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General introduction

GENERAL INTRODUCTION

Many chronic diseases and various physical and mental health problems are in large part preventable (1). An overwhelming body of evidence indicates that an unhealthy lifestyle (e.g. insufficient physical activity, unhealthy diet, smoking, high levels of alcohol consumption, low levels of relaxation) and other modifiable health risks (e.g. high levels of work stress) play an important role in the development of such conditions (1-7). Nonetheless, the prevalence of modifiable health risks is high (8;9). Moreover, even though the prevalence of some risk factors slightly decreased during the last decades (e.g. smoking), that of others increased dramatically in many developed countries due to changes in daily (working) life (10). For example, an increased availability of larger portion sizes, lower prices of unhealthy food, and the influence of commercials has led to an increased energy intake among the population, while at the same time work-related and leisure-time activity levels decreased (11;12). As a consequence, the prevalence of overweight (Body Mass Index [BMI] $\geq 25 \text{ kg m}^{-2}$ and $< 30 \text{ kg m}^{-2}$), obesity (BMI $\geq 30 \text{ kg m}^{-2}$), and their attributable diseases (i.e. type-2 diabetes, cardiovascular disease, and certain types of cancer) increased dramatically during the last decades (13). In 2008, the World Health Organization estimated that globally more than 1.4 billion adults were overweight or obese (14). In the Netherlands, the combined prevalence of overweight and obesity is estimated to be 43% in adult women and 54% in adult men (15). Also, due to increased work pressure, competition, work pace, and job instability, working life became more emotionally and mentally demanding (16-18). Currently, 36% of Dutch workers “regularly have to work at a high work pace” and 30% “regularly have to work under high time pressure” (19). As a consequence, workers experience higher levels of work stress as compared to a couple of decades ago (20), which in turn may lead to the development of various stress-related problems (e.g. mental disorders and cardiovascular disease) (18;21-27).

Economic consequences of modifiable health risks

Next to the human suffering associated with modifiable health risks, the economic consequences are considerable. Various studies indicate that such risk factors are associated with increased medical spending (28-30). For example, Goetzel et al. (1998) examined the relationship between ten modifiable health risks (e.g. stress, smoking, unhealthy diet, alcohol abuse, physical inactivity) and medical claim costs among 46,026 United States (U.S.) adult workers. They found that workers with these risk factors had approximately 25% higher healthcare expenditures than workers without these risk factors (29). Several other reports have shown that people with modifiable health risks are also more likely to be absent from work (i.e. absenteeism), are less productive while at work (i.e. presenteeism), and have higher work disability rates (31-35). Boles et al. (2004), for example, found that mean absenteeism and presenteeism rates ranged from 0.0% to 6.3% and 1.3% to 25.9% in workers with zero to eight risk factors, respectively (32;34). Tsai et al. (2005) also demonstrated an association between the number of modifiable health risks and absenteeism from work, with the average number of sickness absence days per year ranging from 4.1 days among workers with zero risk factors to 12.6 days among those with four or more risk factors (34;36). These findings indicate that health promotion programs aimed at preventing and/or reducing (the number of) modifiable health risks may not only be useful to reduce their individual health consequences but also their associated costs.

Rationale for improving health at the workplace

From a public health perspective, implementing health behavior change interventions in the occupational setting offers a number of advantages over approaches to health promotion in other settings. Amongst them are the possibilities to:

- 1) reach a higher percentage of participants that could benefit from a health promotion program than in, for example, the public health setting,
- 2) implement multi-level interventions that also address work organizational and environmental/policy variables in addition to individual health behaviours,
- 3) offer health promotion programs at relatively low costs, because the infrastructure necessary for program implementation is often already available, especially in large enterprises,

4) enhance maintenance of behavior changes, because employees spend many hours at the workplace and organizational and social support can be made easily available (16;31;37;38).

On top of that, employers themselves may (financially) benefit from implementing worksite health promotion programs as they bear most of the financial consequences of increased absenteeism, presenteeism, and work disability rates (16;31;37). In countries with employer-provided healthcare insurance (e.g. the U.S.) they also bear a large part of the medical costs of their workers. In addition, the looming labor shortages associated with the current ageing of the population make it even more important for employers that their workers are vital and healthy so that they can prolong their active labor participation (39).

Worksite health promotion programs

Today, many employers associate poor health with reduced employee performance, safety, and morale (31). Therefore, they increasingly turn to worksite health promotion programs in an effort to manage employee health and costs (31). To be effective, such programs should be developed in close cooperation with employers and have to be tailored to the needs of the employees at hand (10). The latter is critical as the needs of employees seem to vary by age, gender, type of industry, and job category (40). For example, the prevalence of overweight and obesity is particularly high among blue collar workers, whereas high levels of work stress may be a particular concern among white collar workers (41;42).

In recent years, four different research projects were performed at the EMGO⁺ Institute for Health and Care Research, in which several worksite health promotion programs were developed in close cooperation with managers and employees of various participating companies. All programs were systematically tailored to the stakeholders' needs by using the so-called "Intervention Mapping protocol" (43). These programs included:

- 1) The Vital@Work intervention: A worksite health promotion program aimed at improving physical activity, nutrition, and relaxation, as a potentially effective tool to keep older hospital workers vital and healthy, and thereby contributing to prolonged employability. Vitality is characterized by a perceived high energy level, low levels of fatigue, and feeling fit (44).

- 2) The Mindful VIP intervention: A mindfulness-based worksite intervention aimed at improving work engagement among knowledge workers (45). Work engagement is defined as *“a positive, fulfilling, work-related state of mind that is characterized by vigor (i.e. vitality), dedication, and absorption”* and was previously found to be negatively associated with burnout, depression, and psychosomatic complaints (46-48).
- 3) The VIP in Construction intervention: A worksite health promotion program aimed at improving nutrition and physical activity among construction workers. The program was developed in an effort to combat the high prevalence of overweight, obesity, and musculoskeletal disorders among construction workers (49).
- 4) The Be Active & Relax VIP intervention: A combined social and physical environmental intervention aimed at reducing the need for recovery from work related fatigue in office workers (50). Need for recovery was previously found to be associated with various stress-related problems (e.g. mental disorders and cardiovascular disease) and increased absenteeism (22;24;51).

The impact of worksite health promotion programs

According to *“The conceptual model of health promotion”*, the aforementioned interventions may lead to improvements in individual health and various corporate benefits, such as increased corporate reputation and employee retention as well as reduced absenteeism and presenteeism costs. Improvements in individual health outcomes are thought to occur directly from program impact. Corporate benefits, on the other hand, are hypothesized to occur indirectly as the result of individual health improvements or directly from program impact. For example, improved health and/or well-being may lead to lower absenteeism and/or presenteeism costs, while the provision of a worksite health promotion program itself may improve corporate reputation and/or employee retention (Figure 1) (52).

In accordance with this model, various systematic reviews indicated that worksite health promotion programs can be effective in improving employee health and well-being (53-56). Worksite physical activity and/or nutrition programs, for example, were found to be effective in reducing body fat, waist circumference, and body

weight (53;54). Worksite stress reduction programs, on the other hand, seem to be effective in reducing the levels of stress, burnout, and/or anxiety among workers (55). Research also indicates that worksite health promotion programs are effective in reducing absenteeism and presenteeism rates, and healthcare utilization (57-60), but evidence on their impact on other corporate benefits, such as improved corporate reputation, remains limited.

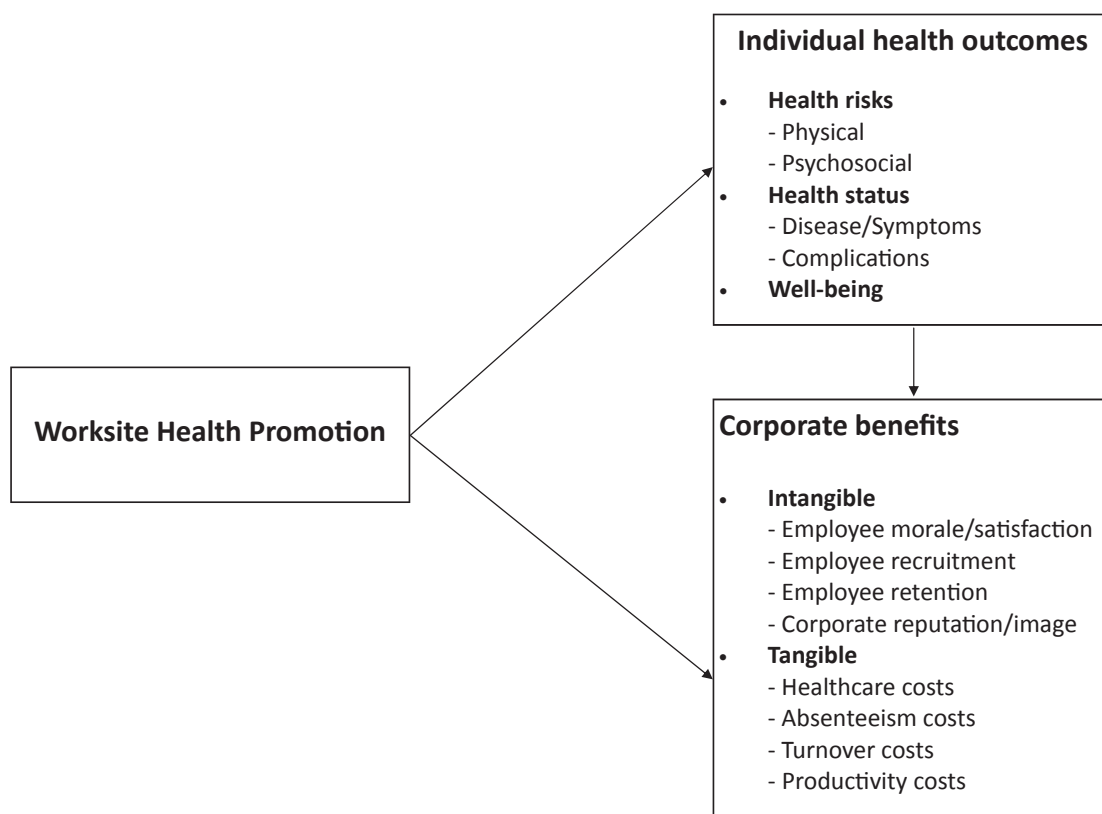


Figure 1: A simplified representation of “The conceptual model of health promotion” (52)

Economic evaluations of worksite health promotion programs

The effectiveness of the aforementioned worksite health promotion programs in comparison to usual practice will be evaluated using a randomized controlled trial (RCT) (44;45;49) or a study with a 2X2 factorial design (50). However, as resources for occupational health are restricted, decisions about investments in such programs are not only guided by evidence of their effectiveness, but also by considerations of their efficiency in terms of their resource utilization (61). To inform

such decisions, economic evaluations can be conducted, which are defined as “*the comparative analysis of alternative courses of action in terms of both their costs and consequences*” (62). Economic evaluations inform decision-makers about whether the (financial) consequences of a new program justify their possible additional costs as compared to an alternative strategy (e.g. usual practice) (63). Several kinds of economic evaluations exist. In *cost-effectiveness analyses* (CEAs), incremental costs of alternatives are compared to their incremental effects (expressed in natural units). Such analyses provide insight into the (extra) cost per additional unit of effect gained. *Cost-benefit analyses* (CBAs), also known as return-on-investment (ROI) analyses, provide insight into the net financial benefit or financial return of a program by comparing incremental costs to incremental benefits of alternatives (i.e. program outcomes converted to monetary units). In *cost-utility analyses* (CUAs), the incremental costs of a program are compared to its attributable health improvements measured in utility units (e.g. “Quality Adjusted Life Years”) (62;64). In *cost-minimization analyses* (CMAs), only the incremental costs of alternatives are compared when it is assumed that their consequences are similar. CMAs are therefore considered inappropriate if there is uncertainty regarding a possible difference in the magnitude of consequences (62).

Critical elements in the design of an economic evaluation are the choice of the kinds of economic evaluations that are performed as well as the applied analytic perspective(s) (e.g. societal perspective, employer’s perspective). When evaluating worksite health promotion programs these choices can be challenging due to the relative complexity of the occupational health decision-making context that generally includes multiple stakeholders (e.g. individual workers, employers, occupational health services, healthcare insurance companies, income insurance companies, public policy makers). A major consideration should be the trade-off and analytic perspective that matters most to the decision-maker(s) at hand (65-67).

Choosing the appropriate kind of economic evaluation

CEAs are of particular interest to occupational health researchers, workers, and public policy makers, particularly if monetary measures do not adequately capture important health outcomes (62;67). CBAs/ROI analyses, on the other hand, are more

salient to decision-makers at the company level, since they can give an indication of a program's impact on a company's bottom-line (66).

As decisions to implement worksite health promotion programs are typically made by the company's management, it would be natural to consider focusing exclusively on financial outcomes (i.e. by solely performing a CBA/ROI analysis) (66). This approach, however, has several shortcomings. First, it ignores the fact that the primary objective of worksite health promotion programs is to enhance employee health. Second, it runs the risk of overlooking the fact that costs may be reduced without health improvements (68). Third, various corporate benefits of worksite health promotion programs are hard to monetize (e.g. job satisfaction, corporate reputation) and can therefore not be included in a CBA/ROI analysis. Fourth, it does not provide relevant information to all stakeholders involved. Within this thesis, both CEAs and CBA/ROI analyses will therefore be performed of the aforementioned worksite health promotion programs.

Choosing the appropriate analytic perspective of an economic evaluation

The analytic perspective refers to the "point of view" taken for identifying relevant costs and consequences for inclusion in the evaluation. The chosen perspective may be that of any relevant stakeholder or an aggregate of stakeholders, such as a societal perspective. An item may be considered a cost from one perspective, but not from another (62). In the societal perspective, for example, all costs and consequences are considered irrespective of who pays or benefits, whereas only those borne by employers are taken into account when the employer's perspective is applied.

As mentioned earlier, decisions to implement worksite health promotion programs are typically made by the company's management. Therefore, economic evaluations of worksite health promotion programs are typically performed from the employer's perspective, but other perspectives may also be relevant, such as the societal, worker's, healthcare insurance's, and income insurance's perspective. The societal perspective is particularly useful, because it provides insight into the distribution of costs and benefits between various stakeholders and thereby allows for bargaining between them (62). This is of particular importance in the Dutch situation, in which employers bear most of the costs of worksite health promotion programs, while the

government and healthcare insurance companies reap a large part of their possible benefits (i.e. reduced medical spending) (69). Also, the application of the societal perspective better ensures that the societal costs of an intervention are less than the benefits experienced by all stakeholders, rather than simply the company's costs being less than their benefits (68).

As there is no restriction to the number of perspectives that can be taken in an economic evaluation, the aforementioned worksite health promotion programs will be evaluated from both the employer's and societal perspective (65;68).

Transferability of economic evaluation results

Applying economic evaluation results across countries and jurisdictions is hampered by the fact that healthcare and social security systems are organized differently. As a consequence, the source and use of resources for an intervention as well as their costs and benefits may vary between countries (70). On top of that, differences exist regarding the stakeholder(s) that reap the possible benefits of worksite health promotion programs, and this particularly influences the transferability of economic evaluation results when the employer's perspective is applied. To illustrate, in countries with employer provided health insurance (e.g. the U.S.), medical costs are generally included in such analyses, as employers in such jurisdiction bear most of the healthcare costs of their employees. In countries with universal health care coverage (e.g. the United Kingdom) and dual-payer systems (e.g. the Netherlands), on the other hand, this cost category is not included, as these costs mainly accrue to the government and/or health insurance companies (71).

In recent years, various studies have been undertaken to explore how the transferability of economic evaluation results can be improved (70;72;73). Amongst others, these studies recommended the application of the societal perspective, to collect and report resource use data separately from unit costs or prices, as well as the provision of some background information on the (occupational) healthcare and social security system of the country in which the original study has been performed (70;72;73).

The Dutch (occupational) healthcare and social security system

In the Netherlands, healthcare is financed by a dual-payer system. Long-term costs of treatment, nursing, personal care, and support are covered by a universal mandatory social health insurance scheme that is financed by income-related employee contributions, supplemented by an annual State subsidy. Such costs are covered regardless of an individual's financial situation, but for most long-term care services income-related co-payments are required. Other healthcare costs are covered by private health insurance. Dutch citizens are mandated by law to buy a basic package of health insurance from a private health insurance company. Supplementary health insurance packages are voluntary (74;75). Uninsured people are liable to a penalty, but those who cannot afford the monthly insurance premiums get a financial compensation through the tax system. Health insurance companies, on the other hand, must offer the basic package of health insurance to anyone who applies, irrespective of their health or age. They get compensation for taking on high risk individuals from the "Risk Equalization fund", which is financed by income-related employee contributions and individual premiums (76;77). Even though competition in healthcare is increasing, many of the costs are still regulated by the government and therefore based on fixed prices (70).

Dutch employers are required by law to contract either a certified occupational health service or hire a board-certified occupational health and safety expert (often an occupational health physician) to assist them with occupational health and safety and sickness absence management (78). For most Dutch employees, occupational healthcare is supplied by large occupational health services operating from outside the workplace (79). Occupational healthcare is not integrated in the regular healthcare system, prices for occupational healthcare are not regulated, and all occupational healthcare costs are paid by the employers themselves (70). When an employee's sickness absence period exceeds 6 weeks, employers are obliged to seek advice from a certified occupational physician (78). In addition, they are obliged to pay at least 70% of the salary of sick employees for a period of two years, and most of them top up the wage payments from 70% to 100% during the first year of sickness absence. Small and medium-sized companies often take out an insurance contract to cover this risk, whereas larger companies typically pay for these salaries themselves.

After the two-year period, sick employees can apply for a work disability benefit through the “Institute for Employee Benefit Schemes” (UWV). UWV professionals will subsequently determine whether an employee is entitled to receive a work disability benefit, and if so, what his or her benefit level would be ($\leq 75\%$ of his/her last earned wage). Those who are able to work up to a certain level receive a supplement to their wage (80).

Economic evaluations and evidence-based practice in occupational health

Information on the resource implications of worksite health promotion programs seems to play an important role in daily practice when deciding whether or not they should be implemented or continued (69;81). To prevent spending already scarce resources on ineffective and/or inefficient interventions, such decisions should be based on the best available evidence (i.e. evidence-based practice). To ensure that this is the case, it is critical that both methodologically sound evidence exists on the resource implications of worksite health promotion programs and that high quality studies are used in daily practice to inform program implementation and/or continuation decisions.

The methodological quality of economic evaluations in occupational health

The number of economic evaluations in occupational health is limited (68) and the methodological quality of those that have been performed is generally poor (67;82;83). For practice, the main implication of a poor methodological quality of economic evaluations is that there is a risk that their results are biased. The use of such biased results to guide program implementation and/or continuation decisions may eventually result in inappropriate (business) investments (82). Therefore, it is of utmost importance that the methodological quality of economic evaluations in occupational health is improved. In recent years, some efforts have been undertaken to improve the methodological quality of such studies (66;68;82), but more needs to be done to accomplish this. A possible means to contribute to this cause may be to provide occupational health researchers with a brief overview of the theory and methodology of (trial-based) economic evaluations as well as recommendations for good practice regarding their design, analysis, and reporting.

The use of economic evaluations in the occupational health decision-making process

Up until now, it is unknown to what extent economic evaluations of worksite health promotion programs are used during the occupational health decision-making process. However, as research indicates that results of economic evaluations of healthcare interventions are rarely used among medical decision-makers (84-86), their use among occupational health decision-makers is likely to be limited as well. In order to improve the uptake of economic evaluation results, more insight is needed into the occupational health decision-making process as well as the information needs of decision-makers. By exploring these issues, recommendations can be made as to how occupational health researchers might better frame and disseminate their economic evaluations to ensure uptake in daily practice (87-89).

Objectives of this thesis

The aim of the present thesis is to contribute to the development of a sound evidence base on the resource implications of worksite health promotion programs as well as to improve the uptake of the results of such studies in daily practice. This will be done by summarizing the current literature, generating new evidence, and developing and providing recommendations for good practice when conducting and disseminating economic evaluations in occupational health.

Outline of this thesis

Chapter 2 and *chapter 3* describe two systematic reviews that were conducted to summarize and critically appraise the current literature on the cost-effectiveness and financial return of worksite physical activity and/or nutrition programs, respectively. *Chapter 4* through *chapter 7* contain economic evaluations of the “Vital@Work intervention” (*Chapter 4*), the “Mindful VIP intervention” (*Chapter 5*), the “VIP in Construction intervention” (*Chapter 6*), and the “Be Active & Relax VIP intervention” (*Chapter 7*). As the methodological quality of economic evaluations in occupational health is generally poor, recommendations for good practice regarding their design, analysis, and reporting are provided in *chapter 8*. To improve the uptake of economic evaluations in daily practice, *chapter 9* describes a qualitative study into the occupational health decision-making process and information needs of occupational

health decision-makers. Finally, *chapter 10* presents a general discussion of our main findings, methodological considerations, as well as recommendations for practice and research. This thesis is concluded with both a Dutch and English summary.

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