

# A Review and Analysis of the Health and Cost-effective Outcome Studies of Comprehensive Health Promotion and Disease Prevention Programs at the Worksite: 1993-1995 Update

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*Editor Note: This is the third in a series of articles written by Dr. Kenneth R. Pelletier summarizing the results of studies examining the impact of comprehensive health promotion programs on health and cost. We received more than 10,000 reprint requests for these articles, which is far more than we have received for any other article we have published. Dr. Pelletier updated the summary because of the tremendous response it received and because additional studies have been published since the first two summaries were printed. Our intention is to continue publishing updated summaries of the impact of comprehensive health promotion programs on health and financial outcome measures periodically and to include all studies published in rigorous peer-reviewed journals. If we have missed a study, please send us a copy to include in the next update.*

*At the request of Dr. Pelletier, this article is dedicated to Dr. Andrea Foote for her innovative and enduring impact on worksite health promotion that recognized the value of the individual worker and the power of the worksite as an ad hoc community to improve individual and organizational health.*

Mark Twain once quipped that he “discovered he had been speaking ‘prose’ for his entire life.” Today, health promotion and disease prevention programs are also being “discovered” because they play a vital role in managed care by providing quality services that may decrease inappropriate or excessive use of medical care. Managed care organizations appear in myriad forms, but when such an organization is financially at risk regarding use, health promotion and disease prevention are discovered. Increasingly, it is evident that the self-insured, self-administered health and medical plans of large corporations, with their emphasis on health promotion and disease prevention, were and are prototypes of managed health care.<sup>1,2</sup> During the recent national debate, the term “managed care” emerged as though it was a radical and untested approach lacking in precedent and evaluation.<sup>3</sup> Rather than viewing managed care as either a threat or a panacea, it is important to recognize that the 51 studies cited in the two earlier articles<sup>4</sup> in this series; the 26 studies cited in this article, an ongoing annotation compiled by Larry S. Chapman of Corporate Health Designs<sup>5</sup>; and a vast number of rigorous, randomized clinical trials conducted outside the worksite focus of this article,<sup>6,7</sup> clearly demonstrate a substantial and growing body of research demonstrating that health promotion and disease prevention within managed health care are both health- and cost-effective.<sup>8</sup> For this article and grid, the focus is limited to those articles that contain both health and cost outcomes of worksite-based comprehensive health promotion and disease prevention. Briefly, three important definitions are used throughout this review. “Cost-effectiveness” refers to the unit cost of providing a service or for achieving a specific health outcome. In discussing a possible reduction in actual medical care costs, the term “cost savings” is appropriate. “Cost benefit analysis” compares the savings from a program compared with the cost of providing that program. All three types of outcomes are evidenced in the studies cited here and the specific type of cost outcome is specified in the table or grid where each individual study is cited. In some instances a study in which cost-effectiveness is not part of the formal outcomes analysis but is strongly inferred is included in this review. All cited research has been published in peer-reviewed, professional journals.

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Surely many other worksite programs, such as the ongoing "Working Well" project of the National Cancer Institute, focused on worksite nutrition programs to reduce cancer incidence in 114 worksites involving more than 25,000 employees;<sup>9,10</sup> a study of highly effective childhood immunizations in a large corporation;<sup>11</sup> and an overview of 44 exercise interventions indicating an annual savings of \$61 to \$450 per employee per year plus coronary heart disease risk reduction benefits ranging from \$75 to \$300 per employee annually<sup>12</sup> that are not included in this review because analyses of cost-effectiveness or strongly inferred cost-effectiveness have not formally been conducted in their published research. Overall, most research involving health promotion and disease prevention in the worksite and other clinical sites indicates that such interventions are both health- and cost-effective. From a purely medical perspective, a recent study from Duke University, "Five-Hundred Life-Saving Interventions and Their Cost-effectiveness," concluded overall that primary prevention is actually more cost-effective than secondary or tertiary prevention. Primary prevention was found to be cost-effective at an approximate average of \$5000 per life per year saved.<sup>13</sup> It is increasingly evident that the issues of the cost-effectiveness of health promotion and disease prevention depend on the specificity of the intervention, the characteristics of the patients, and the appropriate level of intervention for a specific condition.<sup>14</sup>

Is the renewed interest in health promotion and disease prevention really buoyed up by better health and cost outcomes data and research? In a word, no! During this decade of fiscal frugality, the driving question is simply whether prevention is cost-effective. Even within a traditional fee-for-service model, health promotion and disease prevention are both health- and cost-effective as exemplified by the fact that an immunization program for measles, mumps, and rubella can save approximately \$14 for every dollar spent.<sup>15,16</sup> A program to increase the use of bicycle safety helmets can yield an estimated net savings of more than \$200 million each year.<sup>17</sup> Screening mammograms for women 50 to 70 years old every 2 years is highly cost-effective at \$4050 per year of life saved.<sup>17</sup> Programs that target smoking during pregnancy can save more than \$6 for every dollar spent.<sup>18</sup> A survey of both employers and health care providers by the U.S. Department of Health and Human Services indicated that the "work setting represents the single most important channel to systematically reach the adult population through health information and health promotion programs."<sup>19</sup> Among the reasons for the increasing frequency of such programs are that they are popular with employees, supply management with positive yet low-cost benefits for employees, improve both health and productivity in the short term, and reduce medical expenditures in the long term. However, the essence of the reinvigorated interest in prevention is driven by the accelerating movement toward "capitated managed care" and away from fee-for-service models.

Within fee-for-service systems, to be simplistic, the more services that are performed, the more the provider is paid. This same provider also determines both the demand and supply of those services while a remote "third party payor" pays for the self-perpetuating and self-serving transaction.

Beyond the economic consequences of such an approach is the abundant documentation of excessive and/or inappropriate services, including unnecessary inpatient days of hospitalization ranging from a low of 43% unnecessary days in Seattle to a high of 69% in New York with an approximate nationwide average of 59% in such cities as Cleveland, Denver, Los Angeles, Oklahoma City, San Francisco, and Tampa;<sup>20</sup> inappropriate prescription of medication to approximately 40% of the elderly residents in 12 nursing homes in Los Angeles;<sup>21</sup> unnecessary transfusions ranging from 18% to 25%; extensive documentation in numerous studies of excessive use of diagnostic imaging technologies;<sup>22</sup> the common and long-standing documentation of unnecessary cesarean sections and hysterectomies;<sup>23</sup> increasing acceptance that an "estimated 50% of coronary angiography currently undertaken in the United States is unnecessary;"<sup>24</sup> and on and on. These are literally only a few of the most recent studies to document excessive and inappropriate use under a fee-for-service structure. This is not to castigate fee-for-service care per se<sup>3</sup> but simply to underscore that the hue and cry that managed care will lead to denial of appropriate care, rationing, and suboptimal clinical services is virtually lacking in documentation, whereas evidence of excessive care is overwhelmingly evident.<sup>25</sup> What is a legitimate issue is appropriate levels of care that ensure neither overutilization nor underutilization.

Managed care, with its renewed attention to health promotion and disease prevention, is not a panacea. It does, however, militate against the perverse incentive of excessive or inappropriate services to generate revenues or, in some instances, to pay for the investment in a new technology or the politics of empire building by having a hospital or other provider dependent on the revenues derived from a particular medical service or individual practitioner. Within managed care, "capitation" dominates because a provider system and the practitioners within that system receive a fixed amount of money per person per year (i.e., "capitated"). This gives them the incentive to manage the care for that group within the global annual budget. Among the best and most comprehensive analysis of the promise and pitfalls of managed care is a report written for Volpe, Welty & Company by Dr. Jason M. Rosenbluth, called "Integrated Delivery Systems: The Battle Among Payers, Hospitals, and Physicians"<sup>1</sup> and is essential reading for the coming decade. One of the earliest and still best documented studies of such an approach characterized by a Preferred Provider Organization (PPO) with a Point of Service (POS) option was conducted in conjunction with Southwestern Bell Corporation<sup>26</sup> and Metropolitan Insurance Company.

Managed care is in the process of evolving, and it is certain that its ultimate forms, because many variants do exist, will "resemble neither the model espoused by proponents of managed competition nor the models advocated by proponents of more government controls."<sup>27</sup> Writing in *Health Affairs*, Dr. Jonathan E. Fielding and Dr. Thomas Rice of the UCLA School of Public Health have clearly considered both the applications and limitations of managed care to resolve the national medical care and expenditure crisis. With all due acknowledgment to these well-articulated

*Text continues on page 386.*

## Cost-effectiveness Grid

Study	Purpose of Evaluation	Sample Size	Types of Workers	Comparison Group	Evaluation Period
Textile plants (1992) <sup>46</sup>	Examine relationship between workplace health promotion and medical claims	38 textile plants	All	No	1 yr
Traveler's insurance (1992) <sup>47</sup>	Analyze the benefit/cost ratio of a comprehensive HP/DP program for 1986-1990 with projections to the year 2000	Total of 36,000 employees and retirees nationwide	All	No	4 yr and projected over 15 yr
Bank of America (1993) <sup>48</sup>	Determine both health- and cost-effectiveness of a health promotion program for retirees of Bank of America	4712 retirees	All	Yes	2 yr (followed for 3 yr from April 1987-March, 1990)
Thirty-two (32) worksites (1993) <sup>49</sup>	Effect of worksite smoking cessation and weight control on absenteeism in 32 Minneapolis-St. Paul companies	32 sites of 200 employees each = 6400	All	Yes	2 yr
Utility company (1993) <sup>50</sup>	Effect of worksite health promotion on sick days and medical care use	Nine (9) divisions of the company	All (mostly men between 30 and 49 yr old)	No	1 yr
California county (1993) <sup>51</sup>	Health- and cost-effectiveness of a back injury prevention program	205 (six divisions)	Blue collar	No	1 yr
Montreal, Quebec (1993) <sup>52</sup>	Evaluate a worksite alcohol awareness program	322	Blue collar	Yes (within one site of 813 workers with 199 participants)	3 yr
General Motors (1993) <sup>53</sup>	Health- and cost-effectiveness of worksite health promotion in reducing CVD.	1880	Auto workers	Yes by worksite	3 yr
DuPoint (1993) <sup>54</sup>	Assess impact of worksite health promotion program on 7 behavioral risks and self-reported sick days.	7178 and time lagged comparison group of 7101	All	Yes (time lagged, nonequivalent comparison group)	2 yr

Intervention and Outcome Measures	Evaluation Design	Subject Self-Selection	Findings
Number of medical claims per worker	Cross-sectional analysis with a linear regression	Yes	Claims per worker varied threefold. In a linear regression, age: sex, race, plant product, and medical access explained 23% of variance in medical claims. Health promotion (in interaction with plant product) explained 54% of claims (controlling for race, sex, and access variables).
"Taking Care" program of lifestyle management, health risk appraisal, medical self-care book, newsletter, and videotapes. Total program costs from 1986-1990 projected at 5% inflation/year to year 2000. Determine impact on pension liability by use of proxy measures.	Program costs tracked and benefits calculated to reflect decreases in medical costs, absenteeism, life insurance claims, and increases in productivity. Different econometric modeling used for costs in each of these areas and then totaled.	Yes	Study indicated a positive return of \$1:\$3.4 for 1986-2000. Program reached a positive benefit/cost in the first year with a positive balance of \$330,000. A net cumulative benefit of more than \$146 million (for a \$60 million investment) projected to accrue over the 15-yr period.
Health risk appraisal scores (Healthtrac) and medical care costs. Participation rates of 57% at 1 yr and 47% at 2 yr	Randomized with 3 groups: (1) with individual HRAs, recommendation and materials; (2) HRA but no recommendation until year 2; and, (3) control	No	HRA improves 11.7% in group 1 vs 1% in group 2 for year 1 and 2; HRA improved 23% in group 1 and 19% in group 2. First year medical costs reduced by 20% in group 1 or \$164 average decrease vs combined increase of \$15 in groups 2 and 3. Full program cost (group 1) was \$30/person/yr.
Absenteeism (reported sick days). Intervention was a series of behavior change classes repeated 4 times over 2 yr.	Randomly assigned 32 worksites. Both cohort and cross-sectional analysis.	No	Absenteeism decreased 4.5% in the intervention by cohort and 3.5% by cross-sectional analysis. Smoking was associated with sick days but weight loss program was not. Authors conclude that savings are accrued due to reduced absenteeism.
Doctor visits, hospitalization, and reported injuries. A "low" intensity program of access to health resource center and self-care booklet; "medium" with classes and team for group support; and "high" with all of the above plus environmental improvements and targeted high risk participants.	Longitudinal pre-post design	Yes	Only the "high-intensity" group showed declines in doctor visits, hospitalizations, and injuries. Both high- and medium-intensity groups showed declines in sick days. Cost-effectiveness is inferred but not analyzed.
Overall, 77% or 205 of the targeted employees participated for 1 yr. Classes consisted of an HRA, education classes, training, physical fitness and ergonomics improvement	Six divisions randomized into 4 interventions and 2 controls. Pre-post analysis on HRA and back disability claims.	No	Modest reduction in intervention sites in back pain, significant increase in employee satisfaction and reduction in risky behavior. Net benefit of \$161,108 and ROI of 179%.
Two worksite sessions on "responsible drinking" given to small groups of workers in 5 organizations in both private and public sectors.	Pre-post based on cycles of written reports/memos with surveys	Yes	Alcohol health promotion in the worksite is complex but feasible. Cost-effectiveness considered but not analyzed.
CHD risks and per employee program costs in 4 interventions: (1) A: control; (2) B: staffed fitness facility; (3) C: outreach and individual counseling; and, (4) D: counseling outreach, plus organized activity at work.	Pre- and postlongitudinal design	No	Sites A and C increased exercise; site B decreased; more employees with CVD exercised 3 or more times/week in C and D than other sites. Site B gained an average of 2.5 lb and hypertensive patients under control decreased. Sites C and D had most impact. Per employee costs in B, C, and D were \$39.28, \$30.96, and \$33.57. Least expensive programs (C and D) were most effective.
Worksite program of: (1) HRAs; (2) coordinators; (3) on-site classes; (4) environmental changes such as smoking policy and cafeteria; and (5) recognition. Effects on 7 behavioral risks and self-reported illness days.	Pre- and postintervention group with 2-yr follow-up and a time lagged, nonequivalent comparison group.	No	Number and level of behavioral risk factors improved over 2 yr in the intervention. Employees with 3 or more risk factors decreased by 14% and self-reported illness decreased by 12%. Risk levels most improved (4.5% to 79%) for 6 of 7 factors among high-risk individuals. Reduction in illness days may imply cost-effectiveness but not analyzed.

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**Cost-effectiveness Grid, continued**

Study	Purpose of Evaluation	Sample Size	Types of Workers	Comparison Group	Evaluation Period
Utility company (1993) <sup>55</sup>	Determine health and cost outcomes of a worksite health promotion program on medical costs.	1188	All	Yes	1 yr
Blue Cross/Blue Shield of Indiana (1993) <sup>56</sup>	Determine whether employee participation in a comprehensive worksite health promotion program was associated with reduced employee medical care costs.	743 men and women	All	No	7 yr
City of Mesa, Arizona (1994) <sup>57</sup>	Assess the impact of a mobile, comprehensive worksite health promotion program on medical costs.	1325	All	Yes (340 age and sex matched)	2 yr
Johnson & Johnson (1994) <sup>58</sup>	Analyze the incremental effectiveness of a blood pressure control program entitled "IMPACT"	80 (in 5 sites in California, Florida, Georgia, and Texas)	All	Yes (79 controls)	1 yr
Chicago Companies (1994) <sup>59</sup>	Examine data collected 2 yr after the onset of a medical worksite smoking intervention program in 38 Chicago companies	38 companies	All	Yes	2 yr
Cal PERS (1994) <sup>60</sup>	Cost reduction of a mail-delivered intervention (Healthtrac) delivered to California retirees.	54,902	All	Yes	1 yr
First Chicago Bank (1994) <sup>61</sup>	Analyze the medical and disability costs of depressive disorders within a comprehensive, worksite HP/DP program.	Varying number of claims per year	All	No	4 yr
Duke University (1994) <sup>62</sup>	Effects of the "Live for Life" program offered to Duke University employees	15,500 (30% participation rate)	All	No	3 yr
Metropolitan Toronto (1994) <sup>63</sup>	Improve detection of hypertension in blue-collar workers	7856 (545 with blood pressure >90-114 mg Hg)	Blue collar	No	At 40 days and at 1 yr
Johnson & Johnson (1995) <sup>64</sup>	Evaluate effectiveness of a deliberately designed low-cost, worksite cholesterol reduction program (IMPACT)	4 worksites	All	Yes	1 yr
Small worksites (42) in Colorado, Minnesota, Missouri, and Washington (1995) <sup>65</sup>	Study conducted by the Centers for Disease Control and Prevention (CDC) to determine health and cost outcomes of a worksite nutritional program after cholesterol screening	42 worksites	All	Yes	6 and 12 mo

Intervention and Outcome Measures	Evaluation Design	Subject Self-Selection	Findings
4 different health promotion programs of different levels of intensity; focus on behavior change workshops of risk factors.	Pre- and post intervention	No	Strong association between intervention and reduction in medical costs, hospital days, based on cost estimates. With increasing intensity there was increased benefit from \$145/person in group 1 to \$421/person in group 4. Cost/benefit analysis indicated that "medium" intensity of group 3 had greatest level of cost reduction per dollar expended.
4 independent study groups (2 intervention, 2 controls) engaged the BC/BS program with 2 yr of preprogram medical cost data and 5 yr of postprogram data.	Pre- and post longitudinal design with 2 interventions and 2 controls. Pre- and post employee medical care costs.	No	Program participation was not associated with reduced medical costs.
Participant vs control group medical costs based on data from their carrier, CIGNA Healthplan.	Participant and medical costs 2 yr before and 2 yr after the program.	Yes	Medical costs decreased in both groups, with 16% for the intervention and 7% for controls. Specific reduction in general sickness, outpatient and inpatient claims, and total claims. No change in psychologic, substance abuse, or emergency care. Benefit/cost ratio of \$1:\$3.6.
Pre- and post blood pressures adjusted for age, sex, and baseline blood pressures. Low-intensity and low-cost intervention of monthly, 10-minute counseling sessions at work, monthly mailings, and incentives.	Pre- and post	No	Intervention designed to be low impact and low cost and to determine health efficacy before proceeding to cost analysis. Data consistent with cost-effectiveness but not analyzed in this study.
Workers randomized to 2 groups with both receiving self-help manuals and a 20-day TV series over 3 wk. In addition, 1 group received 6 classes and social support over 12 mo.	Pre- and post	No	24 mo after pretest, 30% of the participants in the full program had quit vs 19.5%. A program that demonstrates significant differences at 2 yr after the initial intervention, appears to be cost-effective.
A randomized control trial with periodic risk assessments, doctor visits, hospital days, sick days, and claims data from Blue Shield of California. Participants were Cal PERS (21,170), non-Medicare eligible (8316), and Medical Supplement (25,416)	Pre- and post randomized, quasi-experimental design.	No	Reduced HRA scores, reduced self-report of medical use, and decrease in claims relative to controls. Annual claim costs were in the range of \$3.2 to \$8 million less than expected.
Introduction of EAP in 1985 and tracked annually up to 1989 for changes in number of depressive diagnoses and number of days per event	Quasi-experimental, longitudinal	Yes	Depressive disorders accounted for the largest medical plan costs of all behavioral diagnoses with greatest length of disability and relapse. Higher prevalence in women. Significant reductions in depressive events and costs after introduction of the EAP.
Voluntary, free program with HRA, smoking, weight, stress, nutrition, fitness, and blood pressure components	Longitudinal with absenteeism as the primary outcome	Yes	Absenteeism increased for participants and nonparticipants from 9.4 hr to 13.5 hr over 3 yr. Participants less than nonparticipants with an average of 4.6 fewer absentee hours. Cost-effectiveness inferred but not analyzed.
After screening, employees randomized to a physician for usual care (1 stage) or scheduled for another screening in 2 wk (2 stage)	Randomized trial to determine cost-effectiveness of one-stage vs two-stage blood pressure screening at the worksite.	Yes	Blood pressure declined in both groups by 8.5 mg/Hg after 1 yr. Cost-effectiveness of the two groups did not differ significantly. One-stage screening is preferred and appears more cost-effective.
After screening, 127 randomized into IMPACT (information and counseling) and 125 to regular screening and referral.	Randomized, control trials. At 1 yr, 118 in IMPACT and 116 controls for follow-up evaluation.	No	IMPACT had 16.6 mg/dl decline vs 10 mg/dl in controls. Difference not significant at the .05 level because of small group size. Cost-effectiveness of this low-cost intervention inferred but not analyzed.
After cholesterol screening, 42 worksites randomized into "usual" intervention of 5 min of counseling vs "special" of a 2-hr behavior change class in nutrition	Randomized, control trial. Cholesterol and medical costs at 6 and 12 mo.	No	Total cost was \$50/person/yr. Cholesterol unchanged at 6 mo. At 12 mo, "special" intervention had 6.5% drop vs 3.0% in "usual": group. Concluded that "low-cost" nutrition program is effective in reducing cholesterol. Cost-effectiveness discussed but not analyzed.

caveats, the variants of managed care most evident to date in large corporations, health maintenance organizations (HMOs) and their variants, as well as newly emerging models of preferred provider organizations (PPOs) and similar systems, do represent a potent solution for a significant portion of both the clinical care and fiscal crisis so clearly evident at the national, state, community, and individual level.

Within the new systems of managed care and their capitated budget, a renewed emphasis is on health promotion and disease prevention. Presumably, both primary and secondary prevention will have the effect of reducing the necessity of later and more costly interventions for diseases and disorders that have progressed in severity. In addition, a growing power of consumer or patient demand and satisfaction have emerged because individuals have the option to re-enroll in competing plans on an annual basis.<sup>28</sup> If patients perceive or are denied access to appropriate care, they are likely to change plans, and such a turnover is undesirable to a capitated plan. Given the strong and growing interest of the general public in health promotion and disease prevention, one way to steer between the "Scylla and Charybdis" of demand versus denial is to manage the patient's demands by providing health promotion programs that appear to satisfy the individual's need for services at a more appropriate, earlier, and less costly stage of demand so that access to such services does not have to be denied.<sup>29</sup> This innovation has been termed "demand" management" and is exemplified by the earliest and still the most well-documented research conducted by Dr. James F. Fries of the Stanford University School of Medicine under the "Healthtrac" Company and Foundation.<sup>30-32</sup> This and other research appears to demonstrate that responsible "demand management" is both health- and cost-effective while satisfying the individual need for earlier preventive care without imposing denial to appropriate access or rationing of care. Although this is not proven now, it does provide a note of optimism amid the dire pronouncements of impending doom. Most important, it is a model that is amenable to sophisticated, longitudinal, randomized clinical trials that will enable us to empirically determine whether such an approach is health- and cost-effective while maintaining, or perhaps even enhancing, the subjective satisfaction and quality of life of the individual patient.

Because managed care/demand management is such a powerful model, why is it not more evident? That literally depends to a large degree on where you live. An insightful analysis from the University Hospital Consortium has separated the current health care market into five stages while citing specific cities characterizing each stage.<sup>33</sup> At stage 1, which is "unstructured" little or no managed care exists in cities such as Shreveport. At the other extreme of stage 5 or "endgame" is a theoretical market of "true partnerships and networks" nationwide. Between these ends of the continuum are varying degrees of managed care penetration such as stage 2 or "loose framework" in Miami, Atlanta, Cleveland, St. Louis, Dallas/Fort Worth, and Philadelphia. Stage 3 or "consolidation" is the first stage in which managed care actually becomes the dominant model in cities exemplified by Portland, San Francisco, Oakland,

Denver, Boston, Salt Lake City, Seattle, Houston, Chicago, and Washington, D.C. At stage 4 or "managed competition" more than 50% HMO penetration and other forms of managed care are as well developed as they can be at present characterized by "employer coalitions," "little fee-for-service," "a few large dominant providers," "providers and insurers strongly align," "doctors not in groups pushed out," "eliminate hospital beds," "shift in physician supply," "use of specialists and their fees driven down dramatically," "network develop full continuum of care," and "providers and insurers organize to serve covered (i.e., capitated) lives." Cities characterizing stage 4 are San Diego, Minneapolis, Los Angeles, and Worcester. This mature, stage 4 market clearly represents a graphic prototype of the future look of managed care with both the pluses and minuses in play. Whether we like or agree with this model, it is increasingly dominant and its national persuasiveness is inexorable. It is simply a function of time and geographic location and, indeed, the mountain will come to you.

Focusing specifically on the issue of cost-effectiveness, two remaining issues need to be addressed. One is a methodological one weighing in to support health promotion and disease prevention interventions. The other is an obvious point that not all such programs are cost-effective. With regard to methodology, Dr. Paul M. Kingery and his colleagues addressed the issue of "high-cost analysis" methodology in the *Journal of Occupational Medicine*. Their observation is that medical claims data are highly skewed and violate the statistical assumption of normality. Because a small percentage of employees incur the largest percentage of medical costs, the standard deviation is large and skews the claims data to the right of the normal curve. As a result, the mean is generally much higher than the median. This "inappropriate use of means in cross-sectional studies underestimates sample bias, overestimates the descriptive difference in cost for high-risk and low-risk employees, and underestimates the statistical significance of large differences observed between the means for the two groups."<sup>34</sup> These worksite studies engender the problems mentioned above and two additional ones. Using statistical measures of arithmetic means assumes that an intervention that appears to lower costs for participants achieved a small effect among all high-risk participants. It may in fact have substantially reduced the costs for a small number of participants at high risk and had little effect on costs for the other. Practically speaking, this potential of the most cost savings concentrated in a small number of high-risk employees, the failure to target high-risk employees dilutes the cost-effectiveness of the intervention. Although "comprehensive" programs will and should continue, it is increasingly clear that programs of secondary prevention focused on high-risk individuals, such as the Stanford Coronary Risk Intervention Program, will be increasingly important in managed care.

Not all health promotion and disease prevention programs in the worksite are health- and/or cost-effective.<sup>35</sup> Negative results and methodologic limitations of studies were included and extensively discussed in both earlier reviews and in this one as well.<sup>4</sup> Advocacy for health promotion and disease prevention programs is neither naive nor uncritical. Two recent studies, both focused on heart disease, did not demon-

strate positive health impacts. In 1994, the "Staff Healthy Heart Project" was established at the Royal Prince Alfred Hospital and five nearby hospitals in Sydney, Australia. It was a worksite cholesterol reduction intervention based on dietary interventions in a randomized, controlled trial. Cholesterol reduction was not achieved, and this failure was attributed to poor ongoing participation rates by the hospital's employees.<sup>37</sup> A second study reported in 1995 entitled "Take Heart" evaluated the short-term effects of a low-intensity worksite heart disease risk reduction program using a matched pair design with the worksite as the unit of analysis. Twenty-six heterogeneous worksites of between 125 and 750 employees per site were randomized into early or delayed interventions. After 18 months, no improvements in risk beyond the secular trends were observed in the control sites.<sup>37</sup> Because neither study demonstrated health outcomes, the issue of cost-effectiveness is moot. Although many possible reasons why these two interventions did not demonstrate effects exist, it is evident in reading the description of the actual interventions that they were quite limited in their intervention sophistication given the effectiveness of similar interventions. They failed to address issues of motivation and compliance, and with an intervention of such minimal intensity these were predictable failures.

The usual litany of why such studies fail and/or do not demonstrate cost-effectiveness has been studied.<sup>37</sup> Not only have these previous reviews<sup>4</sup> fully acknowledged such limitations, but these methodologic limitations are applicable to most, if not all, areas of research whether conducted in the worksite or not. Many studies do suffer from methodologic and practical limitations. In reporting the results of the "Take Heart" intervention, the researchers observed that many interventions have been tested by evaluating only employees who self-select to participate in programs, and participation rates are often low. Only rarely is the effect of the intervention assessed in terms of change among all employees. Another problem is that studies comparing treatment and control worksites often include only two or, at most, a few sites. Even when sites are randomly assigned to condition, evaluation designs typically do not permit use of the worksite, as opposed to employees, as the unit of analysis. Another supposed limitation of many worksite studies is the reliance on intensive, highly structured, and expensive interventions delivered by highly trained research staff, a set of conditions that may be difficult to replicate. Another cited limitation is the difficulty in differentiating intervention effects from other variables, such as secular trends, other contextual factors including state or local health policy changes such as indoor air acts, and medical insurance. Finally, many worksite interventions are relatively short and do not address the challenge of how to support long-term maintenance of employee behavior change. To some degree this frequently recanted, rote litany is applicable to all research and surely applies to worksite evaluations of other programs. Although the previous reviews of this literature have fully acknowledged these limitations and more, they have been misinterpreted as an uncritical advocacy of worksite health promotion and disease prevention programs.<sup>38</sup> For the record, that is not the case. It remains accurate, however, that despite the limitations most

of the research to date does (1) indicate favorable health and cost outcomes; (2) more recent and more rigorously designed research tends to support rather than refute earlier and less rigorously designed studies;<sup>39-41</sup> and (3) rather than interpreting the methodologic flaws and diversity as presumptively negative, it is equally indicative of a robust phenomena evident in many types of worksites, with diverse employees, different interventions, and varying degrees of methodologic sophistication.<sup>42-44</sup> In any case, even the most rigorous methodology cannot compensate for predictably, unsophisticated interventions that do not take into account more than 15 years of increasingly multifactorial, effective interventions.

Given "business as usual" in the U. S. Congress, which translates into a virtual paralysis except in matters of reelection, raising their own salaries, and dismantling the policies of the previous administration, it is important to note that these national trends are due predominantly to private initiatives by major insurers, large corporations, coalitions of insurers and corporations, a few hints of state government innovation, and literally nothing out of Washington, D.C. No one is waiting breathlessly for Congress to act. It is precisely because national and state health care reform is being determined by the private sector that the particular studies cited in this article and the previous two in this series are so important. Their outcomes represent documented, viable, ongoing, replicable, and demonstrably effective managed care programs delivered to hundreds of thousands, and collectively to millions, of active employees, dependents, and retirees. Collectively, these projects represent positive models of the future of managed care and responsible demand management. Surely, many unanswered questions and issues remain, particularly regarding the persistent plight of the disadvantaged, racial and ethnic minorities, disabled, and the growing elderly population where prevention strategies are even less well developed or tested. Most important, as Dr. Steven A. Schroeder, president of the Robert Wood Johnson Foundation, has pointed out, "The shift from fee-for-service practice to the many variants of managed care will undoubtedly increase the prevalence of implicit rationing by queue and other administrative means. In addition, the continuing pressure to reduce Medicare expenditures may erode the current high level of medical care received by the elderly in the United States. For now, we must recognize that rationing already occurs in the United States, although less systematically than in other countries, and certainly much less frequently among the elderly."<sup>45</sup> Through the prudent and effective use of demand management, a major objective is to reduce the excessive demands and expenditures inherent in late-stage disease interventions through early detection and free up crisis intervention for all who truly need such measures.

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