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Sickness absence trend analysis and financial outcomes of a nine-year comprehensive workplace health promotion program

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Abstract

Purpose – This study investigated sickness absence trends and economic outcomes of a multiyear comprehensive workplace health promotion (WHP) program.

Design/methodology/approach – The nine-year WHP program was implemented emphasizing lifestyle behaviours as key targets in 2010–2013, whereas the latter half focused on stress management and mental health resources in 2014–2018. Sickness absence data was collected from the employer's HR system from 2009 to 2019. The investment and employer costs data were collected from the service provider's and employer's data basis. Economic impact was estimated for the actual nine-year program period by comparing implementation costs to estimated savings from sickness absences only.

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Competing interest: The corresponding author (Antti Hermanni Äikäs) was an employee of 4event Ltd, which designed and implemented the study's worksite health promotion program. Pilvikki Absetz has kept two single team workshops for 4event Ltd during 2013–2015; the participants (10–20 persons) were employees of Forest Finland Stora Enso. Sami-Petteri Honkanen was Sourcing Manager, Forest Finland at Stora Enso Oyj from 2011 to 2017 and Jussi Ilmari Lemmetty had the same role from 2018 to 2023. Kari Tapani Kellokoski was/is the Safety Manager from 2005–2014 and 2017->. Other authors: The authors declare that they have no competing interests.

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Findings – Sickness absence rate reduced by 38 percent from 2009 to 2019. The average investment was 331 EUR in the program per employee per year. Altogether, the employer invested 1.65 MEUR in the intervention and gained sickness absence savings of approximately 0.78 MEUR.
Originality/value – This study found a moderate decrease in sickness absence data and a positive curve of financial outcomes in a long-term analysis. Estimated program savings, limited to sickness absence benefits only, were not sufficient to cover the employer's costs of the program. Future research should explore other potential long-term savings beyond sickness absence.

Keywords Human resource management, Case study, Cost effectiveness, Programme evaluation, Workplace health promotion, Sickness leave
Paper type Research article

Background

Sick leaves, sickness absences and absenteeism all describe the same phenomena – the employee's time away from work because of illness, injury or insufficient work ability, which are accepted by the employer and legislation as realities of employment (Whitaker, 2001; Higgins *et al*., 2012).

According to Organisation for Economic Co-operation and Development (OECD)'s statistics, the prevalence of the average absence rates due to illness were 3.8 days per year in the USA, 4.7 in the UK, 6.7 in Sweden, 9.1 in Finland and 15.9 in Germany in 2010 (OECD, 2024). All these countries have different kinds of policies for controlling, reporting and compensating absenteeism. Furthermore, the reasons behind absenteeism are multidimensional. Health status of the individual, the quality of work tasks, salary level, the health care policies, delays in accessing medical treatment and work ability management models of an organization affect both the prevalence and costs of absenteeism (Higgins *et al*., 2012; Aldana and Pronk, 2001).

Sickness absences tend to vary between occupational classes and sexes. According to a Finnish panel data study 2005–2013, absenteeism rates were highest in the health and social work sector and in the manufacturing sector (Leinonen *et al*., 2018). Lowest rates were found among white-collar workers in all disease groups such as musculoskeletal, mental, circulatory and respiratory diseases (Leinonen *et al*., 2018). In Finland, men tend to have more absences than women, and the most common reasons for sick leaves have been musculoskeletal diseases and mental disorders (OECD, 2024; Kuoppala *et al*., 2008; Blomgren and Jäppinen, 2021).

Sickness absence rate is a common human resource parameter for employers, and it has been widely used for evaluating the effectiveness of worksite health promotion (WHP) interventions, because it has a direct connection to a corporation's expenses and productivity (Baicker *et al*., 2010; Chapman, 2012; Strömberg *et al*., 2017).

A strategic decision to invest in corporate well-being often involves the issue of resources and expectations of positive return on investment (ROI) (Goetzel *et al*., 2014). And there is an evidence base for ROI expectations. From earlier reviews, meta-analyses and observational studies, we know that interventions can produce positive financial outcomes via reducing sick leaves and health care costs and managing health risks and disability (Baicker *et al*., 2010; Chapman, 2012; Proper and van Mechelen, 2008; Santos and Miragaia, 2022), but not all WHP interventions are successful in producing positive financial outcomes (Pelletier, 2011; Song and Baicker, 2019; Mattke *et al*., 2013; Osilla *et al*., 2012; Lutz *et al*., 2019).

The previous WHP literature has provided ROI results mostly from 1–4 years of follow-up. Longer-term observations are rare. This study investigates sickness absence trends and estimates the associated financial outcomes of a multiyear tailored WHP program executed in Finland from 2010 to 2018. This study builds on three previously published articles that have extensively described the planning (Äikäs *et al*., 2017) and implementation phases (Äikäs *et al*., 2019) and analyzed employee-level health risk changes (Äikäs *et al*., 2020). The planning phase of the intervention was largely in line with recommendations from the literature (Pronk, 2014), with the exception of engagement of middle management, collaboration with occupational health care providers and anticipation of a multi-year implementation already at the planning stage (Äikäs *et al*., 2017). The implementation phase analysis revealed that approximately 80% of the 161

planned services were executed as intended, 67% of the personnel made a lifestyle change and the overall health impact of the full program was considered to be moderate based on the PIPE (Penetration, Implementation, Participation, Effectiveness) Impact Metric Model (Pronk, 2003) calculations (Äikäs *et al*., 2019). The evaluation of health risk showed that the program was effective in maintaining low and moderate risk levels but fell short of reducing the total number of health risks (Äikäs *et al*., 2020). Additionally, the prevalence of measured health risks was lower than in an average working-age population (Äikäs *et al*., 2020; Loeppke *et al*., 2010). The present study complements previous studies in order to evaluate employer-level effectiveness with longer-term observations on absenteeism trends and financial outcomes.

Methods

Study design

This case study focuses on sickness absence trends and associated financial outcomes of a comprehensive WHP program executed in a single company using a prospective longitudinal quasi-experimental cohort study design without a control group (Creswell and Plano Clark, 2011; Ovretveit, 2014; de Vocht *et al*., 2021). Interrupted time-series analysis was used to assess changes in trends and outcomes, following best practices outlined by James Lopez Bernal *et al*. (2017). Similar financial outcomes analysis has been used in a multi-year effectiveness study of a utility company from 1999 to 2007 (Yen *et al*., 2006, 2010). To ensure accurate and transparent reporting of financial impacts, the Consolidated Health Economic Evaluation Reporting Standards (CHEERS) were applied (Husereau *et al*., 2022), see Appendix.

Intervention

A comprehensive WHP program was delivered over a nine-year period from 2010 to 2018 in a Finnish wood supply company. The organization's focus was to buy, harvest and transport wood for the company's mills throughout the nation. The employer had altogether over 100 business units nationwide and over six hundred employees, which were the participants of the program. The program was a tailored version of a comprehensive WHP concept designed and produced by the provider of the program, 4event Ltd, nowadays Freia Ltd. The content, design and implementation process of the total program can be found in earlier studies (Äikäs *et al*., 2017, 2019) and a summary of the program is presented in Table 1.

Participants

All personnel of the wood supply company were the target group of the intervention. Most employees were white-collar workers, i.e. executives, local forest officers, organization officials and a smaller proportion were blue-collar workers, i.e. lumberjacks and terminal workers.

Table 1. Intervention characteristics

N	523–651
Length	9 years, from 2010 to 2018
Main focus of program	2010–2013 Supporting lifestyle change 2014–2018 Reducing stress, enhancing workplace climate
Total No Services	85 different services from 2010 to 2018
Classification	Comprehensive WHP Program
Main components	(1) Health risk assessment (biometrical + questionnaire) (2) Targeted services for three different health status (low, moderate, good) (3) Services available for all employees (4) Local playmaker network (5) Communication and program branding (6) Ongoing program management

Data collection

The sickness absence data were collected from the employer's records by the corporate human resources department. The time period was from 2009 to 2019, which included the nine-year intervention time and a one-year follow-up period. The data consisted of sick leaves, which were accepted by the employer and related salary costs for the employer. The data was limited to full-time workers, as the organization's use of part-time labour was minimal and seasonal in nature, which did not allow for regular participation in the WHP program.

The investments of the program included the service providers' design and implementation costs from 2010 to 2018. The direct and indirect costs of the program were collected from the service provider's financial management system. The direct costs included the following items: health risks assessments tours in 2010–2011, 2013–2014 and 2016–2017, targeted wellness and coaching services, workability days for the whole staff, education sessions for playmakers, communication, planning and management costs. The indirect costs include travel expenses, premises and catering. Data for each year was collected separately and summarized as a total annual cost of the program in euros and without Value Added Tax (VAT). The investment data excluded the employer's own wellness events such as golf or skiing competitions, subcontractor events and safe driving courses, etc.

The sickness absence data was used to estimate financial savings for the sick leaves paid by the employer. However, because this research did not have permission to use the actual salaries of employees, financial estimates of sickness absence savings were based on benchmark data of the private sector of working-age people in Finland from 2009 to 2018 (Statistics Finland, 2024).

Ethical issues

This study followed the ethical principles of the University of Jyväskylä and the research guidelines provided by the National Advisory Board on Research Ethics in Finland (University of Jyväskylä, 2016). The service provider and the employer were provided informed consent for this research. Participation in this research, as well as giving authorization to use the databases, were entirely voluntary. Neither the employer nor the service provider had any role in the design, conduct, or reporting of the study.

Data analysis

The human resource department of the employer provided a total sum of absence hours for the full-time workers from 2009 to 2019. The annual total absence hours were divided by average working hours per day and yearly reported head count of the organization to get annual average sickness day rate per employee. Notably, we used 7.75 h as a divisor since half of the personnel had 8 h and the other half had a 7.5 h workday. The calculated rate was comparable with OECD absence from work due to illness statistics and was contrasted against the rates of Finland from 2009 to 2019 in the trend analysis (OECD, 2024; Statistics Finland, 2024). In addition, a linear regression model in Statistical Package for the Social Sciences (SPSS), was conducted to evaluate the sensitivity of the observed sickness absence trends (James Lopez Bernal *et al.*, 2017).

For the economic outcomes analysis, the costs and savings were calculated separately. As stated earlier, the costs associated with the program include two different categories, direct costs and indirect costs, which form the total investment of the program. These sums were reported on an annual basis. In addition, we calculated total costs per person by dividing the annual sum of money spent with the number of employees for that year. This gave a descriptive and comparable average to analyze annual spending of the intervention. For the total continuum, we calculated cumulative program cost starting from 2010 and ending in the last reported year 2018. Similar methods have been used in a similar long-term financial analysis (Yen *et al.*, 2010).

The annual savings were defined as estimated employer's cost reductions in sickness absences from 2010 to 2018. Notably, we used 2009 as a baseline for the analyses. If the costs

due to sickness absences were lower than in 2009, it was marked as a savings for the employer. Since exact salary information was not available from the employer, we used average salaries provided by Statistics in Finland. For example, the average monthly salary was 3.108 EUR and the hourly salary 18,28 EUR in the private sector in 2010. Corresponding values were 3.553 EUR/month and 20,4 EUR/hour in 2018 (Statistics Finland, 2024). The costs or savings due to absences were calculated by multiplying the annual total sum of absence hours by the average hourly salary in Finland. Similar simple multiplying analysis has been suggested by Krol and Brouwer (2014) for estimating productivity lost in economic evaluations. For the total continuum, we calculated cumulative program savings starting from year 2010 and ending to year 2018.

The financial outcomes were estimated based on the annual costs and savings starting from 2010 and ending to 2018. In this study the ROI for each year was calculated by the amount of euros of financial outcome divided by the amount of euros spent for that year. Furthermore, the ratio of cumulative ROI was calculated by dividing cumulative financial outcomes by cumulative program costs. We applied a 0% discount rate to both costs and health benefits calculated from sickness absence, due to the exceptionally long follow-up period of our intervention (Husereau *et al*., 2022). Finally, we calculated ROI ratios for the first four-year period, the last five years period and the whole continuum. All statistical analyses were carried out with the SPSS 28.0 program.

Results

The descriptive statistics of participants of the multiyear WHP program are presented in Table 2. The total number of participants decreased from 675 employees in 2009 to 499 in

Table 2. Participants of the multiyear WHP program and descriptive statistics at three different time points

year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Number of employees	675	651	634	630	625	530	526	523	523	480	499
Annual turnover (%)	NA	11.0	8.2	4.1	17.0	5.1	3.6	5.5	16.6	6.3	NA
Descriptives			mean (SD)			mean (SD)			mean (SD)		
Age			43.8 (11.0)			45.0 (10.7)			44.8 (11.1)		
Bmi			26.9 (4.0)			26.6 (4.0)			26.8 (4.1)		
Personnel			%			%			%		
Males			83			82			79		
Executives			14			23			26		
Local forest officers			47			49			49		
Organization officers			19			14			13		
Terminal workers			12			10			12		
Lumberjacks			6			4			0		
NA			2			0			0		
Health status in HRA			%			%			%		
Good			40			47			51		
Moderate			29			29			25		
Poor			31			24			24		

2019. The largest drop occurred in 2014, when a statutory labour negotiation took place. The average annual employee turnover was 8.6%. As an overview, most of the descriptive characteristics of the personnel remained relatively similar between the time points. The population was male-dominated, with a mean age of 44–45 years and slightly overweight (based on an average body mass index of 26.7 kg/m2). Notable observed changes over the course of the program included: 1) The proportion of executives increased from 14% to 26%; 2) the number of lumberjacks decreased early on and after the year 2014 they were no longer a part of the organization. In addition, according to the health risk assessment results, the proportion of employees with measured good health status slightly increased from 40% to 51%, while poor health ratings decreased from 31% to 24%.

Sick leave trend analysis is presented in Figure 1, together with OECD statistics from Finland as a benchmark. A linear regression analysis of annual absence rates during the WHP indicated a decreasing trend ($R^2 = 0.618$, F = 14.547, $p = 0.004$). The absence rates of the study's employee subject pool varied from highest 7.3 to lowest 3.5 days per employee from 2009 to 2019. The mean for ten-year follow-up was 5.1 days per employee per year. Employee annual turnover did not affect the sickness absence trends ($R^2 = 0.18$, F = 0.125, $p = 0.734$). Sickness absence rate jumped in the second year of the WHP program but returned to baseline level, where it remained until after 2014, when the trend started to decrease steadily. When compared to the baseline level in 2009, the sickness absence rate was 38% lower than in 2019.

According to the OECD statistics, the average absence days of the Finnish workforce varied between 8,5–9,7 days/per employee per year (mean 9.2 days), from 2009 to 2019 (OECD, 2024). The trend line of Finnish average working-age people is rather stable and clearly higher than the level found in this study.

Direct and indirect costs of the comprehensive WHP program are presented in Figure 2. The total cost of the program was 1.654.425 EUR, including direct and indirect costs. On average, the employer invested 331 EUR in the program per employee per year. However, in this per capita analysis, a wider range of variation was observed due to changes in total money invested and changes in the number of employees. Descriptively, the EUR per person investment from 2010 to 2018 varied as follows: 130, 303, 241, 320, 319, 425, 430, 430 and 383 euros per employee per year, respectively.

The starting year 2010 had the lowest budget (84.656 EUR) and the highest (225.039 EUR) amount of money was reported in the latter half of the program in 2017. During the nine-year

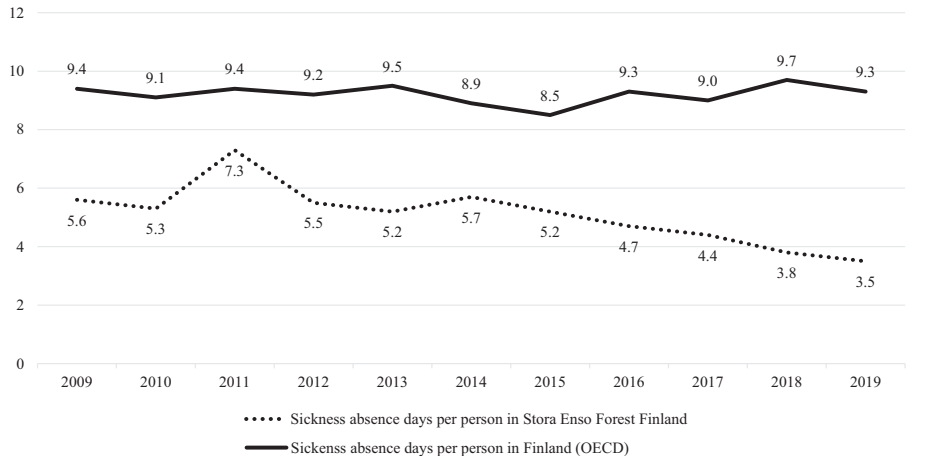

Figure 1. Sickness absence trend analysis among participants and working-age people in Finland from 2009 to 2019

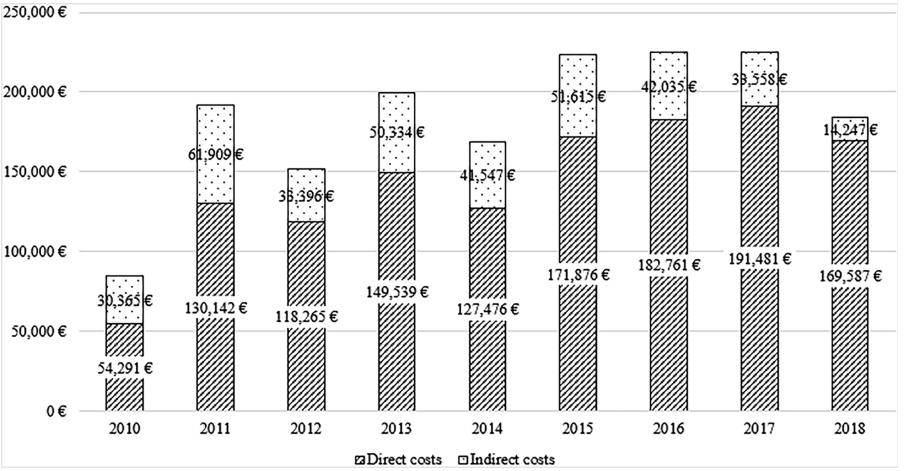

Figure 2. The direct and indirect costs of the health promotion program from 2010 to 2018

continuum, the employer's average annual investment in the program was 183.825 euros. The mean of direct costs such as health risk assessment and targeted services for employees, was 143.935 EUR, which makes up approximately 78% of total costs. Similarly, the average of indirect costs such as travel expenses and catering, was 39.890 EUR and 22% of the total costs of the program.

Financial investments, including direct and indirect costs and estimated financial returns based on sickness absence savings are presented in Figure 3. In addition, calculations of employers' financial outcomes and annual ROI ratios are presented starting from 2009 and ending in 2018.

In 2009, the investments and savings were marked as zero. In 2010, the very first year of the WHP program, the costs were 84.656 EUR and savings 54.858 EUR, which led to a −29.798

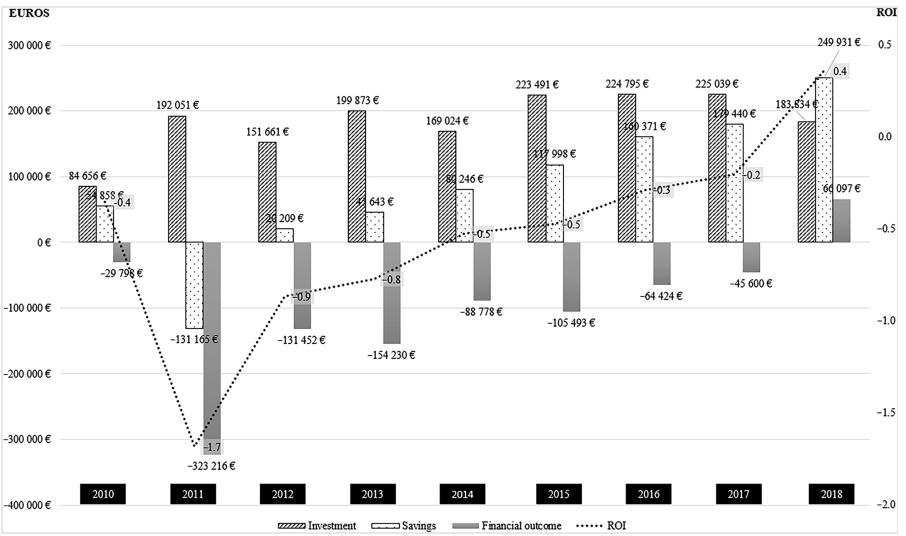

Figure 3. A financial sickness absence return from a nine-year comprehensive WHP program investment

EUR financial outcome for the employer. In the second year of the program, sickness absence rates were higher than baseline, resulting in 131.165 EUR higher expenses and a net −323.216 EUR financial outcome for the employer. From the year 2012 on, the reported savings tend to increase, even though annual financial outcomes stay negative.

Altogether, the trend of sickness absences is mostly lower than baseline and accumulated annual savings from 20.209 EUR up to 249.931 EUR. However, the savings were not high enough to cover the program costs until the very last year of the program. Likewise, the ratio of financial outcomes remained negative until the year 2018, when the financial benefit was 66.097 EUR positive.

The ROI ratio of the comprehensive multiyear program stayed negative almost all the way, ranging from −1.7 to −0.2. However, it is noteworthy that the savings covered more programs' costs during the last five years, and in the very last year of reporting, the ratio was slightly positive 0.4. The ROI ratio for the first four years was −0.9 and for the last five years −0.2. Altogether, the total investment in the program was 1.654.425 EUR and the total sickness absence savings were 777.529 EUR. As a summation, the final financial outcome for the employer was −876.896 EUR during the nine years. This accumulates a total −0.5 ROI ratio for the invested resources.

Discussion

This case study investigated sickness absence trends and financial outcomes of a comprehensive WHP program in a real-world setting without a control group.

The eleven-year sickness absence analysis showed a trend curve that first increased and then steadily decreased. The average time away from work was 5.1 days per employee. This rate was much lower than the average in Finland at 9.2 days, but a bit higher if compared to OECD statistics in the UK 4.4 or in the US 4.0 days (OECD, 2024). Notably, the trend curves in Finland, the UK and the USA have been stable from 2009 to 2019, whereas our study found statistically significant fluctuations at the organizational level.

The overall sickness absence rate was 38% lower at the endline than at baseline. Earlier studies have indicated health promotion programs to have a weak or modest impact on absences (Kuoppala *et al*., 2008; Baicker *et al*., 2010; Conn *et al*., 2009). The effects observed in this study are modest, since the baseline level was already 'good' and below the national average. Several explanations may explain the observed improvement. Firstly, based on our earlier study findings (Äikäs *et al*., 2019, 2020), the health status of the male-dominated population improved and health risk levels stayed low. Secondly, the program provided health-promoting support over multiple years, although the level of investment varied from year to year. Similar positive, moderately declining trends have been observed in a previous multi-year trend study. Byrne *et al*. (2011) reported a decrease in the proportion of employees absent for more than five days, from 12.6% to 10.5% over a seven-year follow-up period.

An interesting change was that the employees' sick leaves increased in 2011, just after the launch of the preventive intervention. There are no similar study findings to compare, but Nyman *et al*. (2012) also found lifestyle intervention ineffective to reduce absences at the beginning of the intervention at the University of Minnesota (Nyman *et al*., 2012). No clear explanatory factor for the increase in a single year was found in the data of this study. However, based on our previous research, the degree of engagement among employees was still weak in the beginning, as in 2011, only 14% of the staff were committed participants, whereas in the following year the figure rose to 38% (Äikäs *et al*., 2019). It is therefore possible that the spikes in individual years are more likely explained by seasonal or internal organizational factors rather than by elements of the external intervention (Higgins *et al*., 2012; Aldana and Pronk, 2001; James Lopez Bernal *et al*., 2017)

The overall economic outcome for the employer was negative despite the fact that the accumulated savings from sickness absence improved the cost-effectiveness of the program. The employer gained net savings mostly from the last five years, but not the first four. Earlier

literature has reported both positive return-on-investment ratios (Baicker *et al*., 2010; Chapman, 2012; Santos and Miragaia, 2022; Yen *et al*., 2006; Henke *et al*., 2011) and negative ROI ratios (Song and Baicker, 2019; Caloyeras *et al*., 2014). This study's ROI ratios stayed mostly negative, varying from −1.7 to +0.4 and the average ROI ratio for the nine-year continuum was −0.5.

The reasons behind the negative ROI of this research were multidimensional. Firstly, this study calculated the economic impact only based on absenteeism. This is a traditional and widely used human resource and employer metric, but gathers data only from one possible saving perspective (Strömberg *et al*., 2017). Based on previous review studies, it appears that comprehensive WHP interventions tend to report moderately positive financial outcomes in terms of healthcare cost savings (Osilla *et al*., 2012; Mattke *et al*., 2013) and absenteeism (Baicker *et al*., 2010). In addition, the associations with productivity and human capital indicators tend to show small positive effects (Vargas-Martínez *et al*., 2021; Basińska-Zych and Springer, 2021; Virtanen *et al*., 2025). In this light and considering the previously published positive results from the same intervention, such as the long-term moderate health impact (Äikäs *et al*., 2019) and the ability to maintain low and moderate health risk levels (Äikäs *et al*., 2020), it could be assumed that, additional financial benefits could have been gained from occupational health care costs, productivity, human capital metrics and presenteeism, which might be even more significant than financial effects of absenteeism (Strömberg *et al*., 2017; Krol and Brouwer, 2014). Unfortunately, these additional perspectives were not available within the protocol of this study due to the employer's challenges in sharing confidential data for open comparison in the highly competitive forestry sector.

Second, the baseline level of sickness absences was already low when launching the intervention. This finding is supported by a previous finding from the same intervention, which showed that the number of health risks in the organization was lower than in the general working-age population (Äikäs *et al*., 2020). The low amount of health risks has been shown to have an association with low sickness absence rates (O'Donnell, 2017; Loeppke *et al*., 2010; Edington, 2001). Understandably, this might have contributed to a floor effect when considering aiming to reduce absences and gain financial benefit below the baseline.

Third, and mathematically put, the total program cost of 1.654.425 EUR was too high to be covered with sickness absence savings alone. On average, the investment was 331 euros per employee per year. This is clearly higher than the average annual cost of $144 per lifestyle management program participant reported by a review of Baicker and colleagues in 2010. Relatively high cost per employee might be due to the fact that the study's forest company was very dispersed nationwide (over 100 locations in a geographically large area) and indirect costs such as travel and accommodation expenses could not be avoided during the implementation. Another explanation might be that the organization's population was quite small ($N = 650$) compared to other studies, companies +1,000 employees (Baicker *et al*., 2010; Goetzel *et al*., 2014). For a smaller population, the administrative costs are higher per employee. However, sufficient annual resources should be allocated to sustain the multi-year implementation (Pronk, 2014; Äikäs *et al*., 2017).

Fourth, the savings calculated from sickness absence are dependent on national and organizational guidelines (Higgins *et al*., 2012; Aldana and Pronk, 2001). Interestingly, Lutz *et al*. (2019) found in their review that health promotion programs implemented in Europe showed only small or even negative economic benefits. The formula used in this study to calculate financial savings was simple and straightforward (Krol and Brouwer, 2014), and the results are in line with the findings of Lutz and colleagues (2019) in the European context. Future research should explore whether, for example, achieving cost savings is more feasible on other continents due to local policy frameworks compared to those in Europe.

This study contained the following limitations. The current study lacked a control group, and the results and findings should be considered in a quasi-experimental context (de Vocht *et al*., 2021; James Lopez Bernal *et al*., 2017). The financial outcome data consisted of only sickness

absence, whereas some benchmark studies have also had other financial metrics to estimate ROI. Another limitation affecting the evaluation of economic impact was the absence of annual salary data. We based our calculations on average hourly wages in the Finnish private sector from 2010 to 2018. In addition, the employer's sickness absence did not contain data at the individual level nor classifications about reasons behind sick leaves. Subgroup analysis would have allowed comparisons between different age groups, genders and staff categories for characterizing heterogeneity according to the CHEERS model (Husereau *et al*., 2022). The study population consisted of full-time employees, predominantly male and working in white-collar roles. Similar outcomes may not be observed in more gender-diverse, part-time, or lower-wage workforces.

Balanced against the limitations, this study included several major strengths. Notably, its eleven-year sickness absence trend analysis and nine-year financial observation period are unique. Also, this study investigated the sickness absence trends and changes in a real-world context with a long-term research cohort (de Vocht *et al*., 2021; James Lopez Bernal *et al*., 2017). Furthermore, the exact investment calculations, direct and indirect costs, were market-based and no financial incentives were used in this intervention to enhance participation or implementation. This makes the whole intervention, health risk assessments and services replicable.

The current study is a unique multiyear observation, providing insights that can deliver valuable information for researchers, health promotion professionals, human resource managers and corporate leaders. Based on the findings of our study, we offer the following recommendations to support the successful design and cost-effective implementation of WHP programs. First, the starting point of the organization largely determines the potential financial benefits that can be expected from a long-term health promotion program. Second, it is unlikely that the development of sickness absences will be consistent year by year. It is advisable to anticipate annual variation already at the planning stage, even if the overall trend could be predicted to go downward. Third, although the intervention studied was sufficiently well-designed and implemented, it would have benefited from a stronger utilization of data-driven dashboards. Predictive analyses regarding how much the program should invest and what kinds of economic benefits could be observed during its implementation would have more strongly connected it with business analytics and course-correction actions.

The current article builds on three articles published previously that describe the outcomes of the same comprehensive WHP program (Äikäs *et al*., 2017, 2019, 2020). The economic analysis presented here complements the previously published effectiveness evaluation. In the future, changes in the same organization and the personnel beyond 2019 would be of interest. In addition, a robust summary of the findings from the four sub-studies conducted on this same intervention – and its further utilization in WHP planning, impact evaluation and research – would be highly relevant.

Conclusion

In summary, this study found a moderate 38% decrease in sickness absence and a positive curve of financial outcomes in a long-term analysis, but the comprehensive WHP program fell short of producing a positive ROI for the employer, based on sickness absence improvements only. However, our findings agree with earlier literature that a comprehensive WHP program can affect employees' health and costs related to sickness absences, when compared to a situation where no intervention or a brief program is provided.

Appendix
Completed Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) checklist for this observational study

Table A1. CHEERS 2022 checklist

Topic	No.	Item	Location where the item is reported
Title	1	Identify the study as an economic evaluation and specify the interventions being compared	Title page
Abstract	2	Provide a structured summary that highlights context, key methods, results, and alternative analyses	Page 1
Introduction			
Background and objectives	3	Give the context for the study, the study question, and its practical relevance for decision-making in policy or practice	Introduction, pages 1-2
Methods			
Health economic analysis plan	4	Indicate whether a health economic analysis plan was developed and where available	CHEERS, Appendix
Study population	5	Describe characteristics of the study population (such as age range, demographics, socioeconomic or clinical characteristics)	Methods page 3, Results page 5
Setting and location	6	Provide relevant contextual information that may influence findings	Methods page 3
Comparators	7	Describe the interventions or strategies being compared and why chosen	Methods page 3, Table 1
Perspective	8	State the perspective(s) adopted by the study and why chosen	Introduction page 2, Methods page 3
Time horizon	9	State the time horizon for the study and why appropriate	Methods page 3
Discount rate	10	Report the discount rate(s) and reason chosen	Methods page 5
Selection of outcomes	11	Describe what outcomes were used as the measure(s) of benefit(s) and harm(s)	Methods pages 4-5
Measurement of outcomes	12	Describe how outcomes used to capture benefit(s) and harm(s) were measured	Methods pages 4-5
Valuation of outcomes	13	Describe the population and methods used to measure and value outcomes	Methods pages 3-5
Measurement and valuation of resources and costs	14	Describe how costs were valued	Methods pages 4-5
Currency, price date, and conversion	15	Report the dates of the estimated resource quantities and unit costs, plus the currency and year of conversion	Methods pages 4-5

(*continued*)

Table A1. Continued

Topic	No.	Item	Location where the item is reported
Rationale and description of model	16	If modelling is used, describe in detail and why used. Report if the model is publicly available and where it can be accessed	Not applicable
Analytics and assumptions	17	Describe any methods for analyzing or statistically transforming data, any extrapolation methods, and approaches for validating any model used	Methods page 5
Characterizing heterogeneity	18	Describe any methods used for estimating how the results of the study vary for subgroups	Not applicable
Characterizing distributional effects	19	Describe how impacts are distributed across different individuals or adjustments made to reflect priority populations	Introduction page 1, Methods page 3, Table 1
Characterizing uncertainty	20	Describe methods to characterize any sources of uncertainty in the analysis	Methods page 4, discussion page 10
Approach to engagement with patients and others affected by the study	21	Describe any approaches to engage patients or service recipients, the general public, communities, or stakeholders (such as clinicians or payers) in the design of the study	Methods pages 3-5
Results			
Study parameters	22	Report all analytic inputs (such as values, ranges, references), including uncertainty or distributional assumptions	Results pages 5-8
Summary of main results	23	Report the mean values for the main categories of costs and outcomes of interest and summarize them in the most appropriate overall measure	Results pages 5-8, Figures 1–3
Effect of uncertainty	24	Describe how uncertainty about analytic judgements, inputs, or projections affect findings. Report the effect of the choice of discount rate and time horizon, if applicable	Results pages 5-8, discussion pages 8-10
Effect of engagement with patients and others affected by the study	25	Report on any difference in patient/service recipient, general public, community, or stakeholder involvement made to the approach or findings of the study	Not applicable
Discussion			
Study findings, limitations, generalizability, and current knowledge	26	Report key findings, limitations, ethical or equity considerations not captured, and how these could affect patients, policy, or practice	Discussion pages 8-10
Other relevant information			
Source of funding	27	Describe how the study was funded and any role of the funder in the identification, design, conduct, and reporting of the analysis	Title page 1

(*continued*)

Table A1. Continued

Topic	No.	Item	Location where the item is reported
Conflicts of interest	28	Report authors' conflicts of interest according to journal or International Committee of Medical Journal Editors requirements	Conflicts of interest have been reported according to the guidance of the International Journal of Workplace Health Management

Source(s): Husereau *et al*. (2022), CHEERS (2022) Explanation and Elaboration: A Report of The Professional Society for Health Economics and Outcomes Research (ISPOR) CHEERS II Good Practices Task Force. Value Health 2022; 25. doi:10.1016/j.jval.2021.10.008

References

Äikäs, A., Pronk, N., Hirvensalo, M. and Absetz, P. (2017), "Does implementation follow design? A case study of a workplace health promotion program using the 4-S program design and the PIPE impact metric evaluation models", *Journal of Occupational and Environmental Medicine*, Vol. 59 No. 8, pp. 752-760, doi: 10.1097/JOM.0000000000001067.

Äikäs, A., Absetz, P., Hirvensalo, M. and Pronk, N. (2019), "What can you achieve in eight years? A case study on participation, effectiveness, and overall impact of a comprehensive workplace health promotion program", *Journal of Occupational and Environmental Medicine*, Vol. 61 No. 12, pp. 964-977, doi: 10.1097/JOM.0000000000001699.

Äikäs, A., Absetz, P., Hirvensalo, M. and Pronk, N. (2020), "Eight-year health risks trend analysis of a comprehensive workplace health promotion program", *International Journal of Environmental Research and Public Health*, Vol. 17 No. 24, p. 9426, doi: 10.3390/ijerph17249426.

Aldana, S.G. and Pronk, N.P. (2001), "Health promotion programs, modifiable health risks, and employee absenteeism", *Journal of Occupational and Environmental Medicine*, Vol. 43 No. 1, pp. 36-46, doi: 10.1097/00043764-200101000-00009.

Baicker, K., Cutler, D. and Song, Z. (2010), "Workplace wellness programs can generate savings", *Health Affairs*, Vol. 29 No. 2, pp. 304-311, doi: 10.1377/hlthaff.2009.0626.

Basinska-Zych, A. and Springer A (2021), "Organizational and individual outcomes of health promotion strategies—a review of empirical research", *International Journal of Environmental Research and Public Health*, Vol. 18 No. 2, p. 383, doi: 10.3390/ijerph18020383.

Blomgren, J. and Jäppinen, S. (2021), "Incidence and length of sickness absence among hierarchical occupational classes and non-wage-earners: a register study of 1.6 million Finns", *International Journal of Environmental Research and Public Health*, Vol. 18 No. 2, p. 501, doi: 10.3390/ijerph18020501.

Byrne, D., Goetzel, R., McGown, P., Holmes, M., Beckowski, M., Tabrizi, M., Kowlessar, N. and Yarbrough, M. (2011), "Seven-year trends in employee health habits from a comprehensive workplace health promotion program at Vanderbilt University", *Journal of Occupational and Environmental Medicine*, Vol. 53 No. 12, pp. 1372-1381, doi: 10.1097/jom.0b013e318237a19c.

Caloyeras, J.P., Liu, H., Exum, E., Broderick, M. and Mattke, S. (2014), "Managing manifest diseases, but not health risks, saved Pepsico money over seven years", *Health Affairs*, Vol. 33 No. 1, pp. 124-131, doi: 10.1377/hlthaff.2013.0625.

Chapman, L. (2012), "Meta-evaluation of worksite health promotion economic return studies: 2012 update", *American Journal of Health Promotion*, Vol. 26 No. 4, pp. 1-12, doi: 10.4278/ajhp.26.4.tahp.

Conn, V., Hafdahl, A., Cooper, P., Brown, L. and Lusk, S. (2009), "Meta-analysis of workplace physical activity interventions", *American Journal of Preventive Medicine*, Vol. 37 No. 4, pp. 330-339, doi: 10.1016/j.amepre.2009.06.008.

Creswell, J. and Plano Clark, V. (2011), *Designing and Conducting Mixed Methods Research*, Sage Publications, Thousand Oaks, CA.

de Vocht, F., Katikireddi, S., McQuire, C., Tilling, K., Hickman, M. and Craig, P. (2021), "Conceptualising natural and quasi experiments in public health", *BMC Medical Research Methodology*, Vol. 21 No. 32, 32, doi: 10.1186/s12874-021-01224-x.

Edington, D.W. (2001), "Emerging research: a view from one research center", *American Journal of Health Promotion*, Vol. 15 No. 5, pp. 341-349, doi: 10.4278/0890-1171-15.5.341.

Goetzel, R., Henke, R., Tabrizi, M., Pelletier, K., Loeppke, R., Ballard, D., Grossmeier, J., Anderson, D., Yach, D., Kelly, R., McCalister, T., Serxner, S., Selecky, C., Shallenberger, L., Fries, J., Baase, C., Isaac, F., Crighton, A., Wald, P., Exum, E., Shurney, D. and Metz, R.D. (2014), "Do workplace health promotion (wellness) programs work?", *Journal of Occupational and Environmental Medicine*, Vol. 56 No. 9, pp. 927-934, doi: 10.1097/JOM.0000000000000276.

Henke, R., Goetzel, R., McHugh, J. and Isaac, F. (2011), "Recent experience in health promotion at Johnson and Johnson: lower health spending, strong return of investment", *Health Affairs*, Vol. 30 No. 3, pp. 490-499, doi: 10.1377/hlthaff.2010.0806.

Higgins, A., O'Halloran, P. and Porter, S. (2012), "Management of long term sickness absence: a systematic realist review", *Journal of Occupational Rehabilitation*, Vol. 22 No. 3, pp. 322-332, doi: 10.1007/s10926-012-9362-4.

Husereau, D., Drummond, M., Augustovski, F., de Bekker-Grob, E., Briggs, A., Carswell, C., Caulley, L., Chaiyakunapruk, N., Greenberg, D., Loder, E., Mauskopf, J., Mullins, C.D., Petrou, S., Pwu, R.-F. and Staniszewska, S. and CHEERS 2022 ISPOR Good Research Practices Task Force (2022), "Consolidated health economic evaluation reporting Standards 2022 (CHEERS 2022) statement: updated reporting guidance for health economic evaluations", *Value in Health*, Vol. 25 No. 1, pp. 3-9, doi: 10.1016/j.jval.2021.11.1351.

James Lopez Bernal, J., Cummins, S. and Gasparrini, A. (2017), "Interrupted time series regression for the evaluation of public health interventions: a tutorial", *International Journal of Epidemiology*, Vol. 46 No. 1, pp. 348-355, doi: 10.1093/ije/dyw098.

Krol, M. and Brouwer, W. (2014), "How to estimate productivity costs in economic evaluations", *PharmacoEconomics*, Vol. 32 No. 4, pp. 335-344, doi: 10.1007/s40273-014-0132-3.

Kuoppala, J., Lamminpää, A. and Husman, P. (2008), "Work health promotion, job well-being, and sickness absences - a systematic review and meta-analysis", *Journal of Occupational and Environmental Medicine*, Vol. 50 No. 11, pp. 1216-1227, doi: 10.1097/JOM.0b013e31818dbf92.

Leinonen, T., Viikari Juntura, E., Husgafvel Pursiainen, K. and Solovieva, S. (2018), "Cause Specific sickness absence trends by occupational class and industrial sector in the context of recent labour market changes: a Finnish panel data", *BMJ Open*, Vol. 8 No. 4, doi: 10.1136/bmjopen-2017-019822.

Loeppke, R., Edington, D. and Bęg, S. (2010), "Impact of the prevention plan on employee health risk reduction", *Population Health Management*, Vol. 12 No. 5, pp. 275-284.

Lutz, N., Tayemans, J., Ballmer, C., Verhaeghe, N., Clarys, P. and Deliens, T. (2019), "Cost-effectiveness and cost-benefit of worksite health promotion programs in Europe: a systematic review", *The European Journal of Public Health*, Vol. 29 No. 3, pp. 540-546.

Mattke, S., Liu, H., Caloyeras, J., Huang, C., Van Busum, K., Khodyakov, D. and Shier, V. (2013), "Workplace wellness program study: final report", *Rand Health Quarterly*, Vol. 1 No. 2, p. 2013, available at: https://pubmed.ncbi.nlm.nih.gov/28083294/

Nyman, J., Abraham, J., Jeffery, M. and Barleen, H. (2012), "The Effectiveness of a health promotion program after 3 years, Evidence from the University of Minnesota", *Medical Care*, Vol. 50 No. 9, pp. 772-778, doi: 10.1097/MLR.0b013e31825a8b1f.

OECD Statistics (2024), "Absence from work due to illness", available at: https://stats.oecd.org/ (accessed 10 May 2024).

Osilla, K., Van Busum, K., Schnyer, C., Larkin, J., Eibner, C. and Mattke, S. (2012), "Systematic review of the impact of worksite wellness programs", *American Journal of Managed Care*, Vol. 18 No. 2, pp. 68-81.

Ovretveit, J. (2014), *Evaluating Improvement and Implementation for Health*, Open University Press, McGraw Hill Education, New York.

O'Donnell, M. (2017), *Health Promotion in the Workplace*, 5th ed., Art & Science of Health Promotion Institute, Troy, Michigan (MI).

Pelletier, K.R. (2011), "A review and analysis of the clinical and cost-effectiveness studies of comprehensive health promotion and disease management programs at the worksite update VIII 2008 to 2010", *Journal of Occupational and Environmental Medicine*, Vol. 53 No. 11, pp. 1310-1331, doi: 10.1097/JOM.0b013e3182337748.

Pronk, N. (2003), "Designing and evaluating health promotion programs: simple rules for a complex issue", *Disease Management and Health Outcomes*, Vol. 11 No. 3, pp. 149-157, doi: 10.2165/00115677-200311030-00002.

Pronk, N. (2014), "Best practice design principles of worksite health and wellness programs", *ACSM's Health and Fitness Journal*, Vol. 18 No. 1, pp. 42-46, doi: 10.1249/FIT.0000000000000012.

Proper, P. and van Mechelen, W. (2008), "Effectiveness and economic impact of worksite interventions to promote physical activity and healthy diet", World Health Organization, Geneva.

Santos, I. and Miragaia, D. (2022), "Physical activity in the workplace: a cost or a benefit for organizations? A systematic review", *International Journal of Workplace Health Management*, Vol. 16 No. 1, pp. 108-135, 2023, doi: 10.1108/IJWHM-04-2021-0076.

Song, Z. and Baicker, K. (2019), "Effect of a workplace wellness program on employee health and economic outcomes - a randomized clinical trial", *JAMA*, Vol. 321 No. 15, pp. 1491-1501, doi: 10.1001/jama.2019.3307.

Statistics Finland (2024), "Average wage in private sector database", available at: https://stat.fi/index_en.html (accessed 30 May 2024).

Strömberg, C., Aboagye, E., Hagberg, J., Bergström, G. and Lohela-Karlsson, M. (2017), "Estimating the effect and economic impact of absenteeism, presenteeism, and work environment-related problems on reductions in productivity from a managerial perspective", *Value in Health*, Vol. 20 No. 8, pp. 1058-1064, doi: 10.1016/j.jval.2017.05.008.

University of Jyväskylä (2016), "The ethical committee, ethical committee approval number 1910".

Vargas-Martinez, A., Romero-Saldana, M. and Diego-Cordero, R. (2021), "Economic evaluation of workplace health promotion interventions focused on Lifestyle: systematic review and meta-analysis", *Journal of Advanced Nursing*, Vol. 77 No. 9, pp. 3657-3691, doi: 10.1111/jan.14857.

Virtanen, M., Lallukka, T., Elovainio, M., Steptoe, A. and Kivimäki, M. (2025), "Effectiveness of workplace interventions for health promotion", *The Lancet Public Health*, Vol. 10 No. 6, pp. e512-e530, doi: 10.1016/s2468-2667(25)00095-7.

Whitaker, S. (2001), "The management of sickness absence", *Occupational and Environmental Medicine*, Vol. 58 No. 6, pp. 420-424, doi: 10.1136/oem.58.6.420.

Yen, L., Schultz, A.B., Schnueringer, E. and Edington, D.W. (2006), "Financial costs due to excess health risks among active employees of a utility company", *Journal of Occupational and Environmental Medicine*, Vol. 48 No. 9, pp. 896-905, doi: 10.1097/01.jom.0000235987.75368.d0.

Yen, L., Schultz, A.B., Schaefer, C., Bloomberg, S. and Edington, D.W. (2010), "Long-term return on investment of an employee health enhancement program at a Midwest utility company from 1999 to 2007", *International Journal of Workplace Health Management*, Vol. 3 No. 2, pp. 79-96, doi: 10.1108/17538351011054998.

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