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The economic value of healthy workers

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Abstract

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1) To demonstrate the feasibility of a designed intervention in changing targeted health behaviors and 2) to evaluate the impact of changes in health risks on the two measures of job performance (a self-reported measure of health-related work impairment (presenteeism) and an objective measure of illness absenteeism).

Design

A pre/post study design (2004-2005) utilizing Health Risk Appraisal (HRA) data to assess changes in prevalence of individual health risks and changes in two productivity measures.

Setting and Subjects

Employees of a private insurance provider in Australia.

Measures

An HRA questionnaire was used to evaluate self-reported work impairment on different aspects of job demands and to assess the prevalence of health risks during March 2004 with a follow-up assessment December 2005. Absence hours due to illness (illness absenteeism) were obtained from company administrative records.

Results

The most improved health risks associated with the on-site lifestyle program interventions were increased physical activity, better perception of physical health and reduction in smoking although some health risks increased during the time period (e.g., job dissatisfaction and high stress). Changes in percentages of work impairment were significantly associated with changes in numbers of health risks—as health risks decreased, work impairment decreased; as health risks increased, work impairment increased. On average, each risk factor increased or reduced over time was associated with an incremental change of 4.2 percentage points of work impairment. Although there was a trend for changes in illness absenteeism to follow changes in health risks, the differences were not statistically significant.

Conclusions

This study demonstrates 1) the impact of a designed intervention program on changing health behaviors and 2) preliminary results indicating that changes in productivity measures follow changes in health risks. The study provides a first indication of the potential benefits of health promotion programming to Australian employees in improving health and to the corporation in minimizing health-related productivity loss.

Keywords

economic, value, healthy, workers

Disciplines

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Introduction

Health promotion in Australia has developed as an accepted strategy within the public health sector to promote better health in their populations with priority areas of cardiovascular health, cancer, injury and poisoning, diabetes, mental disorders, asthma and arthritis (Wise & Signal 2000; Australian Institute of Health and Welfare 2004). While health promotion activities vary by state, the broad areas of activities covered by selected health promotion include general health promotion and education and injury prevention with activities typically targeted to improve the health status and well-being of populations rather than focusing on the health of the individual (Australian Institute of Health and Welfare 2005).

These efforts have shown some progress with significant declines in mortality for coronary heart disease and stroke, cervical cancers and lung cancers for males (Wise & Signal 2000; Australian Institute of Health and Welfare 2004). Likewise, some positive changes in lifestyle behaviors have been documented with decreased smoking rates, improved control of blood pressure, some signs of better nutrition and a decline in alcohol consumption, however, rates of physical inactivity and obesity have continued to increase (Wise & Signal 2000; Australian Institute of Health and Welfare 2004).

At the governmental or policy level, little attention has been given to the application of health promotion within the Australian workplace despite evidence for the potential benefit of these programs for improving the health, quality-of-life and productivity of the workforce. As global economies exert pressure on countries to improve productivity levels (Rahman 2005), the health of a country’s workforce becomes an important priority. Health promotion activities are provided by the private sector within Australian corporations, however, clear leadership or collaborative roles between government health services and private health spending have not been established. For the most part, national health priorities have continued to focus on disease conditions and safety issues, although preventive health models have gained an increasingly important visibility within health services circles (Council of Australian Governments 2006). As preventive health delivery models are considered, targeting health strategies designed to impact the working population provides one model of effective delivery of services to a critical mass of the population that can be readily reached at selected locations during working hours.

In addition, evaluation methodologies are key to sorting out best practices and effective strategies as diverse health improvement interventions are considered (Wise & Signal 2000). If prevention strategies are to gain ground in national priority agendas, the body of evidence demonstrating the impact of designed programming with selected economic outcomes measures becomes imperative to promoting the advisability of a portion of healthcare investments in prevention rather than exclusively in disease treatment and management.

It is the purpose of this case study 1) to utilize pre/post evaluation protocols to measure the effectiveness of designed programming in changing targeted health risks and 2) to document the impact of changes in health risks on two selected measures of productivity (self-reported work impairment/presenteeism and illness absenteeism hours from administrative records).

Methods

Design

This pre/post study was designed to examine the application over time of a Health Risk Appraisal (HRA) measurement tool merging self-reported work impairment (presenteeism) with an assessment of selected health risks among the employees of the health insurance provider Australian Health Management Group (AHM) (Musich et al. 2006). The longitudinal database assembled for this study included: baseline HRA data collected March 2004, follow-up HRA data collected December 2005 and administrative illness absenteeism hours for 2004 and 2005.

Sample

The selected study population consisted of 77 employees who met the following criteria: 1) current employees of AHM during March 2004 through December 2005 and 2) had completed 2004 and 2005 HRAs. Demographic characteristics of non-repeating HRA participants (2004), new HRA participants (2005) and HRA non-participants from 2004 and 2005 were evaluated to assess potential bias among the repeat HRA participants and subsequent generalizability of the study conclusions.

Intervention

At the beginning of 2005, a comprehensive health promotion program was launched targeting the following key health risks: physical inactivity, weight management, stress management and back care. Components of the program included: biometric screening for blood pressure and cholesterol, on-site wellness programming, education and awareness delivered via weekly e-mail messages, flu vaccinations, intranet website with health diaries and static health information, unmanned gymnasium, annual health expo, and one-on-one telephonic health coaching available to all HRA participants.

Measures

Health Risk Appraisal

The AHM HRA questionnaire was used as the measurement tool for the baseline and follow-up assessment of prevalence of selected health risks and medical conditions and to evaluate self-reported work impairment related to different aspects of job demands. The health survey was made available to AHM employees during the month of March 2004 and then again in December 2005 after the implementation of the comprehensive lifestyle intervention programming at the worksite. The HRA was originally developed in the United States by the Centers for Disease Control/Carter Center and subsequently modified by AHM for a more accurate assessment of health status within the Australian environment. The reliability and validity of the core HRA questions (40 questions) have been studied in several applications in the U.S. and, in general, HRA questions were found to be accurate for assigning individuals to stable risk (Edington, Yen & Braunstein 1999) and medical condition categories (Martin et al. 2000). The validity of the AHM HRA questions in assessing health status has been additionally evaluated against Australian medical costs with results consistent with those demonstrated with U.S. medical costs (Hook et al., 2001; Hook, Musich & Edington 2002; Musich et al. 2003).

In addition to self-reported age and gender, 14 individual health risks were selected from the HRA to establish health status and to monitor the impact of targeted programming. Each of the individual health risks was dichotomized to high-risk or low-risk according to the criteria given in the Appendix.

Health status was determined by counting the number of health risks for each participant and categorizing to three levels of health status: low-risk (0-2 health risks), medium-risk (3-4 health risks) and high-risk (5 or more health risks) (Slide 5). The number of health risks and the health status category (low, medium and high risk) were assessed for each employee in 2004 and then again in 2005.

Presenteeism measurement

Five work-related questions were incorporated into the core AHM HRA questions addressing different aspects of job demands selected as suitable for Australian employees (Musich et al. 2006). The questions asked:

In the past 4 weeks, how much time did your stress levels, physical or emotional health make it difficult for you to do the following:

- Work your required number of hours
- Use your equipment properly (e.g., keyboard, mouse, tools or machinery)
- Concentrate on your work
- Work effectively with others
- Work to the best of your ability

Response choices represented the amount of time health problems had diminished one's ability to perform job tasks within the past 4 weeks: none of the time, some of the time, most of the time, all of the time or does not apply. A summary score was calculated by assigning numeric values (with higher values associated with increased work impairment) to each of the responses and then averaging across the responses of the five questions to a total presenteeism score. The score was then converted to a scale of 0% (no impairment) to 100% (completely impaired). Changes in work impairment over the time period were calculated from the difference between 2004 and 2005 work impairment percentages. To date, reliability and validity of the presenteeism metric has yet to be independently evaluated in the Australian employee population.

Illness absenteeism hours

Absence hours recorded for personal illness during 2004 and 2005 were received from the AHM payroll office and total annual illness absence hours were calculated. Changes in annual illness absenteeism hours over time were calculated from the difference between 2004 and 2005 absenteeism hours.

Changes in health risks associated with changes in productivity loss measures

Changes in the number of health risks between the baseline HRA assessment and the follow-up assessment were calculated by subtracting the total number of health risks for each individual in the first and second time periods (Slide 6). Three risk change categories of individuals (i.e., data reduction because of the small study population) were then defined based on three possibilities of change: individuals with a net decreased number of health risks, individuals with no change in number of health risks and individuals with a net increased number of health risks. Changes in work impairment and in annual illness absence hours were assessed relative to these three risk change categories.

Statistical testing

Categorical variables were tested using the chi-square test. Changes in individual health risks and health status categories over time were tested using McNamar's chi-square test. Changes in work impairment and absenteeism across the three risk change categories were tested using analysis of co-variance (ANCOVA) adjusting for age, gender, baseline number of health risks and baseline work impairment/absenteeism levels.

Post-hoc testing of differences in the multi-level variable was performed using Tukey's Studentized Range Test. Tests for trend were performed for adjusted changes in work impairment and illness absence hours associated with the three net risk change categories.

Results

Demographic characteristics

Demographics for 2004 HRA participants, 2005 HRA participants and 2004 and 2005 repeat HRA participants are presented in Table 1. Repeat participants are 76.6% female with an average age of 37.1 years. There are no statistical differences in demographics between repeat participants, non-repeating participants from 2004, new participants in 2005 or HRA non-participants from 2004 or 2005 ($p>0.20$). The participation rate in 2004 was 44% of the total AHM employee population with 34% of participants repeating HRA participation in 2005. Approximately 75% of AHM employees participated in at least one health activity during the program year (see Table 1).

Individual risk changes 2004-2005

The net changes in individual health risks over the time period are presented in Table 2a. The impact of the comprehensive lifestyle intervention program among these participants is reflected in the dramatic improvement in levels of physical activity with a 7.8 percentage point decrease in numbers of sedentary individuals. Individual perceptions of physical health improved and overall smoking rates decreased.

More problematic to AHM, however, is the dramatic increase in job dissatisfaction—a result of corporate restructuring that occurred during 2005. An increase in those reporting high stress was significantly associated with increases in job dissatisfaction ($p=0.0184$). Those at risk for high blood pressure also increased but this increase was independent of job dissatisfaction ($p>0.50$) and is largely a result of increasing individuals reporting high systolic blood pressure numbers and having begun taking blood pressure medications (those reporting systolic blood pressure greater than 139 mmHg increased from 5.9% to 13.9%; those taking blood pressure medications increased from 1.3% to 6.4% (see Table 2a)).

Health status transitions 2004-2005

Overall transitions by health status levels 2004 to 2005 (low-risk, medium-risk and high-risk) indicate a net improvement in percent at low risk from 72.7% to 74.0% ($p>0.50$). Ninety-one percent of those at low-risk in 2004 remained low-risk in 2005. Those employees transitioning to the low-risk category in 2005 were previously in the medium-risk category. Net changes in number of individuals ($p>0.50$) at higher risk status included a reduction in the number at medium-risk (19.5% to 15.6%) and an increase in the number of high-risk employees (7.8% to 10.4% (see Table 2b)).

Changes in work impairment/illness absenteeism with changes in numbers of health risks 2004-2005

When considering changes in total numbers of health risks over time, 70% of the employee population either remained the same or reduced numbers of health risks while 30% increased numbers of health risks. The average number of reduced health risks among those reducing was 1.9 health risks while the average number of increased health risks among those increasing health risks was 2.0 health risks.

Changes in percentages of work impairment were significantly associated with changes in numbers of health risks ($p=0.0394$ decreasing vs. increasing; $p=0.0923$ no change vs. increasing; adjusting for age, gender, baseline risk status and baseline work impairment levels)—as health risks decreased, percentages of work impairment decreased (-5.9 percentage points); as health risks increased, percentages of work impairment increased (+10.7 percentage points). The slope of the line fitted to the changes in work impairment by risk change category showed that, on average, for each risk changed, there was a 4.2 percentage point change in self-reported work impairment from 2004 to 2005 (p for trend=0.1111(see Table 3 and Figure 1)).

Changes in annual illness absence hours demonstrated similar (but not significant) patterns with absence hours decreasing or remaining unchanged among those employees who either reduced their number of health risks or did not change numbers of health risks, respectively, while absence hours increased among those who increased their number of health risks over the time period. The slope of the line fitted to the changes in absence hours by risk change category showed that, on average, for each risk changed, there was a 3.2 absence hour change from 2004 to 2005 (p for trend=0.4421 (see Table 4 and Figure 2)).

Discussion

AHM implemented a lifestyle intervention program during 2004-2005 as a health and productivity management strategy for the primary purpose of improving the health and well-being of their employees with a secondary goal of improving defined productivity measures of self-reported work impairment (presenteeism) and measured illness absenteeism. In the baseline study, increased numbers of health risks were associated with increased presenteeism and absenteeism (Musich et al. 2006).

Results from the follow-up HRA assessment indicated that the lifestyle-focused intervention program was associated with improvements in targeted individual health risks among AHM employees. Most changes were in increased physical activity, improved perception of physical health and decreased smoking. Corporate restructuring during this time period was reflected in unexpected increases in job dissatisfaction and high stress with the two risks being significantly associated. While the stresses associated with corporate restructuring are likely short-lived, program strategies should be adjusted to address the psychological issues that were a consequence of these changes. Increased numbers at risk for high blood pressure may be a positive short-term result from increased awareness and biometric screenings at the worksite.

Overall health status transitions indicated that there was a net increase in the percentage of the population at low-risk, a result of 91% maintaining low-risk status and a gain from risk reduction among employees who had previously been medium-risk. The focus on risk reduction and low-risk maintenance indicates a two-fold strategy providing programming to assist those already at low-risk remaining low-risk while also serving the needs of health improvement for higher-risk employees. In this study group, however, there was also a net increase in the percentage of employees at high-risk, a result of risk status increases from previously low-risk and medium-risk employees and those who remained high-risk over time. While the risk increases were largely due to circumstances outside of the scope of the program (i.e., corporate environment), on-going tracking of changes in health status over time allows for the use of data to facilitate adjustments in year-over-year program strategies and content.

The changes in self-reported work impairment associated with the risk change categories demonstrated that changes in work impairment were significantly associated with changes in numbers of health risks. The slope of the line fitted to the changes in work impairment by risk change category shows that, on average, there was a 4.2 percentage point change in self-reported work impairment per health risk changed. That those who increased risks experienced increases in work impairment emphasizes the importance of low-risk maintenance strategies.

Changes in illness absence hours showed similar trends (although not significant) to those changes demonstrated for work impairment with reductions in absence hours associated with reducing health risks while those who increased numbers of health risks experienced increases in total absence hours. This difference in significance testing may indicate that work impairment/presenteeism provides an early indicator of program impact with illness absence hours being a longer-term metric, nevertheless, as health risks changed—similar trends (increasing and decreasing) for both productivity metrics were evident.

These results are a case study on a small study population and may not be generalizable to other employees, however, they do document the experience of one employer in the Australian environment in implementing a lifestyle-focused comprehensive intervention at their worksite. Baseline health status was measured using an HRA and changes in individual health risks/health status tracked with a follow-up HRA after a year-long intervention period. Self-reported work impairment and payroll illness absence hours were utilized to evaluate the impact of changes of health risks on changes in selected productivity measures. None of the individual risk changes (or health status changes) were statistically significant (because of the small N) but the relationship of changes in work impairment associated with changes in total numbers of health risks was statistically significant (changes in absence hours followed similar but non-significant trends). The work impairment changes are similar to results in the U.S. by Burton et al. (2006) on a much larger study population and indicate the robustness of the relationship of changing risk status with changes in self-reported work impairment. That our slope of 4.2% was close to their published slope of 1.9% (even with our recognized limitation of small sample size) adds credibility to the relationship between health status and productivity metrics.

While these results may not be definitive or generalizable to other employee populations, we would promote the process of an intervention design to include measurement and evaluation. If health promotion providers are to make their case to corporations and/or government officials, we must establish best practices in programming that are documented to promote changes in health behaviors among employee populations as well as provide evidence of economic outcomes in productivity metrics benefiting the organization.

References

Australian Institute of Health and Welfare 2004, *Australia's Health 2004*, [Online], Available: http://www.aihw.gov.au/publications/aus/ah04/ah04--c06-040804.pdf [29 March 2006].

Australian Institute of Health and Welfare 2005. *National Public Health Expenditure Report 2001-02 to 2003-4*, [Online], Available: http://www.aihw.gov.au/publications/hwe/npher01-02/nper01-02-c01.pdf [30 March 2006].

Burton, W.N., Chen, C.Y., Conti, D.J., Schultz, A.B. & Edington, D.W. 2006, 'The association between health risk change and presenteeism change', *Journal of Occupational and Environmental Medicine*, vol. 48, pp. 252-263.

Council of Australian Governments (COAG) 2006, *Better Health for All Australians Action Plan*, [Online], Available: http://www.coag.gov.au/meetings/100206/attachment_d_better_health.pdf [30 March 2006].

Edington, D.W., Yen, L. & Braunstein, A. 1999, 'The reliability and validity of HRAs', In: G.C. Hyner, *et al*., (Eds). *SPM Handbook of Health Assessment Tools*. Pittsburgh, PA: The Society of Prospective Medicine & The Institute for Health and Productivity Management, pp.135-141.

Hook, D., Musich, S., Barnett, T. & Edington, D.W. 2001, 'Using health risk/cost analyses to develop a population health management program in an Australian health insurance environment', *Healthcover* , vol. 11, pp. 49-52.

Hook, D., Musich, S. & Edington, D.W. 2002, 'Excess healthcare costs associated with excess health risks in the diseased and non-diseased', *Healthcover*, vol. 12, pp. 19-25.

Martin, L.M., Leff, M., Calonge, N., Garrett, C. & Nelson, D.E. 2000, 'Validation of self-reported chronic conditions and health services in a managed care population', *American Journal of Preventive Medicine*, vol. 18, pp. 215- 218.

Musich, S., Hook, D., Baaner, S., Spooner, M. & Edington, D.W. 2006, 'The association of two productivity measures with health risks and medical conditions in an Australian employee population', *American Journal of Health Promotion*, vol. 20, pp. 353-363.

Musich, S., Hook, D., Barnett, T. & Edington, D.W. 2003, 'The association between health risk status and health care costs among the membership of an Australian health plan', *Health Promotion International*, vol. 18, pp. 57-65.

Rahman, J. 2005, Department of the Treasury, 'Comparing Australian and United States Productivity', [Online], Available: http://www.treasury.gov.au/documents/987/HTML/docshell.asp?URL=04_comparing_productivity.asp [30 March 2006].

Wise, M. & Signal, L. 2000, 'Health promotion development in Australia and New Zealand', *Health Promotion International*, vol. 15, pp. 237-247.

Tables and Figures

Table 1. Demographics

Demographic	**2004 Participants**	**2005 Participants**	**2004 and 2005 Participants**
	N=224	N=136	N=77
Gender			
Male	19.2%	20.6%	23.4%
Female	80.8%	79.4%	76.6%
Average age (2005)	36.3 years	36.4 years	37.1 years

Note: There are no statistical demographic differences between repeat HRA participants, non-repeaters from 2004 or new participants in 2005 (p>0.20). Participation rates are 44% in 2004 with 35% of participants repeating in 2005.

Table 2a. Individual Risk Changes 2004-2005

Individual Risks	**Baseline Prevalence**	**RiskDifference**
	%	
Physical activity	20.5	-7.8
Cholesterol	3.8	-3.9
Perceived health	21.8	-2.6
Smoking	12.8	-1.3
Health Age Index	1.3	-1.3
Seatbelt use	3.8	0
Weight	29.5	0
Alcohol	5.1	0
Life satisfaction	16.7	+1.3
Medical problems	9.0	+2.6
Drug use for relaxation	6.4	+3.9
Stress	24.4	+5.2
Blood pressure	7.7	+6.5

Job satisfaction	5.1	+7.8

Note: N=77; none of the changes are statistically different, p>0.10.

Table 2b. Risk Transitions (by Individual Employees)

Risk Level	Low	Medium	High	Total
Low risk (0-2 risks)	51	3	2	56 (72.7%)
Medium risk (3-4 risks)	6	7	2	15 (19.5%)
High risk (5+ risks)	0	2	4	6 (7.8%)
Total	57 (74.0%)	12 (15.6%)	8 (10.4%)	77 (100%)

Note: Risk transitions show most movement from medium-risk to low-risk (6 individuals) but also a movement to high-risk of 2 individuals from low-risk and 2 individuals from medium-risk. 91% remained low-risk; 47% remained medium-risk and 67% remained high-risk. Net health status changes (low to low; medium to medium; high to high) are not statistically different, p>0.50.

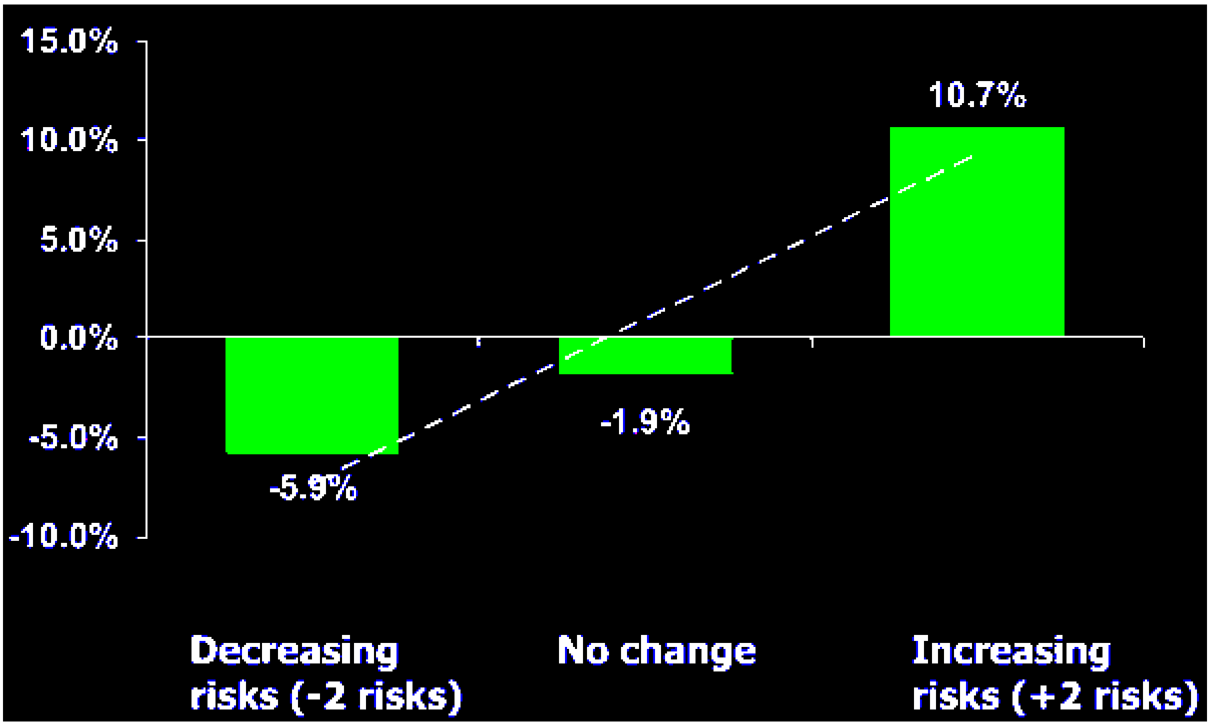
Table 3. Changes in Percentage Work Impairment with Changes in Risks

Risk Levels	N	Average Number of Risks Changed	Work Impairment 2004	Work Impairment 2005	Difference*
Decreasing number of risks	17	-1.9	18.4%	12.5%	-5.9 (-7.9)
No change number of risks	37	0	17.3%	15.4%	-1.9 (-1.3)
Increasing number of risks	23	+2.0	16.5%	27.2%	+10.7 (+11.1)

*p=0.0394 decreasing vs. increasing; adjusting for age, gender, baseline risk status and baseline work impairment; p=0.0923 no change vs. increasing; test for trend: p=0.1111

Note: Changes in work impairment associated with changes in numbers of health risks (decreasing vs. increasing numbers of risks) are statically different and indicate that changes in work impairment are associated with changes in one’s number of risks. Adjusted differences are in parentheses.

Figure 1. Unadjusted Changes in Percentages of Work Impairment with Changes in Numbers of Health Risks



Work impairment decreases (adjusted) associated with decreasing risks are statistically different from work impairment increases associated with increasing risks, p=0.0396; test for trend: p=0.1111; slope of line indicates 4.2 percentage points per risk changed.

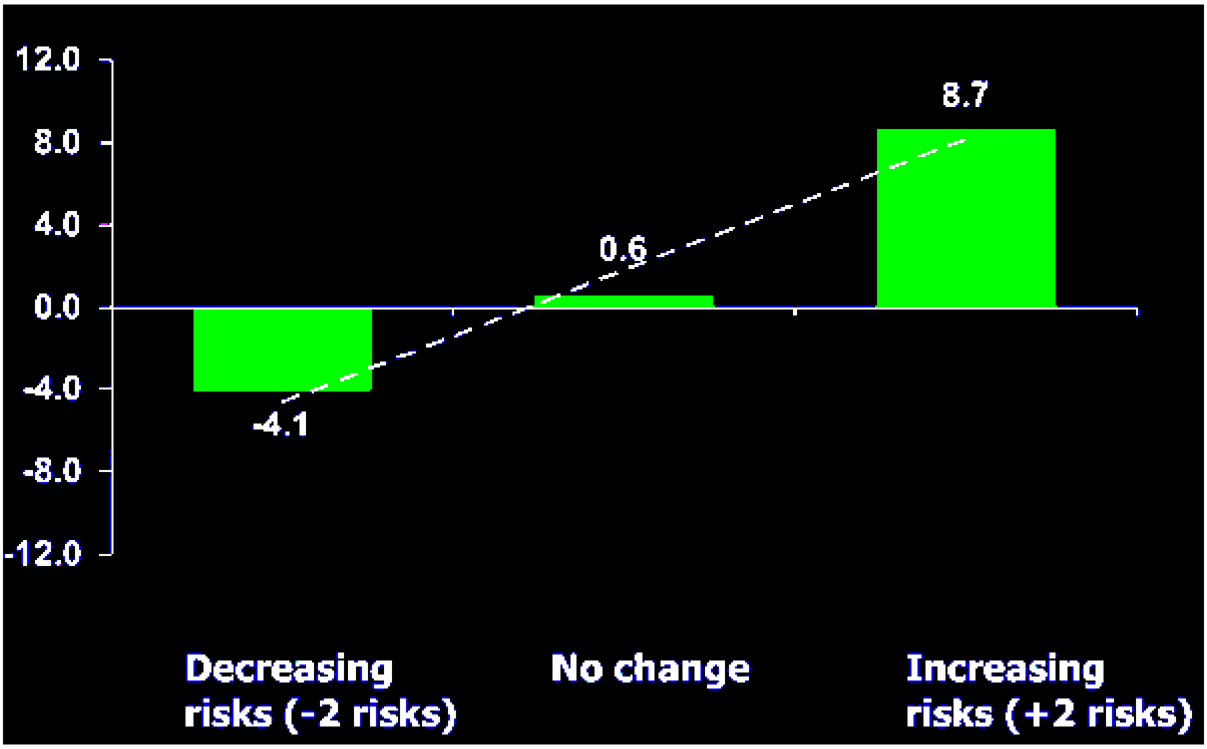
Table 4. Changes in Annual Absence Hours with Changes in Risks

Risk Levels	N	Average Number of Risks Changed	Absence Hours 2004	Absence Hours 2005	Difference*
Decreasing number of risks	17	-1.9	43.7	39.6	-4.1 (-0.2)
No change number of risks	37	0	28.7	29.3	+0.6 (-2.7)
Increasing number of risks	23	+2.0	40.7	49.4	+8.7 (+11.1)

*NS, p>0.40; adjusting for age, gender, baseline number of risks and baseline absence hours; test for trend: p=0.4421

Note: Although there is a trend for changes in absence to be associated with changes in numbers of health risks, the differences are not statically significant. Adjusted differences are in parentheses.

Figure 2. Unadjusted Changes in Annual Absence Hours with Changes in Numbers of Health Risks



Illness absence hours decreases associated with decreasing risks are not statistically different from absence increases associated with increasing risks, p>0.40; test for trend: p=0.4421; slope of line indicates 3.2 hours change per risk changed

Appendix. High Health Risk Criteria

Selected Measures	**High Risk Criteria**
Lifestyle/biological risks	
Alcohol use	Heavy drinker (>14 drinks/week)
Blood pressure	• Systolic blood pressure greater than 139 mmHg or • Diastolic blood pressure greater than 89 mmHg or • Taking blood pressure medication or • Self-reported high blood pressure range
Body Weight	BMI>=27.5 [weight (kg)/height (m) 2]
Cholesterol	Greater than 6.18 mmol/l
Drug/medication use	Sometimes or almost every day
Physical activity	Less than one time per week
Smoking	Current cigarette smoker
Safety belt use	Using seatbelt less than 100% of the time
Health indicator risks	
Health Age Index	Appraised age minus achievable age greater than four

	years (measure of controllable health factors)
Medical problems	Self-reported heart problems, diabetes, cancer, bronchitis/emphysema or past stroke
Perception of physical health	Fair or poor
Psychological risks	
Personal life satisfaction	Partly satisfied or not satisfied
Job satisfaction	Disagree or strongly disagree
Stress	S-scale score over 18
Overall risk levels	
Low risk	0-2 health risks
Medium risk	3-4 health risks
High risk	5 or more health risks