things that don't," Pierce says. "A population program is more like a rodeo—if I'm on a bull, all I can do is tell you where I've been, I can't tell you where I'm going. It's not like having a map. Things change in front of you, you can't control the events."

**KEY MESSAGES**

- Changing social norms through legislative and regulatory changes as well as innovative media campaigns is an effective way of influencing individuals' behavior.
- Achieving policy change requires courage, persistence, and a thick skin. A reliable evidence base also helps.
- A comprehensive range of interventions working at multiple levels is more likely to have an impact than any single intervention.
- Systematic reviews are more likely to have an impact if efforts are made to disseminate and "sell" their findings.
- Systematic reviews are more likely to have an impact if they address issues of external validity and relevance as well as issues of internal validity and bias.
- Credible evaluations of state programs and policies are needed to continue to add to the evidence base.

*Summary: The obesity epidemic presents policymakers with many complex challenges. Multifaceted community-wide interventions are being developed and implemented, but sometimes there is considerable uncertainty about their likely impact and cost-effectiveness. Responses are being guided by common sense as well as scientific evidence from systematic reviews and sources such as the Community Guide.*

From Africa to Australasia and from Europe to the Americas, an unprecedented public health problem has arisen on a scale that would have been unimaginable to previous generations. A multitude of factors has contributed to the rapid emergence of the international obesity epidemic, including modern lifestyles, leisure choices, working environments, urban design, transport, food production, and technological development. Clearly, there are no simple solutions to such a multifaceted problem, and policymakers are confronted with many tough dilemmas. When there are so many uncertainties, what courses of action will bring the greatest benefits? How can politicians and the broader community be helped to understand that community-wide strategies are more likely to succeed than those focusing on individuals' behaviors? How can the push from vested interests to medicalize the response be resisted? How can sectors outside the traditional health domain—such as transport and urban planning—be engaged? What areas of research will yield best returns on investment?

When grappling with such issues, many policymakers have turned to the Task Force on Community Preventive Services and the Community Guide for clues to the way forward. The Community Guide has published a number of systematic reviews in the areas of physical activity, nutrition, and obesity prevention, and has many more pending. Its work has highlighted significant gaps in knowledge, often reflecting a lack of primary prevention studies. More is known, for example, about how to promote physical activity than about how to increase healthy eating. Even where interventions are known to be effective, many questions remain about their implementation and cost-effectiveness. The Task Force has listed numerous research questions it would like public health practitioners, policymakers, employers/purchasers, and funders to consider when establishing research priorities.

Meanwhile, some policymakers have described their difficulties responding to recommendations from the Task Force, the Institute of Medicine, and other organizations, citing a lack of guidance on how to translate public health and clinical evidence about obesity control into meaningful policies. Others have questioned whether "the people, the proficiencies, and the proliferation processes" are available to achieve effective translation and dissemination.

In the absence of comprehensive evidence about which combination of interventions will be most effective and how best to implement them, policymakers must rely on "common sense and input from a variety of sources including staff and special interests," according to Ross Brownson, a professor at the Saint Louis University School of Public Health. For example, many states are implementing obesity prevention policy measures without knowing for certain which are most effective.

Policymakers could often also make better use of the evidence that is available, says Neal Kohatsu, chief of the Cancer Control Branch, California Department of Health Services. "There are many gaps and unanswered research questions from both the clinical and population health perspective, but my own feeling is that we aren't making use of the available evidence," Kohatsu says. "Overall, most people are not as familiar with the evidence as they should be."

For the past several years, a broad-based coalition has been working in North Carolina, where obesity rates are above the national average, to increase physical activity and healthy eating wherever "people live, learn, earn, play and pray." The North Carolina Division of Public Health provides staff support and funding for the program's leadership team, representing more than one hundred public and private partners. Interventions include media and public awareness campaigns, nutrition standards for school meals, mandatory physical activity for grades K–8, worksite programs, and grants for communities to implement physical activity and nutrition programs.

The campaign's materials note that public health victories in areas such as traffic safety and tobacco control offer lessons for obesity control, such as outlining the importance of having highly credible scientific evidence that can persuade policymakers and withstand attack from those whose interests are threatened; advocates who are passionately committed to their cause and who have the inner resources to withstand the pressure applied by the industries whose practices they are criticizing; a partnership with the media; and laws and regulations.

Leah Devlin, state health director, says that while the Community Guide and recommendations from other expert sources have provided some guidance, policymakers have often had to rely on "what we think makes sense." "In public health we do make our decisions to the extent that we can on sound science but in obesity we can't wait for the science to act," she says.

One of the difficulties, adds Marcus Plescia, chief of the Public Health Division's Chronic Disease and Injury Section, is that the interventions supported by the strongest evidence—such as making changes to the built environment to promote activity—are the most difficult to implement, requiring major societal changes. Interventions that may be more straightforward to implement—such as changing school menus—involve many uncertainties. "Nobody really knows whether if you start changing menu items in schools and vending machines, how kids will react," he says. "The big concern is that kids will stop eating school lunches altogether, which we do not want to happen. The question is how hard can you push regarding what nutritional offerings are there, and how quickly or slowly do you need to phase things in? And there's not a lot of evidence on those issues."

North Carolina's plan to prevent overweight, obesity and related chronic diseases from 2007 to 2012 is unlike many health policy documents. Noticeably, it does not carry the logo of the North Carolina Division of Public Health or other groups involved in its preparation. This is part of a deliberate strategy to encourage everyone in North Carolina to feel ownership of the plan and free to disseminate it as his or her own. "One of the great lessons we're learning is that sometimes it is good to lead but lead in the background and let others carry the wider issue," says Cathy Thomas, head of the Division's Physical Activity and Nutrition Branch.

The plan is also notable because it is written in an engaging storytelling style, rather than the dry, academic language and jargon often found in policy documents. "We wanted to write a plan that was readable," says Thomas. "So many times state plans sit on people's shelves. We wanted it to be attractive and to tell the story so people understand that while obesity is a public health issue, it is an issue we all have to engage in, whether you're in a preschool or school or work setting or health care."

Beverley Perdue, North Carolina's lieutenant governor, is also cited as having played an important role in championing the need for action on obesity, both among legislators and the broader community. Plescia says the governor's work, chairing the Health and Wellness Trust Fund Commission and convening a group of experts and politicians to form the Childhood Obesity Study Committee, has led to significant policy change.

In Arkansas, another state noted for its attempts to tackle obesity, the personal support of two prominent local leaders has also been critical in garnering community and political backing for tackling obesity. This is widely seen to reflect their personal experiences with lifestyle-related illnesses: Herschel Cleveland, former House speaker, had a heart attack, while Mike Huckabee, the former governor, went on a high-profile and successful weight loss campaign after being diagnosed with type 2 diabetes.

When evidence is lacking, policymakers bear an extra responsibility to ensure programs are carefully evaluated so as to contribute to the development of the evidence base. The impact of obesity control efforts in North Carolina, Arkansas, and other states will be closely watched by policymakers who are grappling with similar challenges around the world.

Another important message from the obesity front line is that there will be no quick fix. North Carolina has acknowledged that a long road lies ahead, noting that it took almost a century to move from the discovery that lead paint caused neurological damage in children to legislation and regulation that dropped children's blood lead levels. Devlin hopes progress on obesity will come more quickly than this, however.

**KEY MESSAGES**

- Policymakers often must make decisions on the basis of incomplete evidence.
- A lack of evidence is no excuse for inaction.
- Systematic reviews can help identify gaps in the evidence and priorities for future research.
- Policymakers need more than the findings of systematic reviews: they need advice on how to translate these findings into policy and action.
- Prominent leaders with some personal stake in the issue can be powerful champions.
- Evaluation of programs and policies is vital.
- Complicated health problems require complex solutions and persistence.

*Summary: While grappling with the chaos that follows a disaster, policymakers can struggle to find systematic reviews or other scientific evidence that is relevant or helpful to their needs. Most disaster research has been conducted in developed countries, although disasters are most frequent and damaging in poorer countries. Population-based mental health responses to disasters should focus on minimizing stressors and providing social support, as well as ensuring medical services are available to those who need them.*

In late 2004 and early 2005, chaos reigned in many countries bordering the Indian Ocean after a tsunami wrought destruction on an unimaginable scale. Confusion also resulted when a plethora of governments, charities, emergency workers, and volunteers raced to respond to the massive humanitarian crisis.

In some senses, the chaos that inevitably follows in the wake of disasters is also a metaphor for the complexities confronting policymakers in such situations. They must respond quickly to an emergency despite confusion and controversy about which interventions might be most beneficial and growing awareness of the potential for some interventions to do more harm than good. Much debate also surrounds whether some Western responses to disaster, including a focus on post-traumatic stress disorder and other mental health problems, are appropriate or useful for other cultures.

Within days of the tsunami swamping international news headlines, Fran Norris sat in her office in Vermont and methodically worked through a systematic review she'd published with colleagues in 2002, analyzing studies of the mental health of 160 samples involving more than sixty thousand disaster survivors. Among other things, the review highlighted how skewed the literature was towards developed countries—far fewer studies had been done in developing countries, despite the fact that they tend to suffer more disasters and that these tend to have a worse impact. The finding illustrates both a limitation of systematic reviews, that they are the constrained by the nature of the primary studies, and one of their key values: their ability to identify gaps in the literature.

After the review's publication, Norris, a research professor in the Department of Psychiatry at Dartmouth Medical School and a psychologist with the National Center for Posttraumatic Stress Disorder, prepared a short executive summary to help disseminate its findings. She has made a conscious effort to learn to write in a nonacademic style although she finds this difficult. "Academics don't always know how to write interestingly and concisely, to skip the details and qualifications," she says. "It's hard but if you don't do it based on research, someone else is going to do it based on something else. It's challenging to go out on a limb; others may say you should never go beyond the data."

Norris had feedback suggesting the short executive summary generated more interest than the review itself, although she was not sure what impact, if any, it had on policy. "It got attention but I'd be hard-pressed to say it changed policy," she says. "But in some ways, who am I to tell any government what their policy should be? I can try to give some information; here is our best understanding, but I am not even sure I can tell you what it says you should do," she says.

After the tsunami, Norris extracted from the review those studies involving hurricanes, floods, tornadoes, and dam bursts, which might be relevant to the tsunami response. She prepared and posted on the Internet a summary providing the following tips for policymakers: that most people would recover over time but some groups (women, children, people with pre-existing psychiatric conditions, minority ethnic groups, and the poor) were at increased risk of persisting problems; that secondary stressors were an important predictor of chronic problems; that naturally occurring social resources were vital; and that interventions should address both psychological and social/community needs.

Coincidentally, at about the same time as this summary hit cyberspace, WHO officials published an article suggesting a way to move beyond the controversies that have surrounded mental health responses to disasters. It noted that disasters in poor countries are often followed by the arrival of foreign clinicians promoting trauma-focused treatment in the absence of "a system-wide public health approach that considers pre-existing human and community resources, social interventions, and care for people with pre-existing mental disorders."

Based on a nonsystematic literature review, a survey of experts, and the findings of consensus statements and guidelines, the article proposed the following set of principles and strategies to guide responses to populations exposed to extreme stressors: contingency planning before the acute emergency, assessment before intervention, use of a long-term development perspective, collaboration with other agencies, provision of treatment in primary health care settings, access to services for all, training and supervision, and monitoring indicators. Most of these WHO recommendations had been included in a "mental and social aspects of health" standard in a revised edition of the disaster response "bible," the *2004 Sphere Handbook*. It was the first time this widely used handbook included such a standard.

After the article was published, officials at the WHO commissioned systematic reviews, which included anthropological, qualitative, and social science literature, to examine how their recommendations equated with the evidence base. The findings of these reviews were used to inform the development of a more detailed set of guidelines. According to Mark Van Ommeren, a public health scientist at the WHO in Geneva responsible for mental health in emergencies, this example illustrates the reality of how policymaking often occurs. "A lot of people in academe think you do a systematic review and then there's policy," he says. "I don't think it happens at all like that. My experience is that people make policy and then they look for the evidence, and if they are objective, they adjust the policy. For better or worse, the policy process runs way ahead of the evidence process."

In the aftermath of the tsunami, officials at the Thailand Ministry of Public Health turned to the WHO and UNICEF for information to guide their policy responses for strengthening community networks and public education. They were apparently not aware of the Norris review or the related summary that she produced.

Van Ommeren says it is impossible to know how widely WHO and UNICEF recommendations were followed on the ground after the tsunami. "I went to rural Sri Lanka and found our guidance being written on the blackboard and that was somewhat reassuring," he says, "but tons of groups

respond to such emergencies and everyone seems to have their own approach. The aid workers at the scene act according to what they think is the best at the time and it's usually not fantastic; for example, people try to use a clinical model, thinking that anything is better than nothing, which is a very dangerous assumption. The assumption that any care is better than no care often leads to harm."

Van Ommeren says much evidence developed in the West is irrelevant when responding to disasters in developing countries. For example, he says, the Cochrane Collaboration circulated systematic reviews to help the tsunami response efforts, but these were rarely useful because most involved interventions that were not applicable or were relevant only to professionals with advanced training. In addition, these reviews tended to address the effectiveness of individual interventions rather than how services and responses should be organized.

Even if applicable and relevant, health and medical literature alone cannot provide all the information required in the aftermath of a disaster. Sandro Galea, associate professor of epidemiology at the University of Michigan School of Public Health and co-director of the Disaster Research Education and Mentoring Center, says it is unfortunate there are not better linkages between all areas of research relevant to disaster responses, including engineering, political sciences, and health.

An understudied area, he adds, is how disasters affect the behavior of populations. "If I were in charge of policy, I would be much more interested in how people behave after a disaster than their mental health or health," he says. "Companies want to know, for example, if they will still have workers or consumers. The GAO report on the impact of pandemic flu says a large proportion of the costs will be due to behavioral changes."

Galea also stresses the importance of ensuring that the mental and physical health responses are closely integrated. Overall, however, the most critical message from the disaster response research for policymakers is to minimize ongoing stressors and to provide social support. "Rather than devising interventions based on cognitive behavioral therapy or treatments, our biggest population impact is going to be doing something about stressors and social support," he says. "You have to make sure people are housed, fed, and know where their kids are, and have the formal and informal resources to help them cope with the stressors."

Galea says there is a gulf between policymakers and the disaster response evidence base, and he does not expect it to be bridged quickly. "There is always a gap between science and policy, but this is a relatively new field," he says. "Given that this field has coalesced in the last ten years, it will be another ten years until it makes it into policy."

**KEY MESSAGES**

- Findings can be extracted from systematic reviews to provide information relevant to particular situations or contexts.
- Dissemination of systematic reviews requires particular skills, which do not always come naturally to the producers of such reviews.

- The policy process frequently runs ahead of the evidence base, which is often developed after policies have been implemented.
- Systematic reviews are not always relevant or applicable to all cultures or contexts.
- Policymakers require better integration of evidence from a range of fields beyond health and medicine.

*Summary: The Drug Abuse Resistance Education (DARE) program has been widely implemented in schools in the United States and elsewhere since its development in 1983, despite good evidence from a meta-analysis that it has negligible or no long-term benefits. The program has been significantly revised in response to widespread criticism and following the advent of federal education funding policies that encourage prevention programs to be based upon reliable evidence such as that from systematic reviews. Results of further evaluations of the revised program are awaited. DARE's successful diffusion may hold lessons for those seeking to disseminate effective programs.*

In 1983, a former police chief and a health education specialist in Los Angeles combined forces to create a drug education program that soon swept across the nation, becoming the most widely implemented drug prevention program in the United States. In its first year, ten police officers were trained to take the Drug Abuse Resistance Education (DARE) program into fifty elementary schools. In 2006, the DARE organization expected to reach thirty-six million school children around the world, including twenty-six million in the United States, where it has been implemented in 75 percent of school districts.

The program has evolved since its inception to include a variety of activities, including substance abuse prevention curricula for primary and secondary school students, parent education, and after-school and summer programming. Despite its popularity, DARE has attracted widespread concern among health and education policymakers and researchers because the weight of evidence suggests it is not effective. A 1994 meta-analysis, aggregating the findings of several evaluations of DARE, is widely cited by those concerned about its opportunity cost in diverting resources from programs more likely to be effective. Brian Flay, professor of public health at Oregon State University, argues that the meta-analysis findings should inform policy: "The policy implications are clear. Don't do DARE. Rather, spend your money on a program of proven effectiveness."

In 1998, following widespread controversy about DARE programs, the U.S. Department of Education introduced measures to promote the use of evidence-based prevention programs by state and local education agencies that receive funding under the Safe and Drug-Free Schools and Communities Act. Nevertheless, DARE continued to be extremely popular with many schools and communities, and one study found it was often implemented more widely than interventions of proven benefit.

In response to concerns about the effectiveness of its programs, DARE significantly modified its approach and in 1999 collaborated with the Robert Wood Johnson Foundation on a five-year national study evaluating a new curricula for seventh and ninth grade students developed by a national team of prevention experts. The results of this study are in preparation and should be available in 2007. Zili Sloboda, the study's principal investigator and a senior research associate at the Institute for Health and Social Policy at the University of Akron, does not agree with calls to abolish DARE, and instead proposes that experts work with the organization to improve the program. Many critics fail, she says, to make a distinction between the program's content and the effective delivery network created by DARE, which includes impressive quality assurance measures.

"DARE has been extremely effective in creating and sustaining the network," she says. "DARE has the ability that no other unit in the U.S. really has to introduce a new program and disseminate it within a few months to thousands of communities. This is an incredible network, and it's underestimated."

Sloboda believes that some of the opposition to DARE is driven by ideology, including animosity towards police officers among researchers belonging to the "hippie generation" and beliefs that teachers are best at delivering prevention programming. She says prevention programs that serve to alter attitudes and misconceptions regarding the use of drugs require skills that may be quite different from those needed to teach math or science.

Others argue, however, that DARE's widespread implementation illustrates the victory of ideology over evidence, the power of the "feel good" effect and the intuitive appeal of connecting police officers and students. DARE's successful dissemination has also been attributed to the impact of successful marketing.

Critics of DARE have sometimes felt a backlash. Kelli Komro, an associate professor at the Institute for Child Health Policy at the University of Florida, who has been involved in evaluating DARE programs, says DARE's supporters are often vocal and passionate. "I recently gave a presentation in Washington DC on alcohol and drug prevention programs and said, get rid of DARE," she says. "The audience reacted. It was like an uproar."

While DARE is sometimes held up as an example of the failure of evidence to influence policy, Jonathan Fielding, director of public health and health officer for the Los Angeles County Department of Health Services and professor at the University of California, Los Angeles, notes that the program was revised in response to negative evidence. The DARE story is also a reminder that public health interventions are less likely to be effective if they focus on changing individual behavior rather than the environment. "We've learned increasingly that health education alone is going to be insufficient to change behavior," says Fielding. "It may affect attitudes and knowledge but is unlikely alone to affect behavior."

Don Des Jarlais, director of research at the Beth Israel Medical Center Chemical Dependency Institute, contrasts the rapid spread of DARE with the much slower diffusion of another drug-related program, one backed by compelling evidence of benefit—the syringe exchange program. These contrasting case studies illustrate the impact of how issues are framed, he says. The concept of framing was developed within psychological decision theory and refers to the context within which a particular problem is posed. Framing can determine whether something is considered a problem, the range of acceptable solutions, and the most preferred solutions.

DARE was framed as a law enforcement response to a criminal problem whereas the syringe exchange program was framed as a response to the public health problem of HIV in injecting drug users. "The critical thing is that he who gets to frame the question usually gets to decide the answers," says Des Jarlais.

Another lesson from these case studies is that evidence eventually will influence policy, Des Jarlais says. "DARE is being cut back or reformed, and we do have more state and local governments supporting syringe exchange programs," he says. "For big public health problems, over the long run evidence will work, but it can be a very long run."

**KEY MESSAGES**

- Programs can diffuse rapidly despite evidence of lack of effectiveness.
- Programs entrenched within communities and defended by powerful interests can successfully resist evidence-based criticisms.
- Even when a systematic review provides clear answers about the effectiveness or otherwise of an intervention, the implications of these findings for policymaking can be interpreted in different ways.
- It may take many years before evidence influences policy.
- Evidence can inform policy by leading to improvements in programs, as well as replacement of programs.
- How problems are framed can have a powerful impact on the type of solutions adopted.
- Reviews should address both individual and environmental interventions and how such interventions should be organized.

*Summary: In 1983, the Washington State Legislature established the Washington State Institute for Public Policy to provide evidence-based advice on policy questions in diverse fields, including education, health, and criminal justice. The Institute's systematic reviews help answer questions not only about which interventions work or do not work, but also about cost-effectiveness. The Institute is highly regarded by policymakers as a source of credible advice, but its findings do not always influence policy decisions.*

In 2005, legislators in Washington State were facing a dilemma. They had been warned that the state would need to build two new prisons by 2020 to cope with increasing numbers of prisoners. With each prison costing about $250 million to build and $45 million a year to operate, the politicians were looking for advice, based on the best available scientific evidence, about how to reduce the impending burden on taxpayers while maintaining community safety.

The Washington State Legislature has a long history of interest in evidence-based policymaking. In 1983, it established the Washington State Institute for Public Policy to carry out practical, nonpartisan research to help answer policy questions nominated by legislators.

The Institute conducts research using its own policy analysts and economists, specialists from universities, and consultants, and its staff works closely with legislators, legislative and state agency staff, and experts in the field. It has developed expertise in conducting systematic reviews that not only identify interventions that work or do not work, but also answer questions about cost-effectiveness.

In 2005, the Legislature allocated funding for the Institute to conduct a systematic review of cost-effective, evidence-based options to reduce the projected future demand for prison beds, to save taxpayers money, and to contribute to lower crime rates.

The reviewers identified 560 controlled evaluations of adult corrections, juvenile corrections, and prevention programs. To be included, an evaluation had to have a nontreatment or treatment-as-usual comparison group well matched to the program group. The findings of evaluations with nonrandomized designs were discounted by a uniform percentage.

The reviewers preferred evaluation studies using real-world samples from programs in the field. The findings from programs that had only been implemented in a university setting were discounted by a fixed percentage. The reviewers also discounted findings from evaluations where the researcher was also the program's developer to account for potential conflicts of interest and the difficulties of replicating the efforts of exceptionally motivated program originators.

The review identified economically attractive, evidence-based programs in the areas of adult and juvenile corrections and prevention. "We find that if Washington can successfully implement a moderate-to-aggressive portfolio of evidence-based options, then a significant level of future prison construction can be avoided, state and local taxpayers can save about two billion dollars, and net crime rates can be lowered slightly," the reviewers concluded.

These estimates were cautious, they said, to reflect the difficulty often encountered when taking programs to larger scale, and the reviewers suggested the Legislature consider establishing

an ongoing oversight process to ensure quality control. They noted that a previous review of a juvenile justice program found it produced outstanding returns on investment when delivered as designed, but failed to reduce crime when not implemented competently. "Ensuring competent delivery of programs while maintaining fidelity to the program model appears to be essential," they said. "Thus safeguarding the state's investment in evidence-based programs requires ongoing efforts to assess program delivery and, when necessary, taking the required steps to make corrective changes."

It is too early to judge the review's impact, but the state's criminal justice policies already have had a marked effect, with incarceration rates 56 percent below the national rate. The review notes that the rate began to diverge from national trends in the early 1980s after the state enacted sentencing reform laws.

The Institute's director, Roxanne Lieb, says policymakers have become far more aware of the value of systematic reviews in recent years, partly due to the efforts of the Cochrane and Campbell Collaborations. "Our state's policymakers are not directly aware of these groups' efforts; however, this work has influenced researchers and others who advise legislators and has contributed to a climate where meta-analysis is valued," she says. Policymakers particularly value the use of systematic reviews in cost-benefit analysis. "It's one thing to report on effect sizes," says Lieb. "It's another thing for policymakers to understand what the consequences of that effect size might be in terms of the state budget."

Another advantage is that systematic reviews tend to identify a number of effective options, she says. "Local governments can pick which of the effective programs to implement so you get a bit of that local control that people value."

Lieb has learned to be pragmatic during her sixteen years with the Institute. Often their findings meet resistance from interest groups, are contrary to the "current wisdom" of the time, do not answer the questions confronting policymakers, or are not politically welcome or timely. "While the influence of systematic reviews is growing, I would say a majority of decisions on funding that could be potentially influenced by such reviews are still based on many other factors," she says.

The Institute has, for example, done extensive analysis of programs preventing youth problems. "But our influence on funding and programmatic decisions is still relatively modest," Lieb says. "So although in general people are becoming more comfortable with the notion of reviews and acknowledge their value, decision making around funding is often driven by continuation of the status quo, the interests of constituents, and lobbying by service providers. This is not a job that you do with a high expectation of seeing immediate applications. One must have patience. Often, the effects of our findings are relatively invisible as they change the discussion rather than directly influencing decisions that can be singled out."

Lieb stresses that the Institute does not engage in advocacy or lobbying: "We are very softly spoken in terms of presenting information. We work for the Legislature. If they are interested in our results, they will take advantage of them."

If systematic reviews are to gain more influence in policy circles, Lieb says it is critical to improve the consistent quality and to achieve transparency. "Two sets of researchers can produce a meta-analysis on the same topic and come up with different results depending on their selection criteria and measurement decisions," she says. "And while reviews by the Cochrane and Campbell Collaborations are seen as highly credible, they often take a long time to produce because they are conducted by volunteers." Lieb adds that if the selection criteria for systematic reviews prioritized issues involving significant government investment, their influence on policy would likely be increased.

Lieb would also like to see undergraduate training improved for the wide range of disciplines involved in producing and using systematic reviews, including psychologists and social workers: "It would be helpful if social science graduates were universally knowledgeable about the term *effect size* and knew how to recognize a good meta-analysis." Lieb also believes the policy process would benefit if charities and other advocacy groups became more familiar with the benefits of systematic reviews. The experience of Washington State suggests that many benefits can accrue from forging closer connections between policy and science.

## KEY MESSAGES

- Institutionalizing an evidence-based approach in the policy process has the potential to pay significant dividends.
- Systematic reviews are being used to help answer important and complex policy questions in diverse fields, including education, health, and criminal justice.
- Assessing program delivery and making any needed changes are vital when implementing programs.
- There is a need to improve the quality of systematic reviews and the expertise of those who prepare and use them.
- Even when reliable scientific evidence is available, it may not be reflected immediately in policy decisions.
- Systematic reviews would more likely be used if policymakers contributed to selecting the review topics most important to them.
- Providing economic as well as effectiveness data can enhance the relevance and utility of reviews.

The case studies in this report highlight some of the great gains that have occurred in population and public health, as well as some of the frustrations and disappointments. They make it clear that there is a long way to go to maximize the effective use of systematic reviews in population health. These case studies show the multiplicity of forces affecting population health as well as the complexity of issues facing researchers and policymakers within the many sectors that influence population health. They also suggest there is significant potential to enhance the contribution of research evidence to policymaking, while acknowledging that it is only one of many factors influencing policy.

The case studies also reveal the importance of taking a systems or environmental approach to behavior change rather than individual-focused strategies; the role of social norms in influencing behavior; the power of legislative, regulatory, and financial incentives; and the value of a reliable and relevant evidence base to help set political and public agendas and to shape interventions. Improvements to a population's health are rarely achieved quickly or easily: perseverance and pragmatism are often required.

These themes are also instructive for those seeking to boost the role of evidence in population health decision making. Improving the use and usefulness of systematic reviews will require individual researchers, policymakers, advocates, and other relevant groups to modify the way they work. Success in this endeavor is most likely to be achieved if systemic, environmental, and cultural changes promote and support them.

Those who seek to improve the use and usefulness of systematic reviews must recognize that policymaking is not a linear process and that a comprehensive array of interventions is more likely to have an impact than any single intervention. They must also be systematic by making deliberate, strategic efforts to disseminate and implement review findings as well as ready and willing to seize the moment when opportunities arise. Timeliness is often crucial in the policy environment.

At the same time, it is helpful to take a long-term perspective, acknowledging that significant change is rarely achieved in the typical bureaucratic or political time frame of two to three years, advises Trevor Hancock, public health consultant at the British Columbia Ministry of Health. "It's a useful lesson generally for people trying to promote the use of evidence," he says. "If you take tobacco as an example, look back on how long it's taken us to make progress on something as clear-cut as that. That's the bad news. The good news is if you look back twenty or thirty years, we've come a huge way. So huge changes are possible but they take time."

## RECOMMENDATIONS TO IMPROVE THE USE AND USEFULNESS OF SYSTEMATIC REVIEWS

The following recommendations are categorized in general groupings. This does not mean to imply that the research community, for example, alone bears responsibility for implementing recommendations around research or that only policymakers can effect change in the policymaking domain. The case studies in this report highlight the value of genuine, cross-sectoral collaboration.

Fostering collaboration among researchers, policymakers, and other stakeholders will also be important for efforts to improve the use and usefulness of systematic reviews. Prominent champions have also been vital in many public health victories. Identifying, mentoring, and supporting the champions of evidence-informed policy may help achieve the following goals.

**Improving Systematic Reviews**

There is significant room to improve the quality, timeliness, accessibility, and relevance of systematic reviews, so that they better answer the key questions of policymakers: can it work, how well will it work, and is it worth it? Strategies include:

- Ensuring undergraduate and postgraduate curricula in a wide range of disciplines—including public health, psychology, social sciences, political sciences, social work, and journalism—give a solid grounding in evidence-related concepts, including systematic reviews.
- Providing continuing education and mid-career training in evidence-related concepts.
- Providing funding and infrastructure to better support the production, updating, and local adaptation of systematic reviews.
- Involving policymakers and other users of systematic reviews in their topic selection, planning, and conduct. This may help make the reviews more relevant to users' needs, as well as develop networks to aid dissemination and implementation. Higher quality reviews are more likely to result when people with a broad range of experience, in both topic and methodology, are involved.
- Improving the quality and reporting of primary research upon which systematic reviews are based. Participatory research has the potential to increase the relevance of research findings and their subsequent use.
- Ensuring better reporting of costing issues, including separation of research from implementation costs, start-up costs from ongoing operational costs, and actual expenditures from opportunity costs.
- Identifying the harms as well as benefits of interventions both to highlight uncertainty associated with estimates and to describe differential effects by subgroups.
- Determining whether findings of ineffectiveness within primary studies are simply due to failure of implementation or to failure of intervention concept or theory.
- Specifying, where possible, the critical aspects of an intervention that cannot be modified, as well as those that can be modified to suit local conditions without jeopardizing the intervention's effectiveness.
- Ensuring maximum transparency of the review process and full disclosure of the interests of those involved.
- Focusing more review topics towards identifying gaps and limitations in primary studies.
- Better reporting of information on external validity.

- Better reporting of information on factors that seem to predict the success of interventions being reviewed.

**Improving the Translation of Systematic Reviews**

Systematic reviews themselves are often of little use for policymakers already overwhelmed by information. They need concise, meaningful summaries of relevant findings from relevant systematic reviews and their implications. It is unrealistic to expect that researchers will have the skills required for this work. The task may require information brokers or translational scientists—specialist writers or communicators who can speak the language of both policymakers and researchers, and negotiate these different worlds. Strategies include:

- Establishing infrastructure and systems, whether in research organizations, interest groups, or government agencies, to support effective translation of systematic review findings.
- Explaining, where possible, the implications of findings for the local context. Policymakers usually want to know what an intervention will mean for their constituency, or their budget.
- Ensuring an engaging and accessible format and providing contact details for content experts.
- Using anecdotes and storytelling as powerful methods of transmitting evidence-based information; more research is needed on how to combine empirical data with storytelling.
- Engaging a variety of formats, including videos and multimedia productions.
- Translating systematic review findings into manuals and other formats to guide those designing and implementing interventions.

**Improving the Dissemination of Systematic Reviews**

Strategies to help ensure relevant systematic reviews reach potential users include:

- Implementing systems to identify systematic reviews with the potential to improve population health and to ensure their findings reach relevant audiences, both within and outside the traditional health domain.
- Ensuring active dissemination strategies that move beyond the traditional academic approach of publication in journals, and exploiting the power of the media, Internet, and other communication channels. Information brokers could, for example, provide policymakers with timely access to content experts, whether by phone, video conference, or in person.
- Providing in public/population health education and training the skills needed to use and adapt evidence-based approaches, and the development of communication skills, including media advocacy. This is especially important in many public health agencies where workforce turnover is high.
- Developing networks, relationships, and collaborations among researchers, policymakers, knowledge brokers, interest groups, media, and other stakeholders. These networks can be

formal or informal and can include such mechanisms as conferences, task forces, e-networks, or briefings. Note that personal contact can have more impact than an impersonal briefing document.

- Developing infrastructures, programs, and processes to facilitate exchange between the policy and research communities. The American Association for the Advancement of Science, for example, has a program encouraging scientists to enter the policymaking arena.
- Including elected officials in dissemination efforts.
- Developing incentives to encourage collaboration and dissemination. Performance reviews for academics could ask for evidence of their work's societal impact or their role in assisting policy development. Funding agencies could also reward translation and dissemination efforts.
- Making existing databases of systematic reviews, such as the Cochrane Collaboration, more policy user-friendly. Gaps in current databases could be filled; for example, some researchers have proposed that a global registry of anticipated public health studies be established.
- Evaluating systematic review dissemination strategies and ensuring these findings are themselves disseminated and implemented.

**Assisting Policymaking**

Policymaking environments create many barriers to the better integration of evidence. Strategies to overcome some of these barriers include:

- Implementing incentives for policymaking groups to incorporate systematic reviews into their decision making processes and to commission systematic reviews where they are needed. Such incentives could include:
  - Policy briefs or reports and other publications could be required to describe relevant systematic reviews.
  - Research grant applications could be required to detail where the proposed study fits into knowledge gaps identified by systematic reviews.
  - Program funding applications could be required to state where the proposed program fits with evidence from systematic reviews.
  - Performance review criteria for policymakers and advocates could incorporate assessment of the implementation of evidence-informed practices.
- Implementing feedback mechanisms to track the quality of the evidence base being used to develop policies, programs, or advocacy initiatives.
- Implementing incentives to encourage training in evidence-related concepts for policymakers and those who influence policy, including legislators, the legal professions, advocacy groups, and the media.
- Fostering and supporting champions and leaders in evidence-informed policy, at both the individual and organizational level.

- Supporting policy-related research, including studies investigating the determinants of policy and assessing policy outcomes.
- Supporting existing programs and initiatives to strengthen the role of evidence in population health. For example, Health Impact Assessment encourages intersectoral analysis of population health issues,  and the Robert Wood Johnson Foundation Health & Society Scholars program aims to build the nation's capacity for research, leadership, and action to address the broad range of factors affecting the health of populations.
- Ensuring evaluation is built-in—those seeking to improve the use and usefulness of systematic reviews should ensure their work is evaluated and the findings disseminated, where appropriate and possible.

**Engaging with the Media**

The media has a powerful impact on public health by helping to set the political, policy, and public agendas and disseminating information. Strategies to promote evidence-informed reporting include:
- Incorporating evidence-related concepts into journalism education and training.
- Targeting relevant professional groups, such as organizations for health care writers or education writers to raise their awareness of the use of evidence in decision making.
- Encouraging active engagement with the media by both organizations and individuals. This could involve both traditional media strategies as well as approaches such as that of the Center for the Advancement of Health, which has established an electronic news service to promote the translation of health research into action.

**FOREWORD**

p. v    *According to a recent article in* Plos Medicine: Moher et al. 2007

**EXECUTIVE SUMMARY**

2    *The importance of the media:* Cited in Wallack 1994.

**INTRODUCTION: THE POTENTIAL OF SYSTEMATIC REVIEWS . . . AND THE LIMITATIONS**

5    *The rise of the evidence-based public/population:* Waters et al. 2006.

5    *The term* evidence-based public health: Kohatsu, Robinson, and Torner 2004.

5    *Policymakers can be more confident:* Lavis et al. 2004.

5    *Systematic reviews have been used:* Petticrew 2001.

5    *A meta-analysis involves mathematically:* Choi 2005.

5    *Key elements of a systematic review:* Lavis et al. 2005.

5    *Those interested in a more detailed understanding:* www.york.ac.uk/inst/crd/report4.htm
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6    *"In public health, we have discovered:* Brownson, Kreuter et al. 2006.

6    *Systematic reviews can also help answer:* Scollo et al. 2003.

6    *In clinical medicine, randomized controlled trials:* Popay, Rogers, and Williams 1998.

7    *Common myths and misconceptions:* Petticrew 2001.

7    *"Several arguments are commonly:* Ibid.

7    *The more than 180 Task Force recommendations:* Anderson et al. 2005.

10   *Other examples of efforts to better:* Choi, Pang et al. 2005.

10   *The Society for Prevention Research (SPR):* Flay et al. 2004.

10   *Many factors other than scientific:* Davies 2004.

10   *Policymakers are influenced by:* For more on the hierarchy of evidence see Moynihan 2004.

11   *According to Bernard Choi:* Choi 2005.

11   *Others argue that anecdotal information:* Whitehead et al. 2004.

11   *Some researchers have put it thus:* Bowen and Zwi 2005.

11   *Many public health experts say:* Innvær et al. 2002.

11    *Choi and colleagues note:* Choi, Pang et al. 2005.

11    *Whether and how the results:* Lavis et al. 2004.

11    *Systematic reviews cannot always:* Petticrew et al. 2004.

12    *The effect of context on:* Waters et al. 2006; Jackson and Waters, for the Guidelines . . . 2005.

13    *Systematic reviews and the studies:* Green and Glasgow 2006.

13    *A method of evaluating the extent:* Dzewaltowski et al. 2004.

13    *Meanwhile, concerns have been:* Anderson et al. 2005.


### TRAFFIC SAFETY INTERVENTIONS: SUCCESSES AND SETBACKS—IMPLEMENTING THE EVIDENCE SAVES LIVES

15    *In the late 1990s when Congress:* United States General Accounting Office 1999.

15    *This report, widely seen as:* Shults et al 2001.

15    *When the systematic review was completed:* Ibid.

16    *Many state policymakers, when confronted:* Liu et al. 2003.

16    *Many public health experts are:* National Highway Traffic Safety Administration 2006a.

16    *As with the push to ensure:* Dinh-Zarr et al. 2001.

16    *The traffic safety field has:* Morrison, Petticrew, and Thomson 2003.

16    *Investment in research reflects:* National Highway Traffic Safety Administration 2006a.

16    *Ruth Shults, who coordinated:* Shults et al. 2001.

17    *Organizations such as MADD:* Elder et al. 2002.

17    *The dramatic decline in traffic fatalities:* National Highway Traffic Safety Administration 2006b.


### TACKLING YOUTH DRINKING: COLLABORATION COUNTS—WHEN THE EVIDENCE ENGAGES COMMUNITIES

19    *Binge drinking exacts a:* Cited in Nelson, Weitzman, and Wechsler 2005; Task Force of the National Advisory Council on Alcohol Abuse and Alcoholism 2002.

19    *Efforts to combat the problem:* Task Force of the National Advisory Council on Alcohol Abuse and Alcoholism 2002.

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20    *Since 1998, the NU Directions Campus-Community Coalition:* Wechsler et al. 2002.

21    *With the project involving dozens:* NU Directions Campus-Community Coalition 2004.

21    *For Toben Nelson:* Weitzman et al. 2004.

21    *Another hurdle is the:* Weitzman and Nelson 2004.

## TOBACCO CONTROL: THE LONG WAR—WHEN THE EVIDENCE HAS TO BE CREATED

23  *Public health history was made:* Brownson and Bright 2004; Glantz and Balbach 2000.

24  *Another critical aspect of the program:* Glantz and Balbach 2000; Pierce et al. 1998.

24  *More recently, the program:* Tobacco Education and Research Oversight Committee 2003.

24  *Despite the setbacks:* Fichtenberg and Glantz 2000; 2001.

24  *Not all states used:* Burrus et al. 2006.

24  *Systematic reviews have also:* Scollo et al. 2003; Barnes and Bero 1998.

24  *Many experts believe:* Chapman 2005.

25  *A solid evidence base is:* Bryan-Jones and Chapman 2006.

## OBESITY: DEALING WITH UNCERTAINTY AND COMPLEXITY—WHEN THERE ARE GAPS IN THE EVIDENCE

27  *When grappling with such issues:* Burrus et al. 2006.

27  *The Community Guide has published:* Ball, Timperio, and Crawford 2006; Brownson et al. 2001; Kahn et al. 2001.

27  *Meanwhile, some policymakers:* Ryan et al. 2006.

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## THE MENTAL HEALTH AFTERMATH OF THE TSUNAMI: LEVELS OF CHAOS—WHEN THE EVIDENCE IS NOT RELEVANT OR APPLICABLE

30  *In some senses:* Miller 2005; Silove 2005; Van Ommeren, Saxena, and Saraceno 2005.

30  *Within days of the tsunami:* Norris et al. 2002; Norris, Friedman, and Watson 2002.

31  *After the tsunami, Norris:* Norris 2005a; 2005b; 2005c.

31  *Coincidentally, at about the same:* Van Ommeren, Saxena, and Saraceno 2005.

31  *After the article was published:* Inter-Agency Standing Committee 2007.

## DRUG ABUSE RESISTANCE EDUCATION (DARE): LESSONS LEARNED—WHEN THE EVIDENCE IS LACKING

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34  *In 1998, following widespread:* Hallfors and Godette 2002.

35  *Others argue, however, that:* Ibid.

## THE WASHINGTON STATE INSTITUTE FOR PUBLIC POLICY: CONNECTING POLICY AND SCIENCE—WHEN THE INFRASTRUCTURE SUPPORTS EVIDENCE

37  *The review identified economically:* Aos, Miller, and Drake 2006.

37  *These estimates were cautious:* Miller 2006.

## CONCLUSIONS AND RECOMMENDATIONS OF THE AUTHORS OF THIS REPORT

41  *Involving policymakers and other:* Jackson and Waters, for the Guidelines . . . 2005.

41  *Ensuring better reporting of:* RE-AIM 2006.

42  *Ensuring an engaging and:* Lavis et al. 2005.

43  *Developing infrastructures, programs, and:* Choi, Pang et al. 2005.

43  *Making existing databases of systematic:* Author's interview with Bernard Choi, senior research scientist, the Public Health Agency of Canada's Centre for Chronic Disease Prevention and Control, 2006.

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His 2005 book *Selling Sickness: How the World's Biggest Pharmaceutical Companies Are Turning Us All into Patients* (co-written with Alan Cassels and published by Nation Books) has been successfully sold in many nations, including the United States, the United Kingdom, and Canada, and across Asia and Europe. It is being translated into Japanese, Chinese, Italian, Greek, and Spanish, among other languages; it has inspired several TV and radio documentaries; and it was shortlisted for a Walkley and Queensland Premier Award.

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www.thecommunityguide.org—A complete compendium of Community Guide information and references.

**ADDITIONAL SPECIFIC COMMUNITY GUIDE REFERENCES**

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