EDITORIAL (SEE KAHN ET AL., P. 1686)

Reducing Cardiovascular Disease

Opportunities and consequences

One of the enduring myths in health care is that prevention saves money. The intuition behind the idea appears unassailable: if we spend a little money on preventive measures, we can avoid the expensive complications of disease. The maxim "an ounce of prevention is worth a pound of cure," coined by Benjamin Franklin and listed in the Dictionary of Cultural Literacy (1), seems self-evident such that it does not warrant serious challenge. The "prevention saves money" argument is popular with many politicians and health policy makers. For example, the recent Presidential primary season witnessed pledges from many candidates not only to improve health care but also to save money by spending more on prevention (2).

Careful analysis has shown that while preventive care sometimes saves the health system money, usually it does not (3). Economic evaluations tend to conclude that although preventing the need for treatment can offset some costs from avoidable illness, the overall costs can be substantial because of the number of people who must undergo preventive measures (2). Moreover, prevention does not avert death; it only postpones it. As people age, their health costs increase. Therefore, activities and programs that achieve savings by preventing a fatal disease can lead to downstream health care costs as the people who would otherwise die grow older.

Of course, this result does not mean that as a society we should not invest in prevention but, instead, that we should do so with careful analysis and without unrealistic expectations. Preventive measures costing more than they save can still represent good value for money, but whether they will depends entirely on the intervention and population at hand. The study by Kahn et al. is a welcome addition to this discussion (4). Their analysis, which examined the effects of 11 nationally recommended prevention activities for cardiovascular disease (CVD)-related morbidity, mortality, and costs in the U.S., is important on several levels.

First, it quantifies the enormous potential health gains from preventing CVD morbidity and mortality. Ensuring that individuals receive appropriate preventative measures would, at feasible levels of implementation, substantially reduce the number of myocardial infarctions and strokes, adding as many as 130 million life-years and nearly 150 million quality-adjusted life-years to the U.S. adult population over a 30-year period. Aggregating over the population, the biggest reductions in life-years lost would come from controlling blood pressure in the nondiabetic population (<140/90 mmHg), controlling blood pressure in people with diabetes (<130/80 mmHg), and controlling pre-diabetes (fasting plasma glucose <110 mg/dl). Controlling LDL cholesterol levels (<100 mg/dl) in coronary artery disease patients achieves the largest improvement in individual life expectancy, but the population impact is limited by the fact that only 1.5% of all individuals fall into this category.

Second, the authors arrive at a conclusion consistent with previous studies but that will nonetheless come as a surprise to many readers. Despite the health gains, only one of the 11 evaluated preventative activities (smoking cessation) is projected to save money. Although 100% implementation of all 11 measures reviewed would decrease the $9.5 trillion cost of caring for CVD, diabetes, and congestive heart failure over the next 30 years by approximately $900 billion, the prevention activities themselves would cost $8.5 trillion, thus increasing total medical costs by some $7.6 trillion.

Third, the paper shows the value of formal cost-effectiveness analysis to help guide priority setting and adds to the ever-growing number of cost-utility studies in the literature (5). This kind of formal analysis provides decision makers with a structured, rational approach for considering competing alternatives for improving the return on resources expended. Kahn et al. show that smoking cessation, aspirin, and control of pre-diabetes likely represent the most efficient way to reduce CVD-related morbidity and mortality.

Fourth, the paper illustrates the use of sophisticated computer-simulation models to help inform policy decisions. The Archimedes model used by Kahn et al. draws on detailed information on U.S.-population disease patterns and health care utilization to analyze downstream clinical events and costs. As the authors note, this kind of model is particularly useful for research on preventative activities, where randomized controlled trials are often unavailable and would be prohibitively costly to conduct. Models do not replace randomized controlled trials but can extend them and enhance our knowledge by simulating clinical trials and asking "what if" questions: How much morbidity, mortality, and cost are potentially preventable? How do various prevention activities compare in terms of their cost-effectiveness?

A common objection to the issue of simulation models is that their estimates come at the cost of introducing uncertain assumptions (6). However, the methodology does not introduce the uncertainty associated with these assumptions. Rather, it makes the assumptions contributing to this uncertainty explicit and quantifies the uncertainty's impact on the estimated results. For example, by repeating their analysis using different sets of plausible parameters, Kahn et al. determined that assumptions about the cost of the preventive measures and the proportion of eligible individuals receiving services contribute the most to the final result's uncertainty. To be sure, the programming and mathematics underlying the Archimedes model are somewhat complex, but the alternative to formal modeling is to make policy based on implicit assumptions about future consequences.

Finally, the study underscores the fact that the issue in prevention is largely not one with insufficient evidence regarding which clinical prevention activities work. Though there are undoubtedly opportunities to improve this evidence base, the activities analyzed by Kahn et al., as the authors highlight, are supported by good evidence and are widely accepted. Instead, the problem is how to increase their use in an efficient manner. Part of the an-

swer lies in better health promotion activities and education and outreach efforts to deliver services and improve compliance. These activities cost money but may well be worth the needed resources. We must improve the evidence base on the cost-effectiveness of such efforts. Part of the answer also lies in systemic changes, such as infrastructure to link clinicians with community resources, and changes in the system to create incentives that encourage the appropriate delivery of efficient interventions (7).

In an ideal world, critical health care–spending decisions would be informed by directly applicable randomized clinical trial results. Because logistical and ethical constraints make such evidence unavailable in many cases, information must be synthesized and extrapolated across time and to populations not directly studied. As the analysis by Kahn et al. demonstrates, the results are not always consistent with intuition; in this case, it turns out that prevention generally does not save money. The analysis does, however, identify interventions that efficiently produce health improvements and, hence, suggests programs that policy makers should target to increase population compliance. Given the substantial health implications and health care resources involved, using tools like the Archimedes model can help ensure that we are making the best use of available information to identify measures to improve public health.

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References

1. The new dictionary of cultural literacy [article online], 2002. 3rd ed. Hirsch ED Jr, Kett JF, Trefil J, Eds. Available from http://www.bartleby.com/59/3/ounceofpreve.html. Accessed 3 June 2008
2. Cohen JT, Neumann PJ, Weinstein MC: Does preventive care save money? Health economics and the presidential candidates. *N Engl J Med* 358:661–663, 2008
3. Russell LB: Prevention's potential for slowing the growth of medical spending [available online], 2007. Available from http://www.nchc.org/nchc report.pdf. Accessed 3 Jun 2008
4. Kahn R, Robertson RM, Smith R, Eddy D: The impact of prevention on reducing the burden of cardiovascular disease. *Diabetes Care* 31:1686–1696, 2008
5. Center for the Evaluation of Value and Risk in Health: The Cost-Effectiveness Analysis Registry, [available online]. Available from www.cearegistry.org. Accessed 3 June 2008
6. Cohen JT, Neumann PJ: Child health promotion interventions: use of decision analysis to determine when further study is worthwhile. *Health Affairs*. In press
7. Woolf SH: The power of prevention and what it requires. *JAMA* 299:2437–2439, 2008