

Health Risk Reduction Programs in Employer-Sponsored Health Plans: Part I—Efficacy

Mark A. Rothstein, JD
Heather L. Harrell, MD, JD

Objective: We sought to determine whether workplace health risk reduction programs (HRRPs) using health risk assessments (HRAs), individually focused risk reduction, and financial incentives succeeded in improving employee health and reducing employer health benefit costs. **Methods:** We reviewed the proprietary HRA available to us and conducted a literature review to determine the efficacy of HRRPs using HRAs, individualized employee interventions, and financial incentives for employee participation. **Results:** There is some evidence that HRRPs in employer-sponsored programs improve measures of employee health, but the results of these studies are somewhat equivocal. **Conclusion:** Employer-sponsored HRRPs may have some benefits, but problems in plan design and in the studies assessing their efficacy complicate drawing conclusions. (J Occup Environ Med. 2009;51:943–950)

Virtually, every employer faced with substantial increases in employee health benefits expenses has been exploring ways to reduce costs without drastically cutting benefits or excessively shifting costs to employees. At the same time, there has been an increased awareness of the role of lifestyle in health risk and a growing sense of need to increase personal responsibility in health care utilization and outcomes. Employer sponsors of health plans have adopted a variety of activities to improve employee health measures and reduce costs. Some of these initiatives have been aggressively marketed by vendors using proprietary health risk assessments (HRAs), individual health risk reduction programs (HRRPs), and other related services. Besides vendor-produced studies and anecdotal evidence of improved employee health and lower employer costs, is there conclusive evidence that HRRPs are effective in achieving their goals?

Health Risk Reduction Programs

The escalating costs of employee health benefits have sparked an interest by employers in reducing health care payments, especially if employee health is improved at the same time. To satisfy this growing demand, vendor companies have begun selling individualized worksite health promotion plans.¹ According to the websites of these companies, they are now responsible for managing, to varying degrees, the health of millions of employees.²

From the Institute for Bioethics, Health Policy and Law, University of Louisville School of Medicine, Louisville, Ky.

Address correspondence to: Mark A. Rothstein, JD, Institute for Bioethics, Health Policy and Law, University of Louisville School of Medicine, 501 East Broadway 310, Louisville, KY 40202; E-mail: mark.rothstein@louisville.edu.

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DOI: 10.1097/JOM.0b013e3181b05421

Employer-sponsored wellness and health promotion programs have been in place at numerous companies for many years.³ Many of these programs are outstanding in design and implementation. The potential of workplace health promotion to improve population health is reflected in the goal of *Healthy People 2010* to increase from 46 to 75, the percentage of worksites with 50 or more employees offering employer-sponsored physical activity and fitness programs.² Employers have recognized that many employees view health promotion programs (eg, exercise facilities) as a benefit. They also recognize that a healthy workforce is more productive and less costly in a variety of ways (eg, reduced sick leave, absenteeism, turnover).⁴

The new types of health promotion programs addressed in this article are characterized by three elements: 1) the use of HRAs to determine workers' levels of health risk; 2) the development of individualized interventions, which sometimes involves employees being frequently contacted by health advisers or "coaches" to monitor progress in risk reduction activities; and 3) the use of financial incentives, often in the form of reduced employee contributions to health benefit plans, to encourage employee participation.

Health Risk Assessments

HRAs are questionnaires completed by employees about their health practices, history, and status. The assessments are usually meant to provide a general understanding of that individual's modifiable risk factors. By contrast, biometric measurements, such as height, weight, blood pressure, and cholesterol, attempt to give numerical values to health status. Although HRAs are self-reported, biometric measures may be either self-reported or measured by intervention staff.

The concept of a patient-derived HRA was developed by Robbins and Hall in 1970 in an effort to integrate prevention into clinical practice.⁵

HRAs increasingly have migrated from the clinical setting to the workplace in an attempt to predict employees at greatest health risk, those likely to utilize the most health resources, as well as those at low risk and less likely to use health care. Studies show that HRAs can predict medical costs by stratifying individuals into risk categories.^{6,7} HRAs are usually considered proprietary instruments, and, thus, they vary among the vendor companies and can even be further tailored to the needs of particular employers. Because of these differences, as well as their reliance on the self-reporting of participating employees, it is difficult to develop composite models for evaluation of the accuracy or predictive ability of HRAs. Nevertheless, there is substantial evidence that HRAs can be valuable in identifying those in need of intervention to prevent disease development or progression. It is not clear, however, whether employment-based risk assessment and intervention through consulting companies are as desirable as traditional health promotion overseen by the individuals' primary care physicians.

Employee-Specific Interventions

After defining employee health risk, the next step is to devise an individual program for risk reduction. Employees may be contacted by telephone by a health adviser or coach to devise the plan. These advisers have a variety of training and expertise which may or may not be sufficient to develop an appropriate intervention for individuals with a wide range of medical histories, current symptoms, and medications. Other personalized approaches, such as individual feedback on the HRA, nurse help lines, or behavioral counseling, may be used independently or in combination with health coaches.

Financial Incentives

To increase participation in these "voluntary" programs, employers frequently offer financial inducements,

such as a reduction in the employee's monthly contribution for health coverage. It is at this point that the HRRP stratifies workers on the basis of income. A \$20 or \$30 per month reduction in monthly employee contributions is not a sufficient incentive for many higher paid employees to participate. Higher paid employees are able to forego this benefit, or put another way, they can more easily afford to pay a "privacy tax" and not have to share health information with the HRRP vendor and not be bothered at home by individualized interventions. Lower paid employees may be more economically vulnerable, and, thus, more likely to feel coerced into signing up to participate in the HRRP. Especially for lower paid employees, employers could underwrite or subsidize key elements of health promotion, even though this additional cost conflicts with one of the primary goals of HRRPs, saving money.

Evidence of Effectiveness

Numerous studies investigating the outcomes of HRRPs were used to draw conclusions about the efficacy of these programs in the workplace. Although many studies were analyzed, this article is not meant to be a comprehensive review of all such studies. The review is used to demonstrate weaknesses in the methodologies of the studies and call into question published claims about the effectiveness of the HRRPs. The review focused on studies of the effects of HRAs, financial incentives, and individualized approaches, either singularly or in combination. The review was generally limited to studies published within the past 10 years.

Methodological Limitations

Although this assessment analyzed a broad range of studies, there are several difficulties in drawing conclusions about HRRPs in the workplace. First, the interventions studied vary along several dimensions; interventions may address different types

and numbers of health risks, ranging from general health risks to more specific measures of alcohol use, weight changes, or cholesterol levels. The nature of the interventions also varies, such as nurse help lines, classes, behavioral therapy, and changes in the built environment. In other words, generalizing about the effects of HRRPs in the workplace requires drawing conclusions based on interventions that vary in type, scope, and focus.

Next, the nature of the results reported in studies also varies significantly. Studies may look to measure the effects of an intervention on health risk behaviors, biometric measures, stage of change of participants, presenteeism, absenteeism, or return-on-investment. Also, the results of studies may be quantified by different methods. Many studies take a variable that runs along a risk spectrum, such as cholesterol or servings of fruit and vegetables consumed per day, and convert this to a categorical variable of either high or low risk. Other studies retain numerical measures rather than converting them into high- and low-risk categories. These various ways of reporting the effects of different interventions complicates comparison of and drawing conclusions about HRRPs.

Another challenge to analyzing studies of HRRPs is that some variables are self-reported whereas the same variables in other studies may be measured. Furthermore, the statistical analysis itself often differs from study to study. Few studies use an intention-to-treat analysis, but rather report only the results of those participants who complete the intervention. Because participants are voluntary, not using an intention-to-treat analysis inflates the positive results already seen with voluntary subjects. For example, in a study of an internet-based smoking cessation program, with an intention-to-treat analysis considering all who originally started the program, the 7-day point prevalence of cessation was 12.8%, as

compared with 42.9% when only program completers were analyzed.⁸

Finally, studies do not investigate or report the effects of HRRPs on morbidity and mortality rates, in part because the studies do not run long enough to determine such effects.⁹ Although modifying health risks is assumed to affect morbidity and mortality, the magnitude of that effect is somewhat unclear and may not be linear with the magnitude of the effect on a particular health risk. In addition, health risks and behaviors interact, sometimes in ways that are not understood; therefore, a finding that risk is reduced along one variable may not necessarily mean there is a reduction in morbidity or mortality. Nevertheless, the reduction of some health risks in and of themselves has been shown to reduce health care costs,¹⁰ presenteeism (workers on the job but not fully functioning), and absenteeism.¹¹

Summary of Study Results

Most published studies conclude that workplace-based interventions have positive effects with regard to behavioral risk factors, health risk factors, return-on-investment (ROI), presenteeism, or absenteeism. Although the conclusions are generally presented as positive, many of the studies actually found mixed effects on health. Furthermore, many of the most common intervention methods, when analyzed individually, fail to demonstrate the expected effects in light of the broad claims about HRRPs in the workplace.

Questions Asked on HRAs. Because many HRAs are proprietary, we only had access to one set of HRAs used for various purposes at a particular institution. Therefore, the discussion of this HRA may not be representative of concerns raised by other HRAs. Most of the questions on these HRAs address “modifiable” risk factors, such as weight (when considered with height), smoking status, exercise regimens, and dietary intake. Nevertheless, some of the information provided in questions or

feedback can be misleading or provide misinformation. Also, many questions address sensitive issues and may intrude into the doctor–patient or therapist–patient relationship. Furthermore, the questions do not seem to account for any variability in the population, which could harm those who deviate from the norm.

The questionnaires may contain misleading information. For instance, when asking about smoking status on one questionnaire we reviewed in detail, individuals are given an option to choose that they either 1) currently smoke, 2) quit within the last year, or 3) never smoked or quit more than 1 year ago (University of Louisville, Health Risk Assessment, on file at Institute for Bioethics, Health Policy and Law). Such options may convey the idea that risk of relapse significantly declines after 1 year or that health risks from smoking return to baseline after 1 year, neither of which is true.^{12,13} Another part of the questionnaire defined caloric beverages as including juice with added sugar, not all juice. Although juices without added sugar generally have more nutrients per calorie, it is misleading to imply that other juices do not have calories. Finally, one HRA discussed separately digital rectal examinations and rectal examinations (University of Louisville, Get Healthy Now Questionnaire, on file at Institute for Bioethics, Health Policy and Law), which could be two names for the same examination; discussing them separately could lead to confusion about appropriate screening tests.

Many questions on the HRAs seem to intrude into the doctor–patient or the therapist–patient relationship. For instance, employees were asked to indicate if they were taking medication for blood pressure or cholesterol or taking any antianxiety medications, asthma medications, chronic pain medications, depression medications, diabetes medications, sleep medications, or muscle relaxants, among others (University of

Louisville, Get Healthy Now Questionnaire, on file at Institute for Bioethics, Health Policy and Law). When and what medication is started and what dosage is prescribed for a chronic condition is a decision made by a patient with the advice of and information provided by a physician. Besides recommending that a person speak with a physician about possibly needing medications, inquiring into the taking of these sorts of medications intrudes into the doctor-patient relationship, possibly damaging the trust necessary for that relationship to succeed. Similarly, many questions were more appropriate for a therapist or doctor to ask a patient. For example, one form posed a question about the regularity of emotional eating (University of Louisville, Health Risk Assessment, on file at Institute for Bioethics, Health Policy and Law), and another form asked how “worn out” the employee felt and what sort of support the employee had in his or her family and friends (University of Louisville, Get Healthy Now Questionnaire, on file at Institute for Bioethics, Health Policy and Law). Such questions touch on sensitive issues not usually discussed with employers. Even if it were appropriate to inquire into such issues to recommend that the employee seek help from a physician or counselor, to provide computer-generated advice in response to HRA questions crosses the line into patient-therapist and patient-doctor relationships.

HRAs also tend to assume that individual respondents conform to the norm of society. For example, one HRA asked if the individual had maintained at least a 10-pound weight loss and if the individual had increased his or her exercise amount (University of Louisville, Get Healthy Now Questionnaire, on file at Institute for Bioethics, Health Policy and Law). Not all individuals need to lose weight or exercise more, and, in fact, some have found that such assumptions make the workplace an unhealthy place for them.¹⁴ Simi-

larly, the questionnaire asked if the employee had reduced the amount of alcohol consumed, thereby assuming that the employee's alcohol consumption was excessive. The questionnaires assume that questions addressed to the mean are appropriate for all individuals, but such assumptions are inappropriate and can have deleterious consequences.

Health Risk Assessments and Biometric Measures. At least one study has concluded that completing an HRA led to lower health care costs in those employees.¹⁵ Such a conclusion could be supported by the fact that some individuals make changes in their behaviors based on feedback from an HRA and other individuals take their HRA results to their physician for discussion.¹⁶ A high percentage of individuals, however, are confused by the feedback from an HRA,¹⁶ and some behavior changes made as a result of HRA feedback may not be positive. It is logical to conclude, however, that healthier individuals are more likely to fill out voluntary HRAs or complete voluntary biometric measures, thereby suggesting that sampling bias rather than filling out an HRA leads to lower health care costs.

It has been concluded that “[t]here is insufficient evidence that HRAs by themselves lead to health risk reductions.”¹⁷ Furthermore, “employees who typically respond to HRAs are different than nonresponders.”¹⁷ At least one study found that those individuals with some high health risks who completed an HRA accounted for a smaller percentage of medical costs than those high-risk individuals who did not complete the HRA⁷; other authors generally found that the average cost for those who completed an HRA was less than for those who did not.⁷ One study found that those individuals with at least one healthier behavior were more likely to voluntarily have their biometric measures taken,¹⁸ whereas another study found that completers of HRAs were more likely to be physically active and “to

have reported other healthy behaviors on the HRA.”¹⁹ In passive recruitment to health promotion programs, it has been found that there is more self-selection bias for those individuals with better health or healthier lifestyles.²⁰ In fact, at least one author has stated that workplace health promotion programs, which often include HRAs, have a more difficult time recruiting high-risk individuals to the programs.¹⁸ In other words, there is sufficient evidence to suggest that healthier individuals and individuals more interested in improving their health or being healthy^{8,18} are more likely to fill out HRAs. Furthermore, there is a tendency for individuals to overstate their positive health status on an HRA.^{18,21}

Individualized Approaches. Individualized approaches can take many forms. Most programs offering HRAs also gave individualized feedback. Many worksite programs offer other individualized approaches, such as personal health coaches, behavioral counseling, optional nurse help lines, or personal trainers. Reviews of worksite HRRPs have found that more individualized approaches tend to be more effective,^{4,9} though one of these reviews seemed to associate individualization with more intensive interventions.⁹ At least one study, however, found that more individualized approaches led to better success for stress and exercise but did not find the same to be true for smoking and body mass index (BMI).²²

Financial Incentives. Financial incentives can include a broad range of motivators for participation in a wellness program. Companies have used gift cards, cash, and reductions on health plan contributions, with the latter being touted by some as the best type of financial incentive because it is tied to health and health care.²³ The amount of financial incentive can also vary significantly—from \$25 gift cards²³ to \$500 medical benefit plans.²⁴

Financial incentives seem to increase participation rates in health promotion programs,^{8,25} but they do not appear to have an effect on attrition rates.²⁵ There is disagreement as to whether financial incentives better motivate individuals to change their health behaviors. One study found that though financial incentives increase participation rates, there was no change in the success rate of smoking cessation under an intention-to-treat analysis⁸; however, higher participation rates combined with similar quit rates means that more individuals quit. Another study found that financial incentives led to similar results in lowering cholesterol when compared with individualized coaching and classes.²⁶ At least one author has asserted that incentives are necessary to maintain interest in a long-term program.²⁷ On the other hand, at least one study found that financial incentives had a negative effect on changing lifestyle behaviors associated with cardiovascular disease, instead finding that behavioral counseling was a better option.²⁸

Duration of the Health Effects. It is important to consider what health effects are being measured in HRRP studies. Because follow-up is not long enough to track changes in morbidity or mortality rates, surrogate markers of health are being measured instead.⁴ The relationship between various health markers and health outcomes is complex, depending on the health marker, the interaction of the health marker with other aspects of health, genetics and environment, and the understanding of the marker's effect on health outcomes. Although there are data to support the association of many health markers with health outcomes, the complexity of this relationship should not be ignored. The use of surrogate health markers to measure effectiveness of HRRPs makes it unclear what the true health effects of these interventions are; therefore, it is important to consider the duration of the measured effects to better

elucidate the complicated relationship between these markers and health outcomes.

One review found that it took between 3 and 6 months of intervention to see reductions in health risks.⁴ Study interventions may or may not be this long, and the results assessment may be done at the end of the intervention or later. Some studies looked at ongoing programs,^{29–33} but even then, the assessment was frequently done at one point in time, rather than repeated measures over the life of the intervention.

Of those studies investigating the effects of HRRPs in the workplace at one or two points in time, they seem to demonstrate that the effects can last at least 6 months, though later waning, for weight loss³⁴ and at least a year for some other health effects.^{8,19,23,35} Some studies showed longer term results, at least with continuing interventions,^{24,33,35} and one study of a generally one-time intervention also found long-term results.³⁰ A few studies looked at long-term interventions, analyzing the effects of the intervention at several points in time. Such analysis permits better understanding of whether there is continuing interest and motivation in long-term programs, with resulting changes in and upkeep of health status. Two studies demonstrated that longer interventions can continue to have positive effects on health throughout the duration of the study.^{31,37} On the other hand, two other studies demonstrated that long-term, continuing interventions have waning results.^{32,38}

The best conclusion that can be drawn is that the duration of effects of an HRRP varies depending on the length of the intervention, the health effects measured, the type of intervention, whether there are changes over time to the intervention, and even the population receiving the intervention. However, health effects of HRRPs can still be seen one or more years later for some interventions. When effects are measured at only one point in time for either

ongoing or short-term programs, it is impossible to determine whether the effects of the program have waned; some of the studies that do repeatedly measure the effects of the intervention demonstrate that effects may wane. Consequently, the variable duration of the health effects of these programs does not suggest wholly positive long-term results on morbidity or mortality.

Magnitude of the Effects of HRRPs **Return-on-investment**

One frequently cited study found that a comprehensive program, including disease management, had a return-on-investment of between \$4.56 and \$4.73 for every dollar spent on the program.³⁹ Some might argue that this result underestimated true cost savings because it only looked at medical expenditures and did not consider savings from decreased absences and increased productivity. Nevertheless, the authors noted several weaknesses to their study. The authors tried to negate the consequences of selection bias in their statistical analysis, but it is impossible to determine if there was any remaining bias.³⁹ A further concern is that the effects of the intervention on health risk factors was not investigated³⁹; therefore, any actual reductions in health care costs could be due to numerous other factors, such as seeking out less preventive care, which may lead to increased costs in the long term. Also, retirees, those more than 64 and those with HMO plans were excluded.³⁹ It is likely that some of these groups of individuals would account for a large portion of costs. Finally, it does not appear that societal trends were accounted for in the analysis; for instance, although smoking decreased among participants,³⁹ it is unclear how much smoking decreased in the general population in that area.

Another study that investigated an obesity management program found that after 1 year the ROI was \$1.17 for every \$1.00 spent, because of both reduction in health care spending and increased productivity.²³

However, this was an estimated, not actual, ROI.²³ Furthermore, the authors admitted that this was likely an overestimation when they stated, “[a]lthough such immediate, short-term returns on investment from risk reduction programs are unlikely, several studies have found larger returns over longer time periods.”²³ In addition, one review concluded that a program must last for 3 to 5 years to be cost-effective,⁴ and this study ran only 1 year.

A meta-evaluation of workplace studies cited a huge range of positive results for the cost or benefit ratio of studies¹⁰; such huge ranges in economic results were attributed to the variable considerations of what constitutes both a cost and a benefit.⁴ However, the huge range could also be due to varying interventions, different subject populations, and various lengths of intervention and follow-up. In general, though, there appears to be agreement that there is an overall positive ROI, if not due to health cost reduction, then to reduced absenteeism or presenteeism.

Health effects

Studies tend to report the effects on health behaviors and biometric measures in one of two ways, either along a continuum or as artificially defined categorical variables. Although many studies report outcomes in categorical variables, such reporting makes it difficult to conceptualize actual changes in behavior or health risks. Therefore, whenever possible, studies that reported quantitative rather than categorical data will be used to discuss the magnitude of the health effects.

Health behaviors can include a broad range of variables, from servings of fruits and vegetables consumed per day to minutes and types of physical activity participated in per week. One small 12-week study that used an e-mail-based intervention found that participants increased their fruit and vegetable consumption by 0.73 servings per day and decreased their consumption of fat

sources by 0.39 sources a day. When an intention-to-treat analysis was done, the study found that fruit and vegetable consumption increased by 0.37 servings per day and consumption of dietary fat decreased by 0.22 sources per day.⁴⁰ A worksite randomized study that used interventions planned by a group of employees saw a more than 10% increase in those who participated in regular physical activity compared with 2% in the control worksite that was given self-help information. Regular physical activity was defined as 20 minutes of continuous physical activity three or more times per week.³⁷ This same study found that there was no difference in smoking outcomes with the intervention worksite as compared with the control worksite.³⁷ Another study using an internet-based smoking cessation program found that 42.9% of program completers had a 7-day point prevalence of smoking cessation; when an intention-to-treat analysis was used, the 7-day point prevalence was 12.8%.⁸

Although many studies observed positive effects on health behaviors and biometric measures, some also found negative effects. For instance, one study that offered a financial incentive for having biometric measures completed with individualized feedback concluded that the intervention was successful. Among other measures, total cholesterol decreased approximately 6.9 mg/dL, high-density lipoprotein increased by approximately 4 mg/dL, low-density lipoprotein decreased by approximately 13.8 mg/dL. Nevertheless, that same group saw an increase in triglycerides of approximately 16 mg/dL, diastolic blood pressure increased approximately 1.5 mm Hg, waist circumference increased approximately 3.2 cm, and BMI increased approximately 0.7 kg/m².³³ Similarly, a study that used a variety of wellness programs and a small financial incentive to encourage completion of an HRA saw risk decrease in diet, cholesterol, stress, and preventive visits, but still saw an

increase in risk for diabetes mellitus, high blood pressure, and alcohol use.²² Another study found a decline in those considered high risk for body fat, blood pressure, physical activity, smoking, and seat belt use but found that the percentage of participants at high risk for cholesterol (defined as more than 200 mg/dL) increased from 37.2% to 49%.³⁴ One study did conclude that its intervention, including an HRA, mass media and environmental changes, and group sessions, had an overall negative effect on health risk factors because there was no change in cholesterol or fatty acid composition though there was an increase in BMI. This study had a worksite control group that actually increased their high-density lipoprotein.⁴¹ One review found that worksite health promotion did not affect employee perception of physical well-being, though it did positively affect perception of mental well-being.⁴²

Conclusion

HRAs are associated with some markers of better health and lower health care costs, although this might be the result of self-selection bias. Most research indicates that individualized approaches are more effective than generalized approaches, but the data on financial incentives are more complex. Financial incentives may increase participation rates; however, the long-term effects of financial incentives on health outcomes are not as definitive and may even be negative when compared with other interventions. The magnitude of health effects of HRRPs varies considerably; the effects of these programs may last a year or longer, but the magnitude of the effect may diminish over time.

One of the most important conclusions to be drawn from reviewing these studies is that the studies have many weaknesses. The studies use only voluntary participants, meaning that there is some self-selection bias. This bias is compounded by the relatively high attrition rates⁹ and the

lack of intention-to-treat analysis. Such a bias is confirmed by studies that found those more prepared to make health changes or that utilize intervention resources more are more likely to see positive effects on health.⁸ In addition to the self-selection bias, there is also a problem with the length of studies. It is impossible to determine effects on morbidity and mortality based on short-term studies that only measure intermediate health risk factors with complicated connections to disease and mortality. Furthermore, there are few studies that are randomized by worksite. Finally, some of the questions asked on HRAs are misleading, intrude into the doctor-patient relationship, and could be harmful to individuals that deviate from the population norm.

The methodological weaknesses and equivocal nature of the study results raise concerns about the efficacy and desirability of HRRPs and HRAs. They also demonstrate the need for more studies with control worksites, of long duration, with multiple time points of analysis, that account for self-selection bias, that use an intention-to-treat analysis, and that compare interventions of various duration.

In light of these weaknesses, there are several concerns raised when employers, researchers, employees, and government rely on the studies to support HRRPs. Both the methodological weaknesses and results of the studies lead us to question whether employers' expectations and vendors' assurances about ROI and health improvements are realistic and accurate. Because several of the studies indicate both positive and negative health effects from HRRPs, it is reasonable to question whether the interventions could be doing more harm than good when implemented on a large scale and over the long term. Individuals responsible for deciding whether to initiate or continue HRRPs should consider whether there are alternative means to achieve the same health objectives—

both at the worksite and in the clinical setting. More generally, policy makers should assess what, if any, role employer-sponsored HRRPs should play in the health care system and whether health promotion would be better addressed by primary care physicians than employer-sponsored health plans.

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