The Healthy LifeWorks Project

A Pilot Study of the Economic Analysis of a Comprehensive Workplace Wellness Program in a Canadian Government Department

Lydia Makrides, PhD, Steven Smith, PhD, Jane Allt, MPA, Jane Farquharson, MSc, Claudine Szpilfogel, MSc, Sandra Curwin, PhD, Paula Veinot, MHSc, Feifei Wang, PhD, and Dee Edington, PhD

Objective: To examine the relationship between health risks and absenteeism and drug costs vis-a-vis comprehensive workplace wellness. **Methods:** Eleven health risks, and change in drug claims, short-term and general illness calculated across four risk change groups. Wellness score examined using Wilcoxon test and regression model for cost change. **Results:** The results showed 31% at risk; 9 of 11 risks associated with higher drug costs. Employees moving from low to high risk showed highest relative increase (81%) in drug costs; moving from high to low had lowest (24%). Low-high had highest increase in absenteeism costs (160%). With each risk increase, absenteeism costs increased by $CDN248 per year ($P < 0.05$) with average decrease of 0.07 risk factors and savings $CDN6979 per year. **Conclusions:** Both high-risk reduction and low-risk maintenance are important to contain drug costs. Only low-risk maintenance also avoids absenteeism costs associated with high risks.

In Canada, and the rest of the developed world, the high prevalence of major modifiable health risks such as obesity, smoking, physical inactivity, hypertension and dyslipidemia continues to contribute to the epidemic of chronic diseases resulting in a significant economic burden to society.[1,2] There is substantial work to be done, as it is estimated that 80% of Canadians aged 20 to 59 years have at least one of five major modifiable health risks such as hypertension, tobacco use, overweight, diabetes, and inactivity, with one in ten of Canadians having three or more risks.[3] A recent study of 51 workplaces in Atlantic Canada reported an alarming prevalence of modifiable health risks, with half of the study sample having two to four major modifiable health risks, such as daily tobacco smoking, physical inactivity, overweight, and elevated blood pressure.[4]

Workplace wellness refers to addressing modifiable health risks through comprehensive individual and environmental efforts to promote the health of employees. The cost of poor health behaviors is rising, and employees with multiple risk factors are more likely to have higher health care costs.[5,6] Medical care costs for people with chronic diseases account for 60% of total health care expenditures, or $1.2 billion a year in the province of Nova Scotia, Canada (the site of this study).[7] Indirect costs (eg, absenteeism, presenteeism—ie, lower work output) of poor employee health can be two to four times the direct medical costs.[6,8–11] Research has linked poor health status with higher direct health care costs, lower work output, higher rates of disability and injury, and absenteeism.[12–20] And, there are costs associated with "doing nothing" or not investing in workplace wellness.[21] Worker productivity decreases,[22] and as the number of health risks increases, days lost from work each year and concomitant costs also increases.[23] Furthermore, there is an inverse relationship between wellness score and health costs underscoring the importance of helping employees improve their health and decrease their risk.[24]

The benefits and cost savings associated with workplace wellness are well-documented: decreased turnover, increased productivity and organizational effectiveness, decreased absenteeism, fewer health care claims, and positive return on investment.[25–28] A number of studies reviewed by Pelletier over the past 12 years indicate positive clinical and economic outcomes of workplace wellness interventions.[29–34] Pelletier and colleagues[9] reported an increase in productivity by 9% and a decrease of absenteeism by 2%. Other researchers have documented a cost-benefit and return on investment estimates of the advantages of workplace wellness.[35–37]

Healthy employees can cause economic gains for employers, and employee health is becoming an increasingly important investment to improving the business bottom line due to a strong link between health and productivity.[38] This article investigates the relationship between health risks and absenteeism and drug costs vis-a-vis a comprehensive workplace wellness program in the Department of Justice (DOJ) of the Nova Scotia Public Service, Canada.

METHODS

Research Design

A voluntary comprehensive workplace wellness intervention was developed, implemented, and evaluated over a 4-year period (2004–2008) in the DOJ, within the Nova Scotia Public Service of the Government of Nova Scotia, Canada. A total of 733 DOJ employees (approximately 60% of eligible employees) participated in a baseline health risk appraisal (HRA) in 12 sites throughout the province of Nova Scotia. The HRA consisted of collecting clinical data and completing a questionnaire at individual workplaces. Clinical data on modifiable health risks were collected by a trained team of health professionals, led by a registered nurse. A total of 402 employees completed the final HRA upon finishing the intervention and constitute the study sample. Main reasons for nonattendance, or attrition, included retirement, change to other jobs within the Nova Scotia Public Service, or to other sites within the DOJ, and work-related difficulties limiting participation in the program. Approximately 10% of DOJ employees who remained in the study chose not to participate in the final HRA, despite repeated notifications.

This pilot study reports on the analysis of complete data for 402 employees participating in baseline and final screening (immediate postintervention) for modifiable health risk prevalence in 2004 and 2008. The drug cost analysis is based on 298 of the 402 DOJ employees with health insurance coverage over the 4-year period. The short-term illness (STI) and general illness (GI) data used to estimate absenteeism are based on 402 employees. Short-term illness is defined as absence from work due to illness 4 to 100 days

From Creative Wellness Solutions Inc (Dr Makrides), Nova Scotia, Canada; Department of Psychology (Dr Smith), Saint Mary's University, Nova Scotia, Canada; Strategic Support Services (Ms Allt), Nova Scotia Public Service Commission, Canada; The Heart and Stroke Foundation of Nova Scotia (Ms Farquharson), Canada; Research Power Inc (Ms Szpilfogel), Nova Scotia, Canada; School of Physiotherapy (Dr Curwin), Dalhousie University, Nova Scotia, Canada; and Health Management Research Center (Dr Wang, Dr Edington), University of Michigan. Paula Veinot is a health research consultant in Ontario, Canada.

Address correspondence to: Lydia Makrides, PhD, Creative Wellness Solutions, Inc, PO Box 3061, Tantallon, Nova Scotia, Canada B3Z 4G9. E-mail: lmakrides@wellnesssolutions.ca.

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in a year; GI refers to absence due to illness 1 to 3 days over a 1-year period. Effectiveness of the intervention was examined using pre- and postprogram outcome measures, including clinical and economic indicators.

The comprehensive workplace wellness intervention consisted of programs and policies to support employees to make lifestyle changes to improve their health such as the following: annual health risk assessment, competitions to motivate employees (eg, weight loss and healthy nutrition, pedometer walking contests), incentives programs, a variety of educational materials, and one-on-one counseling via telephone and computer-based support across lifestyle risk factors.

A series of annual interactive workshops and group presentations (approximately four) were also provided on a variety of health topics and were conducted on-site by the health professional team (eg, nurse, dietitian, physiotherapist, occupational therapist, exercise specialist). In addition to these workshops, a resource binder was compiled so that the wellness committee could invite local community resources into the worksite to provide ongoing support. Annual health fairs were organized in combination with an annual check-up (eg, blood pressure, cholesterol) by the project nurse. Policy or environmental change included such examples as working with penitentiary food service staff to provide healthy food choices and appropriate portion sizes, provision of healthy snacks at meetings, and creation of walking trails and wellness rooms.

Topics covered by the intervention included a wide range of health issues and interests as identified by the employees through the HRA. The top three areas reported by more than half of employees were physical fitness, weight management, and nutrition, with a focus on establishing and monitoring healthy eating habits. Other interests were cholesterol and blood pressure reduction, as well as information on heart health and smoking cessation. All programs were delivered by health professionals. For example, smoking cessation counseling (as well as other topic areas) took place by a nurse via telephone, or on-site one-on-one and group sessions. Participants also received advice regarding weight management and physical activity with a focus on how to exercise safely and effectively to increase endurance, strength, and flexibility. Ongoing counseling by health professionals also included responding to e-mails received from employees, as well as sending monthly e-mails based on participants' top health risk areas.

Data Collection

A total of 11 health risks were assessed at two time points (Time 1—baseline; Time 2—immediate postintervention). Seven of these risks were examined using the *Personal Wellness Profile* (PWP), a computerized health and lifestyle assessment tool consisting of 39 questions on topics such as age, gender, personal and family health histories, daily physical activities, nutrition, stress level, safety, smoking history, and readiness to change.[39] The PWP has an estimated content validity of 0.90.[40] Convergence validity testing of the PWP using established instruments has shown moderate to moderately high internal consistency as a whole ($r = 0.77$) and reliable subscale scores over time ($r = 0.52$ to 0.90).[41] The collection of clinical data in the present study strengthens the reliability of the self-report questionnaire. The PWP self-report HRA assessed: *physical inactivity* (0 days of exercise), *smoking* (currently smoking or former smoker/quitting), *alcohol use* (more than seven drinks per week for women; more than 14 for men), *use of drugs to relax* (any use), *illness days* (six or more days per year), *safety belt use* (not always wearing a seat belt), and *job satisfaction* (not very satisfied or dissatisfied). *Fat*, *fiber*, and *nutrition* scores were also calculated using the self-report PWP. The overall nutrition score was determined by combining scores of all four areas of nutrition (low saturated fat meals, high-fiber foods, fast food/snacks, breakfast daily) with the fruits/vegetables weighted. The number of good nutrition practices was checked to confirm category score. Fiber intake was assigned a score up to 100 on the basis of the number of servings of grains. Fat score was assigned up to 100 on the basis of frequency of consumption of low saturated fat foods.[39]

Self-report data were supplemented by clinical data. Four modifiable health risks were measured by a health care provider using on-site screening: *obesity* (body mass index [BMI] $\geq$ 30 kg/m^2), *high blood pressure* ($\geq$140/90 mm Hg), *high cholesterol* ($\geq$5.2 mmol/L), and *high glucose* ($\geq$7.0 mmol/L). For overweight, two anthropometric measures were used. Height and weight and waist circumference were collected using a measuring tape. The weight of each subject, without shoes, was also measured using a digital scale (Healthometer Professional 320 KL, Health-O-Meter, Alsip, Illinois). Blood pressure was measured twice using a standard stethoscope and mercury-gravity sphygmomanometer. The lowest measurement was recorded. In addition, a score out of 100, based on an individual's systolic and diastolic blood pressure, was assigned with the highest and most favorable score being 100.[39] An Accutrend (Roche Diagnositcs, Laval, Quebec, Canada) machine with a finger-tip blood sample was used to give nonfasting readings of blood cholesterol and blood glucose levels.

A total wellness score (maximum of 100) was also calculated using the PWP[39] based on 15 health practices, such as aerobic exercise, blood pressure, body composition, cholesterol, and tobacco use. Prior research has demonstrated that these health risks are associated with high health care costs in employee populations.[42–44]

Data were examined relative to risk groupings. For the purpose of this study, high risk is defined as having three or more modifiable health risks, and low risk is fewer than three risks, on the basis of the 11 risk factors listed earlier.[45–47] The reliability of these health risks[44,48] as well as the criteria for the high-risk designation[49] has been discussed in previous publications.

Drug costs and STI and GI data were collected through a third party (health insurance and human resource database from the DOJ, Government of Nova Scotia). Drug costs were gathered for two time periods—October 2003 to September 2005 (baseline) and October 2006 to September 2008. The data of STI and GI were gathered for two time periods—October 2004 to September 2005 and October 2007 to September 2008. For STI and GI, absence hours and pay rate variables were used to calculate these absenteeism costs by multiplying absence hours by pay rate. Historical data retrieved from the third party administrative database for these variables served as a baseline measure. Individual drug costs have been adjusted to 2008 dollars according to the US consumer price index—medical services session. Total amounts paid as well as frequencies were calculated for each time period at the individual level.

Data Analysis

All data were analyzed using Statistical Analysis Software (SAS Version 8.2, SAS, Inc, Cary, NC). Employees in the study were assigned a coded id name (for confidentiality purposes), which appeared on all data collection forms. The pre- and postsurvey data for each study participant were entered into SAS FSP data entry screen using the coded id name as the identifier. Separate data screens were developed for each instrument. These data were then merged for multiple regression and multivariate analyses in SAS 8.2.

According to the risk level at Time 1 (baseline) and Time 2 (immediate postintervention), the 402 employees were classified into one of four risk change groups: low-low (low risk at Time 1 and stayed at low-risk status at Time 2); low-high (low risk at Time 1 and moved to high risk at Time 2); high-low (high risk at Time 1 and moved to low risk at Time 2); and high-high group (high risk at Time 1 and remained at high risk at Time 2). Change in wellness score was examined across risk change groups over time using the Wilcoxon nonparametric statistical procedure. Differences in wellness score between measurements (Time 1 to Time 2) were also calculated for the four risk change groups on the basis of wellness score.

The absolute and relative change from Time 1 to Time 2 in drug claims ($n = 298$), and STI and GI measures (combined for a measure of absenteeism; $n = 402$), were calculated for the four risk change groups. Because of a small N in each of the risk change groups, statistical tests of significance were not performed on the absolute and relative changes.

A continuous variable for risk change (number of Time 2 health risks minus Time 1 health risks) was also formed. Employees with number of risks decreasing by more than two were truncated into a category called "− 2" group. Similarly, those with number of risks increasing by more than 2 were collapsed into "+ 2" group. A regression model was applied to test the cost change along the risk change over the study period. Level of statistical significance was set at $\alpha < 0.05$.

RESULTS

Participant characteristics are shown in Table 1. Calculations were performed (Fisher exact test for sex and Wilcoxon nonparametric statistical procedure for all other continuous variables) to assess whether there were any differences in characteristics between those participants who remained in the study (Time 1 and Time 2 data; $n = 402$) and those who completed baseline measures only (Time 1 only data; $n = 331$). There were no significant differences with respect to sex, age, health age, cholesterol, nutrition score, fat score, fiber score, alcohol score, and fitness score. Statistically different characteristics were as follows: wellness score ($P = 0.0081$), blood pressure score ($P = 0.0461$), BMI ($P = 0.0518$), waist circumference ($P = 0.0512$), and average number of risk factors ($P < 0.0001$), with those completing only baseline measures having less favorable scores, except for blood pressure.

The following results report on changes in drug usage and absenteeism (STI and GI combined) over time (Time 1 and Time 2). The interval between Time 1 and Time 2 is approximately 3 years.

Wellness Score

Table 2 shows changes in wellness score associated with Time 1 to Time 2 risk change. A higher score indicates better wellness status. Overall mean wellness score at Time 1 was 49.3 for the low-risk group and 27.2 for the high-risk group. A further examination of Time 1 mean scores based on risk change showed an obvious trend in the mean wellness scores, with the high-high group having the lowest scores and the low-low group having the highest scores. Compared to the increase of 4.2 points in wellness score in the low-low group, the wellness score in the low-high group decreased by 2.0 points, which is a statistically significant difference ($P = 0.0116$). Meanwhile, the increase in the wellness score of the high-low group is even more significant than that of high-high group (15.6–3.7 = 11.9; $P < 0.0001$).

TABLE 1. Participant Characteristics—Comparison between Two Groups: $N = 331$ (T1 only) and $N = 402$ (T1 and T2)

Characteristic	Time 1 Only ($N = 331$)	Time 1 and Time 2 ($N = 402$)	P
Age (yr)	43.6	44.9 at T1	NS
Sex (male)	$n = 151$ (45.6%)	$n = 157$ (39.0%)	NS
Wellness score (out of 100)	38.8	42.4	0.0081
Health age (yrs)	43.7	43.9	NS
Blood pressure score (out of 100)	46.3	50.2	0.0461
Cholesterol (mmol/L)	5.0	5.1	NS
BMI (kg/m^2)	29.4	28.7	0.0518
Waist circumference (cm)	94.3	91.8	0.0512
Risk factors (number of)	3.3	2.6	0.0001
Nutrition score (out of 100)	50.5	50.9	NS
Fat score (out of 100)	58.6	57.6	NS
Fiber score (out of 100)	55.9	56.1	NS
Alcohol score (out of 100)	82.2	81.9	NS
Fitness score (out of 100)	45.0	46.7	NS

GI indicates general illness; NS, not significant; STI, short-term illness.

Cost Change Versus Risk Change

Employees who moved from low-risk to high-risk status showed the highest relative percentage increase in all drug measures (usage, supply, and cost), while those who moved from high-risk to low-risk status had the lowest relative increase (Table 3).

With respect to cost change between Time 1 and Time 2, among the four risk change groups, the employees who moved from low-risk to high-risk status showed the highest relative increase (81.3%) in drug costs. Meanwhile, those who moved from high-risk to low-risk status from Time 1 to Time 2 had the lowest relative increase (24.4%).

As seen in Table 4, employees who moved from low risk to high risk had the highest increase in absenteeism hours and cost (160.7% and 160.4%, respectively) among all risk change groups. The increase in absenteeism at Time 2 more than doubled compared to Time 1.

Projected Cost Savings

Figure 1 illustrates the change in total absenteeism (STI and GI combined) costs by risk change. A clear trend was seen in the absenteeism cost (Fig. 1); with each risk change from Time 1 to Time 2, the absenteeism cost changed by a corresponding $CDN248 per year per employee ($P < 0.05$). There was no significant increase in drug costs on the basis of increasing risk. The total number of risks in the study sample decreased by 0.07 (1.93 − 1.86) over the study period. The projected total savings in absenteeism associated with risk reduction would be $CDN248 × 0.07 × 402 employees = $CDN6979 for Time 2 period (October 2007 to September 2008).

DISCUSSION

This pilot study provides data on the relationship between health risks and absenteeism and drug costs in relation to a comprehensive workplace wellness intervention. It presents changes in health risk status and cost savings associated with this intervention. The findings suggest that both high-risk reduction and low-risk maintenance are important and valid strategies to retain drug cost. Nevertheless, only low-risk maintenance could avoid a certain amount of absenteeism cost (due to STI and GI) associated with high risks.

The prevalence of multiple health risks is alarming. The current pilot study found that, at baseline, 31% of the worker population was at high risk (having three or more modifiable health risks). This is higher than another estimate of the Canadian population, reported at 11%.[3] The higher prevalence of modifiable health risks in the present study may be explained by the fact that additional risks were captured that were not measured in the Heart and Stroke Foundation study. Nevertheless, the association of multiple health risks with negative outcomes (eg, increased illness days, increased trend of short-term disability incidence) found in the present study is substantiated elsewhere.[50]

The statistically significant difference in mean wellness score between high-high and high-low groups and between low-low and low-high groups illustrates that change in risk status is consistent with change in wellness scores. Not surprisingly, the high-high risk group with the lowest wellness scores and the low-low group with

TABLE 2. Change in Health Risk Status and Wellness Score Associated With Risk Change From Time 1 to Time 2 ($N = 402$)

Time 1 Health Risk Status	Time 2 Health Risk Status	*n* (%)	Time 1 Wellness Score	Time 2 Wellness Score	Difference	% Difference
Low (0–2 risks)	Low	227 (56.5)	52.4	56.6	4.2	8
	High	50 (12.4)	35.3	33.3	− 2.0	− 6
High (3 or more risks)	Low	54 (13.4)	30.8	46.4	15.6	51
	High	71 (17.7)	24.5	28.2	3.7	15

TABLE 3. Change in Drug Usage Associated With Risk Change ($N = 298$)

			Drug Usage (%)			
Time 1 Health Risk	Time 2 Health Risk	*N*	Time 1	Time 2	Difference	% Difference
Low (0–2 risks)	Low	169	11.7	13.5	1.8	15.4
	High	34	11.8	17.3	5.5	46.6
High (3 or more risks)	Low	47	18.5	18.9	0.4	2.2
	High	48	21.0	24.0	3.0	14.3
			Days Supply (*n*)			
Time 1 Health Risk	Time 2 Health Risk	*N*	Time 1	Time 2	Difference	% Difference
Low	Low	169	519	666	147	28.3
	High	34	582	897	315	54.1
High	Low	47	796	913	117	14.7
	High	48	1044	1462	418	40.0
			Cost ($)			
Time 1 Health Risk	Time 2 Health Risk	*N*	Time 1	Time 2	Difference	% Difference
Low	Low	169	765	956	191	25.0
	High	34	640	1160	520	81.3
High	Low	47	1134	1411	277	24.4
	High	48	1532	2111	579	37.8

TABLE 4. Change in Total Absenteeism (STI and GI Combined) Associated With Risk Change

T1 Health Risk	T2 Health Risk	*N*	T1 hrs	T2 hrs	Difference	% Difference
Low (0–2 risk)	Low	227	25	24	− 1	− 4.0
	High	50	28	73	45	160.7
High (3 or more risk)	Low	54	56	52	− 4	− 7.1
	High	71	93	59	− 34	− 36.6
T1 Health Risk	T2 Health Risk	*N*	T1 Cost ($)	T2 Cost ($)	Difference	% Difference
Low	Low	227	596	638	42	7.0
	High	50	589	1534	945	160.4
High	Low	54	1365	1308	− 57	− 4.2
	High	71	2208	1414	− 794	− 36.0

GI indicates general illness; STI, short-term illness.

the highest scores suggest that wellness score is a predictor of risk status—the lower the wellness score, the higher the risk. This will further justify the use of HRAs to establish a composite wellness score that can then be used to implement targeted workplace wellness interventions and track changes in health risk. These findings also support the notion of low-risk maintenance. This is important, as the natural flow of risk over time, independent of wellness interventions, involves changes in both directions (ie, high to low and low to high).[16] It should be noted that the wellness score was mostly influenced by waist circumference, glucose, and BMI and less so by blood pressure and cholesterol, which may warrant further investigation, given that there were some baseline differences between those who did and did not complete the intervention. While blood pressure was higher in the intervention group, BMI, waist circumference and wellness scores were less favorable for those who did not complete the intervention. This would suggest that the "healthier"

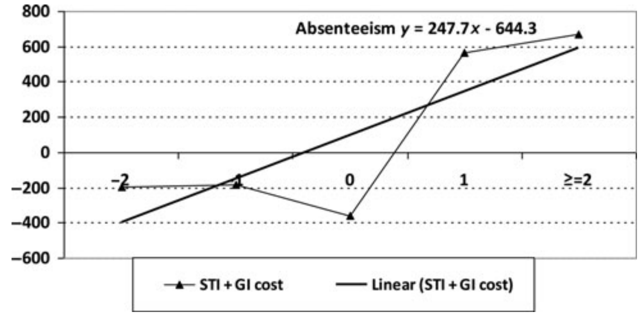

FIGURE 1. Absenteeism (STI and GI) cost change by risk change. GI indicates general illness; STI, short-term illness.

employees may have been more likely to be retained. It is uncertain whether this implies that results are more or less conservative, as there would be potential for even greater improvements in employee health and reductions in employer costs by recruiting and retaining the less healthy employees. To improve participation in future workplace programs, it may be worthwhile to tie behavioral interventions into organizational policy, find mechanisms to make employer support more visible, adopt incentives for behavior (not health status), link financial incentives to insurance premiums, and have employee advocates.

The move from low risk to high risk is associated with rising health care costs. Research has demonstrated that, as risks increase, costs increase and when productivity measures are factored in, the costs are doubled or tripled.[6,9,10,51] Among the four risk change groups, the employees who moved from low risk to high risk showed the highest relative increase in drug costs, and those who converted to low risk from high risk had the lowest relative increase. This underscores the importance of implementing both high-risk reduction and low-risk maintenance to control drug costs. According to the literature, an incremental increase in drug expenditures is associated with modifiable health risks; corporate drug costs increase in a stepwise manner as the number of self-reported health risk factors increase.[52] Nevertheless, it is interesting to note that our study demonstrated that the low-risk to low-risk and high-risk to low-risk groups also had increased costs, albeit smaller. While the reason for this is unclear, one explanation may be that the workplace wellness intervention promoted individuals to be proactive, and increases in medication use for high cholesterol or hypertension, as identified during the HRA screening, may have contributed to these increases. It is unknown whether there were any policy changes at the time of the study that may have improved access in general.

Average annual medical claims costs are higher for employees classified as high risk and also significantly related to number of high-risk classifications.[45] A study by Edington and colleagues[46] demonstrated that high-cost status and high-risk status are significantly associated. These researchers report that the largest increase in average medical claims costs occurred in employees who moved from low-risk to high-risk status, and the greatest reduction was in employees who moved from high-risk to low-risk status.[46]

Results of the current pilot support the value of workplace wellness to decrease absenteeism. The relative rate increase in employees whose risk increased from low to high doubled at Time 2 compared to Time 1 emphasizing the importance of maintaining low-risk status. When properly designed, workplace wellness is an effective prevention strategy to improve worker productivity.[53–56] A number of studies provide evidence of medical and insurance costs for participants in health promotion programs, particularly programs involving exercise. For example, one study reported that participation in a worksite fitness center was associated with 1.3 days fewer short-term disability days per year per employee ($P = 0.02$).[57]

Given that populations migrate naturally to higher risk status over time, the estimated cost savings found in this pilot study of $CDN248 for each health risk decrease, resulting in a nearly $7000 cost savings in absenteeism per year, is a conservative estimate.[17] It has been reported that by keeping healthy employees at low-risk status, an organization saves approximately US$350 per employee per year.[19] Therefore, the real savings in the study group would likely be higher, and simply maintaining the same risk level over time is a positive outcome. This is particularly important given that the absenteeism data discussed earlier suggest that only low-risk maintenance would avoid increase in STI and GI costs. The present pilot study did not examine presenteeism, as this was beyond the scope of the project, but it is likely that cost savings would be higher if presenteeism was taken into account. For example, it has been reported that each risk change increase or decrease is associated with a concomitant change of 1.9% productivity loss over time, estimated to be $US950 per year per risk changed.[22]

STUDY LIMITATIONS

Limitations of the study include the small sample size for some of the risk groups and the short-term nature of the intervention. The study did not factor in extent of participation (ie, sporadic participation vs continuous participation). Therefore, the extent of migration of risk due to how well employees adhered to the intervention is unknown. Furthermore, a number of extenuating circumstances within the penitentiary and justice centers as well as union issues imposed limitations that required multiple offerings and limited our ability to target the interventions to the study participants only. Thus it was not possible to assess costs related to the intervention. However, strengths of this 4-year pilot study were the use of comprehensive workplace wellness interventions related to personal, musculoskeletal, and organizational health; clinical measures to supplement self-reported data; and the fact that the intervention took place in the context of "real-life" or in a "living" workplace within a challenging work environment. Thus results are likely to be more generalizable. Another limitation relates to self-report, which may have led to misinterpretation of the data, thus influencing the validity of overall scores for some variables (eg, exercise, smoking). Social desirability bias and memory errors (eg, forgetting) can lead to over- or underreporting. Nevertheless, this limitation is not unique to this analysis and is inherent to data collection in this field and to mass screening. For other variables, such as cholesterol and blood pressure, more objective measures were used, which is a strength of this study. Lastly, for cost analysis, we only examined employees with health care insurance through this organization. In Nova Scotia, Canada, a universal provincial health insurance covers all residents. For additional insurance provided by an employer, employees generally cannot opt out unless they are covered by a spousal plan. It may be of interest for future studies to measure whether there are differences between employees covered by the employer's plan versus those who opt out and are covered by a spousal or other plan and whether these factors influence cost savings.

CONCLUSION

This pilot study reports on the potential cost savings of workplace wellness programs. The results emphasize the importance of high-risk reduction, and especially, low-risk maintenance strategies to reduce employer costs; even modest changes in risk status can result in cost savings. In this population, both high-risk reduction and low-risk maintenance were important and valid strategies to retain drug cost. However, only low-risk maintenance would avoid a certain amount of absenteeism cost (STI and GI). The cost savings associated with high-risk reduction and low-risk maintenance imply an economic basis for justifying investment in workplace wellness and suggests potential financial benefits of incentives associated with these programs. Leveraging the workplace to improve health is beneficial for both employees and for business. Wellness scores, found to be a predictor of risk change, further justify the value of using HRAs to implement targeted workplace wellness interventions to reduce costs associated with an unhealthy workforce.

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