Psychosocial risk factors for long-term sick leave- a prospective study of the Norwegian working population

With a special emphasis on female health and social workers

Cecilie Aagestad

Department of Behavioural Sciences in Medicine

Institute of Basic Medical Sciences

Faculty of Medicine

National Institute of Occupational Health

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STAMI
NATIONAL INSTITUTE
OF OCCUPATIONAL HEALTH

UiO : University of Oslo

CONTENTS

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SUMMARY

Background: Long-term sick leave (LTSL) is considered a physical and psychological burden for the individual affected, and those with the longest periods of sick leave have a high risk of not returning to work. Factors in the psychosocial work environment are considered important determinants for a sustainable working life and the notion that psychosocial factors at work can cause adverse health problems is well established. Previous research pertaining to identifying psychosocial risk factors for sick leave has been dominated by the Karasek job demand–job control (–social support) model. While this model provides a testable hypothesis, it has been criticized for being too narrow with regard to capturing new and emerging risks. The number of people working with patients, clients and customers is increasing, and work tasks in such occupations require different skills and personal qualifications than those needed for traditional manual work. In occupations handling patients, clients or customers, emotional demands and adverse social behavior are prevalent, but the impact these factors have on subsequent LTSL is insufficiently documented.

Aim: The aim of this dissertation was to identify work-related psychosocial risk factors for doctor-certified LTSL, and to estimate the proportion of LTSL cases attributable to psychosocial exposure at work in the general working population, and in the population of female health and social workers. An additional objective was to examine whether the higher risk for doctor-certified sick leave in women working in health and social occupations compared with women in the general working population was explained by particular work-related psychosocial and mechanical risk factors.

Methods: Randomly drawn from the general working age population in Norway, the cohort comprised individuals aged 18–69 years who were surveyed in 2009 (n=12 255, response at baseline 60.9%), who were followed up in the national registry of social transfer payments in

2010. *Paper 1* included respondents registered with at least 100 working days in 2009 and 2010 (n=6758). The outcome was doctor-certified sick leave for 40 days or more during 2010. *Paper 2* was based on a subsample of female health and social workers (n=925). The outcome was doctor-certified sick leave for 21 days or more during 2010. *Paper 3* included female respondents registered with at least 100 working days in 2009 and 2010 (n=3032). Using this sample, we compared health and social workers (n=661) with the general working population (n=2371). The outcome of interest was doctor-certified sick leave for 21 days or more during 2010. The associations between work environment and sick leave were calculated by logistic regression analysis as odds ratios (ORs) with 95% confidence intervals (CIs) with adjustment for potential confounders. For the statistically significant work-related factors in the regression analysis (*Papers 1 & 2*), the population attributable risk percent (PAR%) estimates with 95% CIs were calculated.

Results: The exposure for high emotional demands (OR=1.32; 95% CI 1.03 to 1.69), high role conflict (OR=1.58; 95% CI 1.20 to 2.09) and that for low supportive leadership (OR=1.50; 95% CI 1.15 to 1.96) were the most consistent risk factors for LTSL in the general working population. In this study, it was estimated that 15 percent of the LTSL cases were attributable to these factors *(Paper 1)*. In the study of female health and social workers, violence and threats of violence (OR=1.67; 95% CI 1.14 to 2.45) was the most robust risk factor for LTSL, and 13 percent of the LTSL cases were attributable to violence and threats of violence *(Paper 2)*. Women working as health and social workers had a higher risk for LTSL compared with women in the general working population (OR=1.42; 95% CI 1.13 to 1.79). In this study, 70 percent of the excess risk of LTSL was explained by psychosocial and mechanical factors, and the factors that contributed most were emotional demands, violence and threats of violence and awkward lifting *(Paper 3)*.

Conclusion: The main conclusion from the three papers in this dissertation was that psychosocial factors—especially those related to handling patients or clients—such as high emotional demands and violence and threats of violence, are of significant importance for sick leave in the Norwegian working population. These factors in addition to low supportive leadership and high role conflict are potentially preventable. Hence, this thesis points to the potential health benefit of focusing on these factors in the work of prevention.

LIST OF PUBLICATIONS

The dissertation is based on the following three publications

Paper 1

Cecilie Aagestad, Håkon A. Johannessen, Tore Tynes, Hans Magne Gravseth, Tom Sterud

Work-related psychosocial risk factors for long-term sick leave: A prospective study of the general working population in Norway

Journal Occupational Environmental Medicine, 2014; 56 (8): 787-793

Paper 2

Cecilie Aagestad, Reidar Tyssen, Håkon A. Johannessen, Hans Magne Gravseth, Tore Tynes, Tom Sterud

Psychosocial and organizational risk factors for doctor- certified sick leave. A prospective study of female health and social workers in Norway

BMC Public Health 2014, 14:1016

Paper 3

Cecilie Aagestad, Reidar Tyssen, Tom Sterud

Do work- related factors contribute to differences in doctor- certified sick leave? A prospective study comparing women in health and social occupations with women in the general working population

BMC Public Health 2016, 16:235

INTRODUCTION

Work is an essential part of life to most people, and important for economic independencies, social contact and self-realization. Those who participate in working life, are considered more healthy than those outside working life (1), however, it is well documented that work environmental factors can affect health negatively and may lead to impaired health and sick leave (2-5).

Long periods of sick leave are considered a physical and psychological burden for the individual affected, and those who have the longest periods of sick leave have been associated with a high risk of not returning to work (6, 7). Consequently, sick leave generates substantial financial costs for society and the reduction of sick leave as well as disability pensions is an important political objective. Thus, knowledge that facilitates the identification of work-related risk factors for long-term sick leave (LTSL) is an important step in developing relevant and targeted prevention strategies at the work place in order to prevent adverse health effects among individuals and to reduce the cost and productivity loss for the society.

Factors in the psychosocial work environment are considered important determinants for a sustainable working life and the notion that psychosocial factors at work can cause adverse health problems is well-established in recent reviews (8-14). Previous studies on psychosocial risk factors for sick leave have mainly been dominated by the job demand–job control–social support model (JDC-S) developed by Karasek (1979) and Karasek and Theorell (1990) (15, 16). The dimension job demand is primarily based on workload, and not on other types of demands, and despite the later inclusion of social support, the model is limited in the number of job characteristics it considers and may not reflect the modern world of work (17). In Norway, as in many European countries, there has been an increase in people working in occupations handling patients, clients, or customers, which requires skills and personal qualification other than traditional manual work. In these occupations, emotional demands

and adverse social behaviour is prevalent (18), but the impact these factors has on subsequent LTSL is not well known.

The overall aim of this PhD project is to identify work-related psychosocial risk factors for doctor-certified long-term sick leave in general, with a particular focus on women working in health and social occupations, since they have been shown to have an elevated risk for sick leave. An additional objective was to estimate the proportion of LTSL cases attributable to psychosocial exposures at work in the general working population and in a population of female health and social workers. This project is the first to investigate the effects of several psychosocial risk factors taking into account the potential confounding of mechanical factors in a representative sample of the Norwegian working population, with one-year follow-up register-based LTSL. As such, the project will bring new knowledge and can inform empirically founded preventive and intervention measures.

Sick leave, health and working conditions

Sick leave is both a medical characteristic of the individual, as well as a legal right to ensure financial safety for the employee. The medical term for sick leave, according to the National insurance law (§8-1)(19), imply that the individual is unable to perform gainful work because of reduced workability due to illness or injury. Sick leave can be work-related or caused by factors beyond work. Work-related sick leave is a result of health problems (illness or injury) partly or entirely caused or intensified by working conditions (20).

Sick leave in a Norwegian context

In Norway, employees are entitled to either a personal declaration of sick leave of up to three days for four times within a 12-month period or up to eight days with a maximum of 24 days within a 12-month period, depending on their employer`s settlement with the Norwegian Labour and Welfare Organization. In addition, an employee has the right to stay at home if their child is sick. If the employee is sick beyond the personal declaration days, or if the severity of the illness requires it, then a doctor-certified sick leave is required. Employees receive full compensation from the first day of sick leave. After one year on sick leave and if the employee is still unable to work or has reduced capability to work the employee is entitled to work assessment allowance or disability pension. Norwegian sick leave benefits are characterized as generous, and in comparisons with international sick leave, this perspective contributes to the high rates of sick leave in the Norwegian working population (21).

The reduction of sick leave, as well as disability pensions, is an important political objective, and in 2001, a tripartite agreement, between the government, trade union and the labour union, on inclusive working life ("IA-avtalen") was signed. One of the intentions in the agreement was to reduce sick leave and to prevent disability in Norwegian employees (22). In the period since this agreement took place, there has been a reduction in sick leave (Figure 1).

However, it is unclear whether this reduction is related to the agreement or not. In 2014, the main objective of the agreement was reformulated and the working environment was highlighted as an important contributor to a sustainable working life (22). Hence, the importance of identifying risk factors in the work environment for primary prevention has received minor attention (23).

Figure 1. Prevalence of doctor-certified sick leave (SSB)
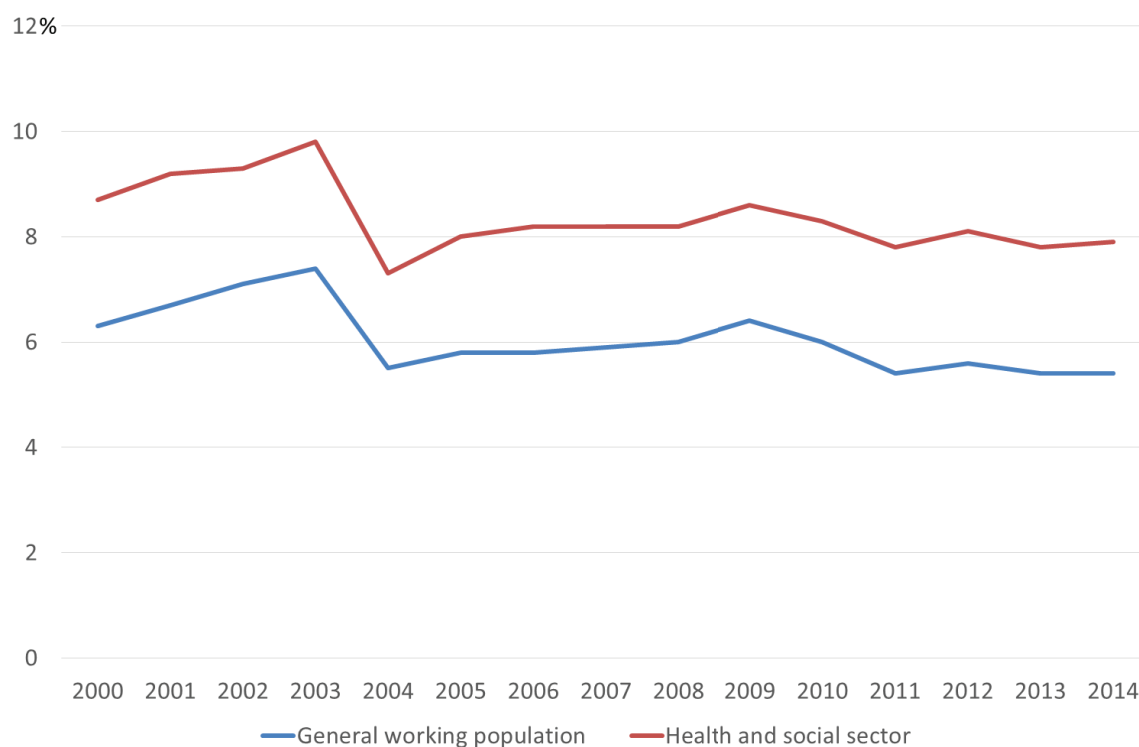
Over the last 15 years, the sick leave rate has varied (Figure 1), and several explanations for these variations have been proposed. The hypothesis that an increase in health complaints could explain an increased sick leave rate has not been confirmed (24). Other explanations have been proposed such as general developments in the labour market, changes in doctors sick leave certification practice and in the regulation of sick leave benefits (21, 25). Probably the most valid explanation is a change in the regulation of sick leave benefits. This was the case in 2004 when there was a reduction in sick leave. The main explanation was the authorities' introduction of regulations for better monitoring of the sick-listed, more stringent

requirements of sick leave for more than eight weeks and measures for increased use of graded sick leave (26). Change in the work environment over time as an explanation for sick leave rate variations, have to our knowledge not been studied in Norway. This was not the scope of this thesis, but should be a topic for further research.

Sick leave varies between sectors and in the health and social sector the rate is higher. In 2014, the risk for sick leave was 46 percent higher in the health and social sector (7.9%) compared to all sectors (5.4%) (27). An increased risk for sick leave in this sector is also observed in other Nordic countries (28-30). The health and social sector is the largest sector in Norway and employs more than one-fifth of the working population and, more specifically, one-third of the female working population. Accordingly, sick leave in this sector will have a great impact on the general sick leave level. Several occupations in this sector have challenges both with respect to psychosocial and to mechanical (ergonomic) factors in the work environment (18). The identification of specific risk factors for sick leave in these occupations will identify preventive interventions with potential impact on the total sick leave rate in the working population.

Sick leave and working conditions

The link between exposures in the work environment and sick leave is not straight forward, and a distinction between factors in the work environment that predict sick leave, and consequences of the work environment for individuals with reduced workability caused by illness or injury is important to consider. Thus, the need to be sick-listed is dependent upon both occupation, general working conditions and diagnosis (31)

The model in Figure 2 shows in a simple way the relationship between work and sick leave.

Figure 2. Simple model showing the relationship between work and sick leave (Copied from
Mehlum p123, 2011)
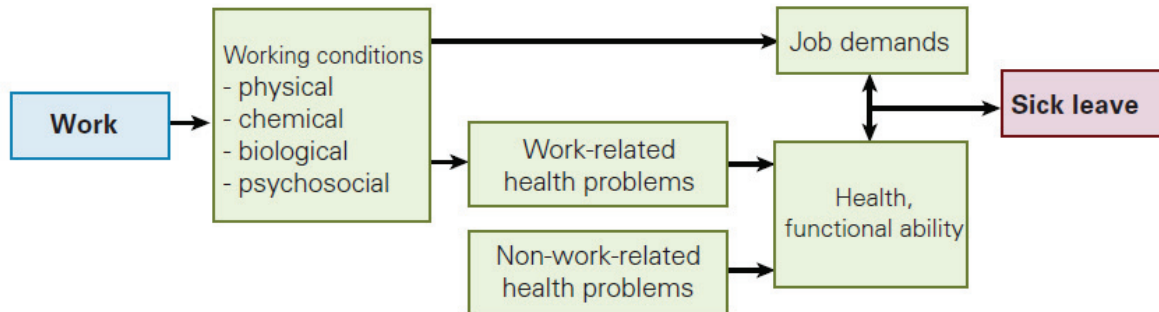
According to this model, sick leave is the result of a mismatch between functional ability and

the total level of demands at work. The requirement to take sick leave explained in this way

will depend on the relationship between the individuals, their general health and job demands.

This implies that the same illness or impairment may result in varying degree of incapacity to

work due to dissimilar job demands (23). According to this model, a high level of

psychosocial job demands, such as the demand to work at a rapid pace, may not be

compatible with reduced health or functional ability and may lead to sick leave. While having

high levels of job control with an opportunity to adapt the work situation to the individual

health or functional level would reduce the need to be on sick leave. Moreover, work may

also influence sick leave through individual psychological and social mechanisms, with an

impact on factors such as work motivation (32). This was not the scope of this model and is

beyond the scope of this thesis.

While occupational differences and differences in job demands will have an impact on

whether an employee will be sick listed or not. There are individual differences related to sick

leave that are important to consider as well. This is partly reflected in the model in Figure 2 in

the box "Health, functional ability". Studies report that employees with a chronic disease or

injury have a higher risk for sick leave compared to initially healthy workers (33, 34). Some

mental disorders, such as depression or anxiety, are of greater importance than others with respect to sick leave or disability, also because such disorders may be masked as somatic disorders and underdiagnosed (35). In addition, older age, female gender, previous long-term sick leave, lower educational level, and manual work (21), have been identified as risk factors for LTSL, and such factors are often treated as confounders in large epidemiological studies of the work environment and sick leave. Sick leave and health problems are a complex result of general motivation (36), genes and environmental factors such as socioeconomic position and lifestyle (37-39). The contribution of work environmental factors may explain a considerable part of sick leave in the Norwegian working population, and the overall aim of this dissertation is to identify psychosocial risk factors for LTSL. While the model in Figure 2 is a theoretically model of the relationship between work and sick leave. The model in Figure 3, shows possible associations between the factors considered in this dissertation and LTSL. In this analysis model, we assume that by taking into account demographic variables, previous LTSL, and mechanical factors we will be able to identify the direct effect of work-related psychosocial risk factors for subsequent LTSL in the Norwegian working population.

Figure 3. Associations between psychosocial and mechanical exposures and LTSL (Long-term sick leave).
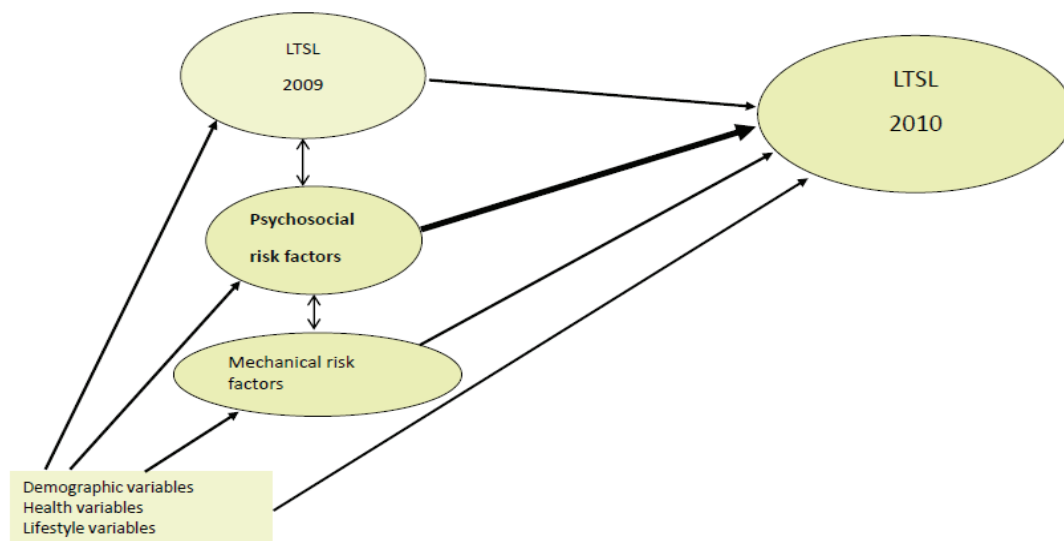
Work-related psychosocial risk factors and stress responses

In this thesis the term psychosocial risk factors will be used to describe potentially stressful characteristics at work, which have been demonstrated to increase the risk for mental distress (40-42), musculoskeletal disorders (8-10, 43), cardiovascular diseases (11, 12, 14) and related sickness absence in the research literature. Despite the increasing interest in the psychosocial work environment, there is no uniform definition of the construct. The psychosocial work environment is often roughly defined as the psychological and social conditions people experience in the work place (44). In the literature "stressors" and "psychosocial risk factors" are used interchangeably and they are probably overlapping concepts (45). Warren has defined psychosocial stressors as "nonphysical aspects of the work environment that have a psychological and physiological impact on the worker" (Warren, 2001, p.1299)(46). Cox et al has described psychosocial risk factors as equivalent to workplace psychosocial hazards, the latter defined as "those aspects of work design and the organization and management of

work, and their social and organizational contexts, which have the potential for causing psychological, social and physical harm" (Cox et al, 2000, p.14)(47). By introducing the word hazards as equivalent to stressors or risk factors, psychosocial risk factors in the work environment, are largely acknowledged as important determinants of occupational health equated with physical and chemical hazards in the work environment. Closely related to psychosocial risk factors are organizational risk factors. Although these concepts are overlapping, organizational risk factors often refer to structural affiliations at the work place such as working hours, shift work, as well as reorganizations and downsizing.

Biological mechanisms

Stressful experiences in the work place can be referred to as chronic stressors (the cumulative load of high demands and low control), or acute stressors (violence and threats of violence). Both types of stress can have long-term effects on the health (48). The theory of *Allostatic load* can give us a framework for understanding the biological mechanisms on how psychosocial stressors in the work environment can predict health problems and in turn sick leave. Allostasis is referred to as the ability to achieve stability through change (49). The core of the body`s response to situations that are perceived as strenuous is in this perspective to turn on an allostatic response that initiates a complex adaptive pathway, and then shutting off this response when the threat is past. In a strenuous situation, some hormones (adrenalin/noradrenalin) increase cardiac activity (heart rate/blood pressure) and other hormones (glucocorticoids as cortisol), that convert fat and proteins into sugar for energy consumption, are released. This response has throughout evolutionary history been useful in dealing with fearful situations and as a short-term response, there will be no pathophysiological consequences for the individuals. However, if the inactivation of the system is inefficient, such as if the individual has enduring thoughts and worries related to the job, even during leisure time, the overexposure to stress hormones over time can result in

allostatic load and pathophysiologic consequences for the individual (9, 11, 13, 40, 48), and in turn sick leave (2, 4).

Psychosocial working conditions: model versus empirically driven research

In occupational health psychology, there are two leading models the demand–control model developed by Robert Karasek (16) and the effort–reward imbalance model developed by Johannes Siegriest (50). It is mainly the Karasek model, that has dominated the research on psychosocial risk factors for various health outcomes and sick leave in the last 35 years. The Karasek model is a theoretical framework and has been important for understanding how specific factors in the work environment may lead to impaired health and sick leave, and has provided testable hypothesis. Central in the model is the combination of job demands and job control. Karasek defines job demands as "stress sources, such as work load demands, present in the work environment"(Karasek, 1979,p.287) and job control as a grouping of decision authority or autonomy and skill discretion or task variety (15). A combination of these dimensions classify four different job types: "High-strain jobs" (high demands/low control), "Active jobs" (high demands/high control), "Low strain jobs" (low demands/high control), and "Passive jobs" (low demand/low control). High-strain jobs are the most risky to health, while active jobs in this model lead to well-being, learning and personal growth (15). In the 1990s, the model was expanded to include social support from significant others (16). Those who experience low social support in combination with high demand and low control would experience the highest level of strain (iso-strain) (51).

In the last 10 years, the study of risk factors beyond the Karasek model has received increasing interest among researchers. Instead of restricting variables to test one specific model, several factors are studied simultaneously to identify which factors are of most

importance in explaining the risk for sick leave in a population (52, 53). This approach could be more efficient in terms of intervention. Factors such as emotional demands, bullying, violence and threats are not belonging to a specific model (41, 54-56) but they are factors that are measured in most European surveillance systems of occupational health (57). As such, they reflect the interest of these variables on a societal level as well. In this dissertation, we are studying well-established factors as job demands and job control in addition to less studied factors, to empirically determine which factors are of most importance in explaining the risk for sick leave. This is supposed to better target interventions in the Norwegian working population.

General population studies on psychosocial risk factors for long-term sick leave

In an international perspective, there has been an increasing amount of research on psychosocial work factors and sick leave, especially in the wake of, large-scale prospective studies from the Whitehall II cohort (58, 59), the Belstress cohort (60, 61), and the Gazel cohort(62, 63). The common denominator of these studies is the study of the Karasek dimensions (job control–job demand–social support) in relation to sick leave of various length. In a 2004-review, the authors conclude that low job control appeared to be the best documented psychosocial risk factor for sick leave, but the author concluded that few studies had a longitudinal design (2). The Karasek dimensions have also been studied in more recent large-scale studies of Norwegian workers (64-67). Associations between job demands, job control, job strain and LTSL among 40–47-year-old respondents were found in the Hordaland Health study (67). The finding that job strain was associated with sick leave complies with other recently published nationally representative studies (68-70). In a 2016-review of prospective studies on sick leave, job strain in addition to job control is considered documented risk factors for sick leave (4).

Despite the large amount of research on the Karasek dimensions, when summing up the literature, three factors in the psychosocial work environment have received increasing interest among researchers; role conflict, social support from leader/quality of leadership, and emotional demands (52, 71, 72).

Role conflict results when two or more expectations at work are incompatible. Thus, role conflict is included as one of several items in the job demand dimension measured in the Job Content Questionnaire (JCQ) (73). The relative contribution of role conflict has not been approved in studies of the Karasek job demand dimension. Role conflict has been associated with muscular/skeletal pain (43, 74), headache (75) and mental distress (42, 76). In addition, associations with sick leave have been reported in prospective studies of the Danish working population (52, 72). Correspondingly, it was also of interest to study role conflict as a predictor for sick leave in the general Norwegian working population, when adjusted for other factors.

In recent years, different aspects of leadership have received increasing interest in the study of diverse health outcomes and sick leave (2, 4). The leader is often the most prominent person in a department or enterprise and has, therefore, significant impact on the employees. Social support from the leader is often a general measure for practical support and feedback. Social support, in general, is the most frequently studied in occupational health studies and this is probably related to the Karasek and Theorell (51) iso-strain hypothesis, which has been discussed above. Fair leadership is to what degree the leader treats the workers fairly and this is conceptually related to organizational justice. Organizational justice refers to the fairness in the rules and social norms that govern companies particularly in terms of resources and the distribution of benefits (77). Organizational injustice has been related to cardiovascular diseases, mental health problems and sick leave (77, 78). Recent studies report that social support from leaders and fair leadership have a protective effect on mental distress (76), and

that fair leadership has a protective effect on low back pain (79). These aspects of leadership seem important for health and they are, therefore, included in the index for supportive leadership measured in this dissertation. Supportive leadership has been associated with neck and shoulder pain (43), and disability (80) in previous studies of the Norwegian working population. In general, there has been conducted a large amount of research on social support from the leader and subsequent sick leave. However, according to a recent review, there is very limited evidence for an association between general social support from leaders and sick leave (4). Although, according to the same review there is higher, but still limited evidence for an association between quality of leadership and sick leave (4). Nevertheless, in a study of the Danish working population no associations between social support from the leader and quality of leadership were associated with sick leave for more than three weeks (52).

Emotional demands could be characterized as a part of the employment that involves contact with people, which requires a trained response that helps to manage patient emotions in the everyday working life of health organizations (81). Another aspect of emotional demands is hiding emotions. In hiding emotions, the employee hides their true feelings and state of mood when in contact with patients, clients etc. In this dissertation, a combined measure of emotional demands and hiding emotions are used, especially since the two constructs are highly correlated. Emotional demands have been associated with mental distress (42) (82), occupational injuries (42), and associated with sick leave in studies of the Danish working population (52, 72). However, only a few general population studies include emotional demands as a risk factor for sick leave in occupational health studies.

In addition, few studies have provided a measure for how much of the sick leave can be explained by work environmental factors, which motivated this thesis. Results from a Danish study, report that the contribution of work environmental factors explains a considerable part of the variation in sick leave between groups. The authors conclude that a 40 percent

reduction in sick leave for more than six days could be achieved, if all employees were exposed to physical and psychosocial factors at the same level as those that were 10 percent less exposed (71).

Despite an increasing number of prospectively designed general populations studies on psychosocial risk factors for sick leave, we need more knowledge about which psychosocial risk factors are important for the health and social sector. Are these the same as in the general population or specific to that particular sector?

Studies on psychosocial risk factors for long-term sick leave among health and social workers

Female health and social workers are on top of the sick leave statistics, and their sickness absence should, therefore, be looked at more in detail. In contrast to the general working population, the risk of sick leave in health and social occupations is, to a greater extent, supposed to be influenced by psychosocial factors related to patient handling activities, such as emotional demands, and adverse social behaviour, such as violence and threats of violence from patients or clients (18). Moreover, mechanical exposures such as heavy lifting and lifting in awkward positions are also prevalent among occupational groups in this sector (18), and these need to be taken into account when the aim is to study psychosocial and organizational risk factors for sick leave in this sector.

When summing up the literature of prospective studies of health and social workers, comparable to the studies in this present dissertation (55, 83-86), the most studied and robust associations between psychosocial exposures and sick leave in the sector are related to the Karasek dimensions involving high job demand and low job control in the work situation (87-89). In recent studies, the importance of other factors in the psychosocial work environment have been included. Clausen et al. (83) found that emotional demands, role conflict, possibilities for development and quality of leadership predicted LTSL among health and

social workers in the eldercare service in Denmark. In another Danish study, violence and threats of violence were found to be the strongest predictor of sick leave among health workers (90). In addition to psychosocial risk factors, organizational factors such as shift work (91), evening work (92), and organizational change have been identified as a risk factor for LTSL (93, 94) in this sector. Still, few studies have taken several factors into account simultaneously, and no previous studies have investigated which of these factors contribute the most to sick leave among female health and social workers, also when adjusted for mechanical exposures. An additional aim is to estimate how much of LTSL among female health and social workers could potentially and theoretically be eliminated if the effects of certain psychosocial or organizational factors were removed from the population. This can be done by implementing population attributable risks percent (PAR %) into the analyses of the data (95, 96). The high proportion of women has previously been used as an explanation for the high risk of sick leave in this sector, explained by the fact that women, in general, have a high risk for sick leave (97). Although the work environment has been acknowledged as a possible contributor for sick leave, the relative importance of work environment has not previously been approved (97).

Limitations of previous research – the potential of mechanical confounding on psychosocial factors

In this thesis, the main objective was to identify psychosocial exposures for LTLS. However, in a work environment, the employee is not only exposed to factors related to the psychosocial work environment, but to a variety of factors. It is not possible to take into account all possible confounding factors, but studies have indicated that psychosocial and mechanical factors may have a confounding effect on each other. In two previous studies, after mutual adjustment for physical and psychosocial working conditions, only physical working conditions were associated with subsequent sick leave (71, 98). In a Finnish study of

employees in the City of Helsinki, physical working conditions were considered more important than psychosocial exposures for LTSL (99). In addition, mechanical factors measured in this present cohort have been identified as risk factors for LTSL in a previous study (100). The contribution of mechanical factors relative to psychosocial factors is not adequately studied and therefore it was decided to adjust for mechanical factors in the analyses of this thesis that aimed to identify psychosocial risk factors for LTSL.

The overall aim of the project was to identify work-related psychosocial risk factors for doctor-certified long-term sick leave in the general working population, with particular focus on women working in health and social occupations leading to the following research questions addressed by this thesis:

1) Which work-related psychosocial factors predict LTSL, when also controlled for confounding risk factors (Papers 1 & 2).

2) What is the potential gain in sick leave reduction through improvement of the psychosocial work environment (Papers 1 & 2).

3) Are there specific work-related psychosocial factors that predict LTSL in Norwegian female health and social workers, and that also explain the excess risk for LTSL compared to other female workers (paper 2 & 3).

MATERIAL AND METHODS

Design of the study and data collection

This project had a prospective cohort design, with registry data on doctor-certified sick leave. All three papers in this dissertation were based on survey data from the Level of living condition survey, working environment (levekårsundersøkelsen, LKU), conducted by Statistics Norway. Data were collected during the period June 22, 2009, to January 9, 2010, by personal telephone interviews (0.5% of completed interviews were face to face). Prior to the telephone contact, potential respondents were informed by mail about the study, the topic of the study and data privacy protection. Data on sick leave were obtained by a merger between the survey of living conditions–working environment, and the national registry of social transfer payments.

In LKU eligible respondents are community-living Norwegian residents' ages 18–69 years. In 2009, a gross sample of 20,136 was randomly drawn from this population. Of these, a total of 12,255 persons were interviewed (60.9%). Among non-responders at baseline (n =7881, 39.1%) the most important reason for not responding was that the interviewer was unable to get in touch with the respondents despite several attempts (19%), 16% did not want to participate and 3% were prevented from participation. Why the respondents were prevented from participation, is not further described by Statistics Norway (101).

Subjects

In the first paper (Figure 4), respondents who were in paid work for at least one hour during the reference week or temporarily absent from such work and had worked for at least 100 actual working days during a year both in 2009 and 2010 constituted the follow-up sample (n=6758). The gender distribution of the sample was, n=3070, 45.4% women and, n=3688, 54.6% male respondents.

In the second paper (Figure 4): Female respondents who were in paid work for at least 1 hour during the reference week or temporarily absent from such work (both in 2009 and 2010) and registered with a health and social occupation constituted the follow-up sample (n=925). The sample consisted of registered nurses (n=271, 29.3 %); physical therapists, radiographers, and other health workers with college educations (n=63, 6.8 %); social workers and social educators (n=99, 10.7%); nursing and care assistants (n=409, 44.2%); and doctors/dentists' assistants and pharmacy technicians (n=83, 9%). In this paper, we included also those working less than 100 actual working days because we are studying one specific sector were part-time work is prevalent.

In the third paper (Figure 4): The follow-up sample comprised female respondents (n=3032), who were in paid work for at least one hour during the reference week, or who were temporarily absent from such work. The respondents were registered with an occupation and an active employee relationship for at least 100 actual working days in each year (2009 and 2010). Using this sample, female health and social workers (n=661, 21.8%) were selected and compared with others in the general female working population (n=2371, 78.2%).

Figure 4 A flow chart of the selection process regarding populations in the three papers and the number of subjects included.
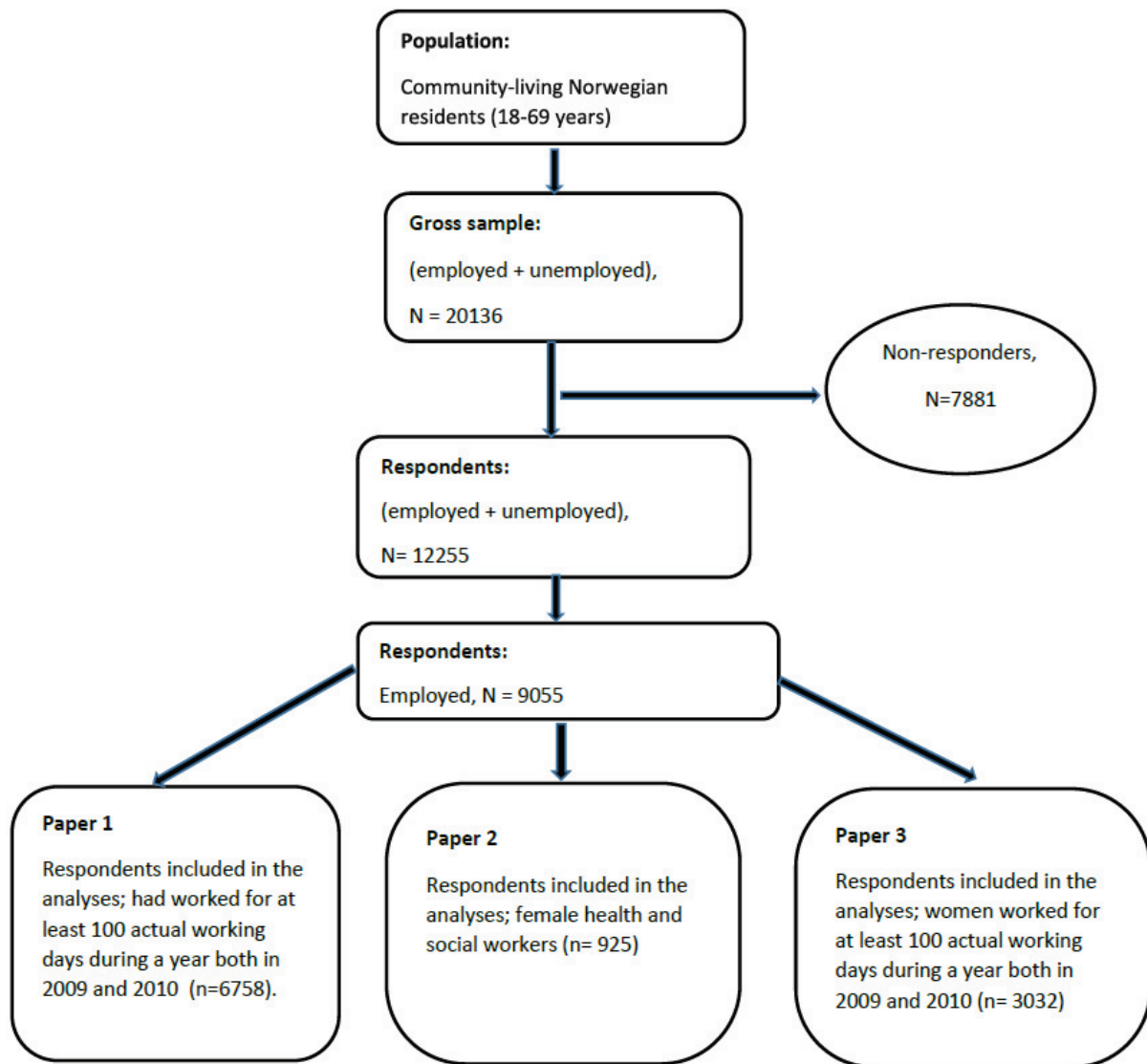
Measures

Table 1 provides an overview of the variables included in the present papers in this dissertation.

Long-term sick leave

Data on doctor-certified sick leave were obtained from the national registry of social transfer payments. The registry includes all economically active individuals aged 16–69 in Norway (i.e., those with a minimum of 4 hours per average working week) in the reference period. Statistics Norway merged this data with the survey data from the level of living conditions-working environment.

In Paper 1 LTSL was defined as medically confirmed sick leave for a period of 40 or more actual working days during 2010, the year after the initial survey was undertaken. In Paper 2 and 3, LTSL was defined as medically confirmed sick leave for 21 or more actual working days during 2010, the year after the initial survey was undertaken. The study populations included were all workers (Paper 1), female workers in health and social occupations (Paper 2) and female workers in health and social occupations and other women in the general working population (Paper 3). To increase the statistical power in the analyses we chose another cut-off with respect to the number of sick leave days in the studies of female health and social workers.

Psychosocial factors

Perceived psychosocial factors at work were measured by single items and scales from QPS-nordic, and items developed by Statistics Norway (see Table 2 in the appendix for further details). To explore the factor structure of the psychosocial variables included in the project (Paper 1) we performed a principal component analysis with oblimin rotation. In line with our theoretical expectations, the principal component analyses indicated that the items were associated with seven specific psychosocial factors (Table 1 in the appendix) The internal

consistency of the dimensions measured was estimated for each scale using Chronbach`s alpha. The items in the living condition survey, working environment was adopted from the work-stress questionnaire QPS- Nordic (102) in addition to items developed by statistics Norway (101). In the studies items from QPS-Nordic have been used in the scales quantitative demands (two items, α=0.70), role conflict (three items, α=0.64), and supportive leadership (three items, α=0.70). The scale Job control (four items, α=0.71) was constructed using two items from QPS- Nordic and two items developed by Statistics Norway. The items in the scales emotional demands (two items, α=0.69) was developed by Statistics Norway. Answer categories were "To a very great extent," "to a great extent," "to some extent," "not really," and "hardly at all." For these work-related psychosocial factors, the mean scale score was converted into three categories: low (1.0-2.0), medium (2.1-3.0), and high (3.1-5.0). All variables were coded so that high exposure indicates assumed negative exposure such as; high quantitative demands, high role conflict, high emotional demands, low job control, and low supportive leadership. Possibility for development (α=0.72), Answer categories were "Very good," "good," "poor," and "very poor." The last two categories were combined and used as one category, "poor or very poor." Bullying (two items) were collapsed into one dichotomized item (yes =1, no =0) and violence and threats of violence (three items) were collapsed into one dichotomous variable (yes =1, no=0). All variables are described in greater detail in Table 2 in the appendix.

Organizational factors

In Paper 1 Job insecurity was measured with one dichotomized item (yes=1, no =0), in the study of female health and social workers (paper 2), we included organizational work variables as downsizing, reorganization and shift work. The items is developed by Statistics Norway (101). The variables are described in more detail in Table 2 in the appendix.

Confounders

Table 1 provide an overview of the confounder variables that we have taken into account in the different papers. Mechanical workload was treated as a confounder in Paper 1 & 2. In Paper 3 mechanical workload was included as an exposure (or predictor) variable.

Perceived mechanical workload

Perceived mechanical work load was measured with items developed by an expert group in a Nordic cooperation project (103). The following items were included in the papers: neck flexion, hands above shoulders, hand/arm repetition, squatting /kneeling, standing, work with upper body bent forward, and awkward lifting. Scores were coded from 1 (not exposed or exposed very little of the work day) to (4 exposed three fourths of the work day or more). The variable heavy lifting was included in paper 3 (see Table 2 in the appendix for further details).

Demographic and health variables

Age and educational level were based on administrative registry data. Education was coded into five educational levels (years of education). Occupation was based on an open questionnaire and coded by Statistics Norway into a professional title, in accordance with the International Standard Classification of Occupations (ISCO-88). Married/registered partner/cohabiting was coded as yes=1, no=0, as was children in the household. The variable chronic health complaints, disability and smoking was developed by Statistics Norway (see Table 2 in the appendix for further details.

Table 1 An overview of variables included in the individual papers
(Paper 1, 2 & 3)

	Paper 1	Paper 2	Paper 3
Outcome			
Long-term sick leave 40 days +	x		
Long-term sick leave 21 days +		x	x
Psychosocial variables			
Job demand	x	x	x
Job control	x	x	x
Job strain	x		
Emotional demands	x	x	x
Role conflict	x	x	x
Supportive leadership	x	x	x
Possibilities for development	x	x	x
Bullying	x	x	x
Violence and threats of violence		x	x
Jobinsecurity	x		
Reorganization		x	
Downsizing		x	
Shift work		x	
Mechanical variables			
Neck flexion	□	□	x
Hand/arm repetition	□	□	x
Hands above schoulder	□	□	x
Squatting/kneeling	□	□	x
Standing	□	□	x
Upper body forward bend	□	□	x
Awkward lifting	□	□	x
Heavy lifting		□	x
Demographic variables	□	□	
Gender	□		
Age	□	□	□
Cohabitation	□		
Children at home	□		
Education	□	□	□
Occupation	□		
Health and lifestyle variables			
Disabeled/injured	□	□	
Chronic health complaints	□	□	
Previous LTSL 40 days+,21 days+	□	□	□
Smoking	□	□	

* The variable is a predictor variable in the analyses

□ The variable is treated as a confounder in the analyses

Statistical analyses

Analyses were conducted with SPSS statistics version 20.0/21.0 (IBM, Armonk, NY, USA). Frequencies and means were used to describe the data in the present thesis, and to evaluate group and gender differences chi-square for non-parametric (categorical) and t tests for parametric (continuous) data were used. Analysis of variance (univariate one-way ANOVA) was used to compare mean levels of the included variables in Paper 3. Correlations between variables were calculated with Pearson's correlation coefficients (Papers 1 & 3). To avoid over adjustment, we did logistic regression analyses and adjusted each work-related psychosocial predictor only for other work-related psychosocial predictors that were first estimated to exert an influence more than a certain threshold level (Papers 2 & 3). This estimation was made on the basis of the following procedure suggested by Rothman (104) and applied to baseline data. In the first step, crude odds ratio (OR) was separately estimated for each work-related factor. In the second step, each of the other work-related variables were entered one at a time. If the inclusion of a potential confounder resulted in a change in the OR of 10% or more, that variable was treated as a real confounder in the multiple regression models (Papers 1 & 2). The associations between work environment and sick leave were calculated by logistic regression analysis as ORs with 95% confidence intervals with adjustment for potential confounders. For the statistically significant work-related factors in the regression analysis (Papers 1 & 2) the population attributable risk percent (PAR%) estimates with 95% CI were calculated. PAR-estimates combine data on prevalence and risk (odds ratio) to provide an estimate of the proportion of cases in the population that are attributable to a particular exposure (95).

Ethics

The survey was carried out by Statistics Norway according to statutory rules. Statistics

Norway has appointed its own privacy ombudsman, who is approved by the Norwegian Data

Inspectorate. All subjects gave their informed consent prior to inclusion in the study (101)

Results in summary

Paper 1

Cecilie Aagestad MSc, Håkon A. Johannessen PhD, Tore Tynes MD PhD, Hans Magne Gravseth MD PhD, Tom Sterud PhD

Work-related psychosocial risk factors for long-term sick leave: a prospective study of the general working population in Norway

Aims: The study was undertaken to examine the effect of work-related psychosocial exposures on long-term sick leave (LTSL) in the general working population of Norway. The main focus in most previous research has been the importance of the job demand–control (social support) model as a predictor for sick leave. In this study, we wanted to include factors beyond this model to examine the variety of potential psychosocial risk factors for sick leave. The identification of specific risk factors will contribute to targeting more work of prevention. An additional aim was to estimate the proportion of LTSL cases in the population attributable to psychosocial exposures at work.

Methods: The eligible respondents were interviewed in 2009 and registered with at least 100 working days in 2009 and 2010 (n=6758). The outcome was medically confirmed LTSL of 40 days or more during 2010. Psychosocial factors were studied as predictors of LTSL with logistic regression models, and we also calculated population attributable risk percent (PAR%)

Results: During the follow-up period 634 (9.4%) were classified with LTSL. The risk was significantly higher for women than men (12.1 vs 7.2% respectively), older workers (11.2 % in the 55 to 69 years group vs 8% to 9% in the other age groups), and those with lower

education (13.9% for basic school level vs 3.8% for 4 years or older of university/college). A higher risk was also seen among those in elementary occupations (19.5% vs 4.9% for professionals), persons with a chronic health complaint (18.9% vs 6.7%), those who were disabled/injured 20% vs 8.3%), regular smokers (12.9% vs 8.6%), and those having LTSL-during the baseline year (36.1% vs 6.9%). Civil status and children in the household were not related to LTSL. In model 2, low job control was close to significant and high job strain was a significant predictor of LTSL. In the fully adjusted model 3, significant predictors were high role conflict (OR=1.58; 95% CI 1.20–2.09), high emotional demands (OR=1.32; 95% CI 1.03–1.69), and low supportive leadership (OR=1.50; 95% CI 1.15–1.96). The estimated population risk attributable to the significant estimates in the fully adjusted model was approximately 15%.

Conclusion: The main conclusion of the study was a substantial relationship between self-reported low supportive leadership, high emotional demands, role conflict and subsequent LTSL in the working population. Interventions aimed at reducing LTSL in the general working population may benefit from focusing on emotionally demanding work, supportive leadership, and role conflict.

Paper 2

Cecilie Aagestad, Reidar Tyssen, Håkon A. Johannessen, Hans Magne Gravseth, Tore Tynes, Tom Sterud

Psychosocial and organizational risk factors for doctor-certified sick leave. A prospective study of female health and social workers in Norway

Aims. In Norway, as in other Nordic countries, doctor-certified sick leave differs substantially across sectors, and among health and social workers, in particular, there is an increased risk. Previous studies have shown that work environmental factors contribute to sick leave. In this study, we wanted to examine whether general factors related to the job demand–control (social support) model or more sector specific factors related to working with patients, were of most importance for sick leave among women in this sector. The identification of specific organizational and psychosocial risk factors for long-term sick leave (LTSL), taking into account potential confounding related to mechanical risk factors such as lifting and awkward body postures, will be important in the work of prevention.

Methods: A randomly drawn population sample of Norwegian residents were interviewed about working conditions in 2009 (n=12,255; response rate 60.9%). From this sample female health and social care workers (n=925) were followed in a national registry for subsequent sickness absence during 2010. The outcome of interest was doctor-certified sick leave of 21 days or more (LTSL). Eleven work-related psychosocial and organizational factors were evaluated with logistic regression models on LTSL, and we also calculated population attributable risk percent (PAR%), of the significant predictors.

Results: In total, 186 persons (20.2%) were classified with subsequent LTSL. In model 1 bullying was significant (OR=3.10; CI 1.30–7.40), but after thoroughly adjusting for

competing explanatory variables, the most consistent predictors for LTSL were violence and threats of violence (OR=1.67; 95% CI 1.14–2.45). The estimated population attributable risk for violence and threats of violence was 13%.

Conclusions: The present study among female health and social workers revealed a substantial relationship between self-reported violence and threats of violence and subsequent long- term sick leave.

Paper 3

Cecilie Aagestad, Reidar Tyssen, Tom Sterud

Do work- related factors contribute to differences in doctor-certified sick leave? A prospective study comparing women in health and social occupations with women in the general working population

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Aims The aim of the study was to examine the extent to which the higher risk of doctor-certified sick leave in women in health and social occupations compared to women working elsewhere could be explained by particular work-related psychosocial and mechanical risk factors.

Methods A randomly drawn cohort aged 18–69 years from the general population in Norway was surveyed in 2009 (n=12,255, response at baseline=60.9%), and were followed up in the national registry of social transfer payments in 2010. Eligible respondents were women registered with an active employee relationship for ≥100 actual working days in 2009 and 2010 (n=3032). Using this sample, we compared health and social workers (n=661) with other women in the general working population (n=2371). The outcome of interest was long-term sick leave (LTSL) ≥21 working days during 2010. Eight psychosocial and eight mechanical factors were evaluated. The associations between women in health and social occupations and women in the general working population with LTSL were calculated as the odds ratio (OR). Multiple regression analyses were conducted, and after adjusting for age, education, previous LTSL and working hours/week. We adjusted for each psychosocial and mechanical factor one at a time, and finally added all of the factors simultaneously. The impact (%) of each separate factor or set of factors on the occupational difference was estimated as percentage of change in OR in the initial model.

38

Results After adjusting for age, previous LTSL, education and working hours/week, women in health and social occupations had a higher risk for LTSL compared with women in the general working population (OR=1.42, 95% CI 1.13–1.79, p=0.003). After adjusting for psychosocial and mechanical factors, 70% of the excess risk for LTSL was explained compared with the initial model. The main contributory factors to increased risk were threats of violence and violence, emotional demands and awkward lifting. Standing and upper body forward bend were also of importance.

Conclusions Psychosocial and mechanical factors explained much of the excess risk for LTSL in women in health and social occupations compared with women in other occupational groups. Psychosocial risk factors were the most important contributors.

DISCUSSION

This dissertation focuses on identifying work-related psychosocial risk factors for doctor-certified LTSL in the general Norwegian working population and in a specific population of female health and social workers. The exposure for high emotional demands, high role conflict and low supportive leadership were the most consistent risk factors for LTSL in the general working population. In this study, it was estimated that 15 percent of the LTSL cases were attributable to these factors. In the specific population of female health and social workers, violence and threats were the most robust risk factor for LTSL and 13 percent of the LTSL cases were attributable to these factors. The results indicate that other factors beyond the Karasek model of psychosocial work factors are of importance for sick leave in the Norwegian working population. The higher risk for LTSL among female health and social workers compared to that among other working women was to a large extent explained by emotional demands, violence and threats, and awkward lifting. Results from this dissertation will contribute to identifying and helping to prioritize measures for prevention that can create a work environment that is beneficial for worker health.

Methodological considerations

Design

Major methodological strengths are the prospective design and the linkage to reliable follow-up data on sick leave from the registry in all three studies in this dissertation. The follow-up time in the three studies was sick leave during a year after the baseline exposure. Different time-lags have been applied in previous studies on psychological stressors at work and subsequent sick leave (105). The ideal time-lag of longitudinal job stress research has remained a long-standing methodological issue (106), and it is difficult to establish the proper time sequence for a cause and an effect (104). A longer follow-up time could have the

40

advantage of providing more sufficient time of exposure to create effects on the outcome variable. However, a longer follow-up time could be considered a limitation as well, due to the fact that during a longer time between exposures and effect, the levels of exposure might have changed for some participants, which may lead to an underestimation of effect sizes. Nevertheless, the follow-up time in the present studies is in line with several other prospective studies of psychosocial risk factors and sick leave (52, 66, 67). Prospective cohort studies have the advantage that exposure could be assessed before the disease, and compared to cross-sectional studies, where the exposure and outcome are measured at the same point in time, results from prospective studies could be closer to indicate causality. Ahrens et al. (107) arrange different types of studies according to their ability to corroborate the causality of a supposed association. According to this ranking, an increased risk of disease among the exposed in cohort studies *indicates* a causal relation. However, an association between an exposure and an outcome is not sufficient to claim causality (108). This implies that even if there is an association between an exposure (psychosocial risk factors) and an effect (sick leave), this could be due to random variation, bias, confounding or reversed causality, which needs to be addressed when evaluating the potential of *indicating* causality in our studies. By evaluating the sources of potential bias in our three studies the validity of the results can be largely determined. In order to judge whether an association is due to random variation, we have used statistical significance tests and 95% confidence intervals. P-values less than 0.05 in these three studies are regarded as statistically significant, which imply that there is a 5% chance that any statistically significant association may be due to chance (type I statistical error).

Internal validity concerns

Outcome measure: LTSL

In all three papers, we have used information on doctor-certified sick leave days from the registry of social transfer payments. Information on sick leave days during both 2009 and 2010 from this registry were linked to the survey of living conditions–working environment. The register data is of a high quality, and inclusion to the register is totally on a national level. The use of different sources of measures in the studies excludes the potential of common method bias (109). Moreover, with regards to the outcome measure, selection bias due to non-response, loss to follow-up and recall bias is not regarded as a problem in the three papers in this dissertation.

Because of data protection issues, we could not obtain data on the number of sick-leave periods, the length of each period or start and stop dates for a given period. In study 1, LTSL was defined as registered sick leave for at least 40 days during a year. In studies 2 and 3, LTSL was defined as registered sick leave for at least 21 days during a year. The selection of fewer days in the LTSL measure in studies 2 and 3 was done in order to increase the statistical power in the dataset. Still, because of the sick leave benefits and the possibility for self-certified sick leave for three to eight days on three different occasions we believe that doctor-certified sick leave for more than 21 days may also have captured serious sickness. Despite this, using 40 days, as in Paper 1, will include only those that really struggle hard with staying at work, and this method may, therefore, be regarded more valid with respect to predictors of LTSL. However, there is no uniform definition of LTSL in the literature, and there is a variation between studies whether the absence is registered as days, episodes or length of episodes. This implies that comparisons between studies are difficult and sometimes impossible, and when discussing results, it is important to consider in each case, whether the results of the studies are comparable or not.

Exposure measure

The exposure measure in the three papers is based on self-reports. A potential bias in self-report is that the exposure data could be biased by response behaviour e.g. cognitive consistency within the individual, by attribution processes, or personality characteristics and affective states, such as negative affectivity (110). The concern is that those experiencing negative affect, due to personal dispositions, may report more adverse working conditions compared to more optimistic individuals. However, few factors in the psychosocial work environment can be studied objectively (111, 112), and by studying exposures in the work environment in a population with a considerable sample size, reporting style due to different response behaviour should be equally distributed between subgroups. Defining the reliability of data and validity of the instruments may be even more important.

The exposure measure has been adopted from the survey of living conditions–working environment. The survey is mainly conducted for the purpose of surveillance of occupational health and covers a broad set of factors, with limited use of validated scales or instruments measuring psychosocial exposures. Nevertheless, several of the items tapping psychosocial factors has its origin in the Nordic Questionnaire for Psychological and Social factors at work (QPS-Nordic) which is considered a validated instrument for measuring psychosocial risk factors in the work environment (102). However, some of the items in the three studies have been developed by Statistics Norway. With the exception of role conflict, all the other factors reached a Crohnbach`s alpha > 0.7 in our data which is a commonly acceptable estimate of reliability, and the factor scores reported in this dissertation indicate that the applied measures worked reasonably well in the present studies (attachments).

Confounding

Confounders are major issues in examining the validity of observational studies. In prospective studies, confounding is a common source of error, and can bias study results. A confounder is a variable that is associated with both the outcome variable and the exposure variable, and could be considered either as a cause or a proxy for a cause but not as an effect of the two variables of interests (104). A confounder can cause spurious associations, and may either under- or overestimate the effect between an exposure and a disease.

In Table 1, there is an overview of the variables that have been treated as confounders in the papers. In the three studies, the selection of confounders is based on our knowledge of the field, from other similar prospective studies and literature reviews. This is especially with respect to age, gender, education, occupation, health variables, family status, smoking and information about previous sick leave, which have been considered confounders in most previous prospective studies (2, 113-115). In addition, to treat gender as a confounder in the analysis within Paper 1, we stratified by gender. This was also done to check for heterogeneity, which is recommended in studies of occupational health (116).

Over adjustment

A variable should only be controlled for if it is a confounder, and there might be sources of over adjustments in the three papers. In Paper 1, we adjust for occupation and in Papers 1, 2 and 3, for education. These variables are indicators of socioeconomic position and might capture non-work-related factors as general health, lifestyle, competence and resources, and might influence both self-report of the working conditions as well as sick leave. However, at the same time, there is a risk of adjusting for work-related factors that are correlated with education or specific occupational groups. There is no clear-cut answer to this, and in a study by Rugulies et al. (52), occupations were treated as an effect modifier.

44

There is no agreement between studies whether psychosocial factors should be adjusted for each other in the analyses or not. We performed statistical analyses in the selection of possible psychosocial confounders. We adjusted each work-related psychosocial predictor only for other work-related psychosocial predictors that were first estimated to exert an influence above a certain threshold level (10 % change in OR) (Papers 2 & 3). In the literature, there is no agreed universal limit for considering a variable a confounder, and 5%, 10%, and 20% changes in the estimates have been used, and choosing between them may be somewhat random (104, 117). A possible limitation in using statistical analyses to identify potential confounders is that it may be difficult to distinguish between a variable as a confounder or a mediator where both are associated with the potential risk factor and the outcome, but the mediator is on the pathway from the exposure to the disease. This will be further discussed in the discussion of the main results in the dissertation.

Despite adjusting for several confounders, in observation studies, there will always be potential unmeasured confounders that have not been adjusted for in the analyses. Even though we have adjusted for several confounders in our analysis, we have not adjusted for lifestyle factors beyond smoking, such as weight (BMI) and level of physical exercise, which have been associated with LTSL in previous studies (115, 118) (99). We cannot rule out residual confounding due to the lack of lifestyle factors measured in the studies.

Reversed causality

In epidemiological research, it is important to consider the potential of reversed causality. When an association is reported between two factors, it could in some cases be difficult to establish which one caused the other. In Paper 1, we found associations between psychosocial risk factors i.e., role conflict and sick leave. But, it could be that previous sick leave influenced the experience of role conflict in the work environment and this could bias the association with subsequent sick leave. Accordingly, we did additional analyses and excluded

those with registered sick leave in 2009 from the analyses. No changes in the estimates were detected (Papers 1 & 2), and we conclude that the results of the analyses were not due to reversed causality.

External validity concerns

External validity refers to the generalizability of results, i.e., the extent to which the results in our studies could be generalized to the source population, to other general working populations, or to more specific populations of female health and social workers. Generalizability to the source population is highly related to sampling, sample size, and response rate. The response rate for the survey of living condition–working environment in 2009 was 60.9 percent. The baseline sample was compared with the gross sample according to the benchmark of age, sex and region, and no major differences were detected (101). Hence, selection bias is not regarded as a major threat to the external validity in Paper 1. However, a limitation is that we do not know how representative the female health and social workers are in relation to the source population since we do not have the response rate for the different occupational groups included in the survey (Papers 2 & 3). In addition, we do not know whether people with poor health or elevated risk for sick leave, were less likely to respond at baseline, which may have led to biased and attenuated estimates and thus threatened the internal validity. However, studies have shown that some differences in the participation of questionnaire surveys related to socio-demographic variables and health status do not produce biased risk estimates (119).

Despite the relatively high response rates in the studies of this dissertation the diversity in working conditions and regulations between countries could be important to consider with regards to generalizing of our results. Although i.e., the Scandinavian countries have many similarities in the psychosocial work environment, there are differences in the sick leave benefits which could affect the generalizability of our studies. In Denmark, people with long-

term sick leave (of more than 120 days a year) may be discharged, and this might explain why the rates for LTSL are lower in Denmark, compared to Norway and the other Nordic countries (30). Even if Denmark and Norway share several of the same work environmental exposures, fewer employees would have the potential to be on LTSL in Denmark compared to in Norway. Although there are some differences in the social welfare system between countries, the results of this dissertation could be generalized to other general working populations especially the Danish working population.

Strengths and limitation of our study

To sum up, this is the first prospectively designed population study with one-year registered sick leave at follow-up to analyse the association between psychosocial factors at work and LTSL in the Norwegian working population. A major strength is the linkage to register-based data on doctor-certified sick leave. The study had a fairly high response rate, and common method bias and recall bias was not regarded as a problem in the analyses. The study fulfils the Hill criteria of temporality (120). The study covers a broad set of factors both well-established as well as newly emerging risk factors, that have received minor attention in occupational health research. However, besides the mentioned difference in LTSL between the first and the last two papers, it could be considered a limitation that we do not have diagnosis on the sick leave or consecutive episodes of sick leave. The exposure data are from the level of living conditions survey of working environment. This survey is an important contributor in mapping the psychosocial work environment in Norway. Hence, it is not developed for scientific purposes, and there is a lack of validated instruments of measuring diverse psychosocial exposures. It would have strengthened the quality of this research if more full-scale measures were included for further analyses. Especially, since there is a lack of population representative studies of work environmental factors and sick leave in the Norwegian working population.

Discussion of main findings

1) Which work-related psychosocial factors predict LTSL, when also controlled for confounding risk factors (Papers 1 & 2)

Role conflict and supportive leadership

The most consistent findings, after thoroughly adjusting for confounders, are that high role conflict and low supportive leadership predicted subsequent LTSL in the general working population. In the more specific population of female health and social workers, non-significant but elevated risk estimates (OR) were found for both factors. The non-significant estimates may be due to a smaller sample and low statistical power in the dataset of female health and social workers, which could imply a type 2 statistical error (false negative findings). Role conflict as a risk factor for sick leave in the general working population is reported in previous comparable population studies (52, 72), and also in specific populations of health and social workers (90, 121). In a 2016-review, the authors conclude that the evidence for an effect of high role conflict on subsequent sick leave is very limited, especially in studies of specific sectors (4). The impact of role conflict and sick leave should, therefore, be further examined also in specific occupational groups with a sufficient number of respondents to avoid the possibility of type 2 errors. In the same review, the authors conclude that there is very limited evidence for low social support from the leader and risk of subsequent sick leave (4). In our studies, social support from the leader is one item in the measure of supportive leadership. Previously, in studies of the Norwegian working population, supportive leadership has been associated with musculoskeletal pain in the neck and shoulder and work-disability (43, 80). However, the construct has not been studied as a risk factor for sick leave in other general or sector specific populations, and therefore, this requires further validation.

Emotional demands

Emotional demands were associated with LTSL in the general working population (Paper 1), in line with the study of Rugulies et al. (52). Thus, in the fully adjusted model, when we stratified by gender, significant associations were reported for high emotional demands and sick leave in men, but not in women. This is consistent with the finding in a study by Lund et al. (72). In both of the studies, adjustments for mechanical exposures are conducted, and in the study of Lund et al., the significant association in men appeared after adjustment. It is possible that we were able to identify men with a high risk for emotional demands and subsequent sick leave when taking into account mechanical exposures. In Paper 2, no significant associations between high emotional demands and sick leave among women working in health and social occupations were reported. Thus, when interpreting the findings in Paper 2, we considered the possibility that we were not able to detect an effect of high emotional demands and subsequent sick leave among female health and social workers due to lack of contrast in the data since most of the respondents report high emotional demands. Hence, in Paper 3 we compared women in health and social occupations with other working women to determine how much of the increased risk for sick leave among female health and social workers could be explained by environmental factors in work. We found that emotional demands explained a significant part of this increased risk. A plausible explanation is that there is now a contrast between an exposed population and a population who, to a lesser degree, is exposed to emotional demands and we, therefore, manage to identify this factor as a contributor in explaining the increased risk of LTSL among women working in health and social occupations. Despite the non-consistent results in the studies, emotional demands could be defined as a possible emerging risk and this has received minor attention in research literature that aims to identify work environmental risk factors for sick leave. An increasing interest of this factor is observed especially in the nurse and health care literature. From 1970

until 2014 there has been an increase in the employment rate of individuals in the health and social services from 112 000 to 570 000, and an increase is also observed in education, retail and accommodation. At the same time, there has been a slight decrease in traditional work places in the industry sector. Physically demanding work has for decades been a topic of interest in work and health research, in addition to the quantitative demands measured in the Karasek model. Emotional demands from patients have been linked to mental health treatment needs in young Norwegian doctors of both genders (82), and the factor of "emotional demands" could be a risk factor for "emotional exhaustion" a factor in the burnout concept (122). The importance of this concept has been much studied and validated in human service organizations, also as a predictor of sickness absence (123). However, there is still only a few prospective studies that take emotional demands into account when studying sick leave in controlled predictor models, and according to the 2016-review, there is limited evidence for emotional demand as a risk factor for sick leave (4).

Job control, Job demand and job strain

In agreement with the general literature, no effect of high job demands on subsequent sick leave was found in Papers 1 and 2 (2-4). Low job control and job strain are considered risk factors for sick leave with the strongest evidence possible in observation studies (4), and in studies 1 and 2, we found elevated risk estimates for low job control, and this finding is in keeping with the general literature. However, after thoroughly adjusting for confounders in Paper 1 model 2, low job control was no longer a significant predictor for LTSL, and the main confounder was occupation. Sick leave differs between occupational groups and work factors have been found to contribute to these occupational differences (63). To estimate the direct effect between work environmental exposures and sick leave we, therefore, decided to treat occupation as a confounder in our analyses (Paper 1). The estimates were further attenuated when adjusting for mechanical exposures in model 3. High job strain reached significance in

Paper 1 model 2, but after further adjusting for mechanical exposures high job strain was no longer significant. However, the point estimate OR=1.30 is equivalent to results from a recently published study of middle-aged Norwegian workers where job strain was reported as a significant predictor of LTSL (67). In addition, the possibility for development, which is a dimension in the job control construct, did not reach significance in Papers 1 and 2. In Paper 1, the main confounder was occupation. These results are in line with the study of Rugulies et al. (52), and in other studies the results are somewhat mixed (72, 124). Hence, the experience of low job control, low possibilities for development and high job strain is prevalent in some occupational groups, that are characterized by having manual work (18), which could imply that there is a social gradient in exposure for these factors. By adjusting for mechanical factors, the effects of job control and job strain on LTSL were further attenuated. We believe that we have strengthened our conclusions by taking into account the potential confounding effect of mechanical exposures in line with the study of Lund et al. (72). However, by including more confounders into the model, this contributes to further attenuate the estimates. The probability for type 2 error due to over-adjustment cannot be ruled out. The finding of no association between job insecurity and LTSL in Paper 1 is in line with the study of Lund et al (72) and Roelen et al (125). In a recent review the authors conclude that there are very limited evidence for an association between job insecurity and subsequent sick leave (4).

Bullying

Bullying and harassment are unwanted actions with negative consequences for the individual and for workplaces. People who have experienced bullying report higher prevalence of various stress-related symptoms such as anxiety, depression, sleep problems, headaches and stomach problems, and, in some that are highly exposed, posttraumatic stress disorders (126). In Papers 1 and 2 bullying predicted LTSL in model 1, but when adjusting for psychosocial confounders, the estimates were no longer significant. We selected a statistical approach to

51

decide which psychosocial factors to adjust for, but such analyses do not tell whether a factor could be treated as a confounder or a mediator on the pathway from exposure to disease. Bullying seemed highly correlated with other psychosocial factors and especially low supportive leadership. Thus, by adjusting bullying for psychosocial factors we include more variables into the model and then lower the estimates. Despite the non-significant results in our study, previous prospective studies report an association between bullying and subsequent sick leave (54, 55, 127). In a recent review, bullying predicted sick leave in eight out of nine prospective studies (4), and most of the studies had populations from the Nordic countries. This probably reflects the general focus on mapping adverse social behaviour, such as bullying, in these countries (57).

2) What is the potential gain in sick leave reduction through improvement of the psychosocial work environment (Papers 1 & 2)

In studies 1 and 2, we estimate the population attributable risk percent of LTSL related to psychosocial risk factors at work. The population attributable risk percent (PAR %) is used as a measure for the potential of reducing cases of sick leave by improvement of factors in the psychosocial work environment. In study 1, we estimated that 15 percent of the cases of LTSL in the general working population, theoretically, could be eliminated by the improvement of role conflicts, emotional demands and low supportive leadership. In some population studies, population attributable risk estimates have been provided (63, 67, 98, 124, 128) However, there are disparities in how many and which psychosocial variables have been included in the analyses, and it varies whether these have been controlled for possible confounders. Therefore, comparing studies and their findings is quite demanding and often impossible. Nevertheless, the result of 15 percent is relatively close to 19–21 percent in two of the studies (63, 128). Hence, in a recent published Norwegian study by Wang et al. (67), the PAR estimate of high job strain was 6.8 percent, which is fairly consistent with the findings in our study (Paper 1) 7.5 percent, before adjusting for mechanical exposures.

In Paper 2, the PAR estimate revealed that 13 percent of the cases of LTSL among female health and social workers could be eliminated if violence and threats did not occur. In a Danish study, it was estimated that elimination of violence and threats would potentially reduce sickness absence days by 10 percent (90), and this is fairly consistent with our findings. Estimation of PAR is valuable for applying priority to different preventive measures. However, it is important to consider that PAR estimates are not replacements for relative measures of effect, but provides an important estimate of the relative impact of different exposures and risks in a population (129). Because of the prerequisite of causality, it could be

considered pretentious to estimate PAR on the basis of observational studies. We calculated PAR estimates on the basis of adjusted risk estimates and the knowledge of low correlations between the variables. However, it is important to consider that the accuracy of the PAR estimate depends on the completeness of the specified model, the categorization of the exposure variables, and the level of exposure in a given population.

Though, it is important to consider that PAR estimates provide a theoretical estimate for prevention. PAR is most useful when the factor is clearly causally related to the outcome, and where there is a consensus that the exposure is amenable to intervention. In the work environment there are exposures of high severity, which affect a few people in specific occupations (e.g., asbestos and mesothelioma), and exposures which affect many individuals at small excess risk (e.g., role conflict and sick leave). Theoretically, these two different situations may lead to the same PAR estimate, thus, in prioritizing preventive measures both severity and prevalence of the defined factors should be taken into account.

3) Are there specific work-related psychosocial factors that predict LTSL in Norwegian female health and social workers, and that also explain their excess risk for LTSL compared to other female workers (Papers 2 & 3)

The most consistent finding was the effect of violence and threats of violence on subsequent sick leave among women working in health and social occupations. In addition, violence and threats also explained much of the excess risk of sick leave among women working in this sector when compared to women in other sectors (Papers 2 & 3). In a European perspective, violence and threats at work is described as an emerging risk factor (130). An increasing trend of violence and threats is also observed in the Norwegian working life (18). Internationally, the study of violence and threats has received much attention especially in the study of work environmental exposures among nurses (56). In such studies, violence and threats have been related to health outcomes such as injuries (56) and mental and physical health consequences (131, 132). However, we have only identified one former prospective study of violence and threats and sick leave (105), and the evidence for an association with subsequent sick leave is still very limited (4). Our sample includes not only nurses but also social workers that are exposed to very demanding and often violent clients. The increased exposure of health and social workers to such violence may also be a consequence of health reforms with deinstitutionalization, fewer hospital beds, and limited custody arrangements for patients and clients that may be potentially dangerous. Because of the increasing risk of exposure (18), violence and threats should be taken into account when planning further studies on psychosocial risk factors, health outcomes and sick leave.

Organizational factors

In Paper 2, we included organizational factors such as shift work, reorganization and downsizing. This was motivated by the fact that shift work is prevalent in the sector and has been associated with sick leave (133). In Norwegian hospitals, there has been several

55

reorganization processes and mergers, and studies have reported an increased risk of sick leave among those affected (94, 134). However, we did not find any effect of organizational variables on sick leave in our study (Paper 2). This might be explained by our sample that consists of workers from different occupational groups and sectors within the health and social sector. Shift work is common among nurses and nurse assistants, but not among physiotherapist or social workers and it could be considered a limitation of our study that we could not study the occupational groups separately due to the low statistical power in the dataset. We cannot rule out that shift work, reorganization or downsizing are more important for LTSL in some health and social occupations than others, and this requires further investigation.

Mechanical factors

In Paper 3, we included mechanical factors in the analyses and not only as confounding variables. The motivation was to determine if mechanical factors or psychosocial factors contributed the most to the difference in sick leave between women working in health and social occupations compared to other working women. Psychosocial factors contributed the most, but mechanical factors as awkward lifting, upper body bent forward, standing and heavy lifting contributed to this difference as well. In two previous general working population studies, mechanical factors were reported as negligible in explaining the increased risk for LTSL among women compared with that among men (135, 136). It is well known that health care workers very often are exposed to physical strain at work, and therefore may differ from other working populations. The results of this present study indicate that comparisons of more specific populations can provide additional knowledge about particular risk factors, which may account for the high level of sick leave in some female-dominated occupations. In

addition, the predictive value of mechanical risk factors on LTSL in a population of female health and social worker should be further investigated.

Topics for further research and conclusions

There is an increasing number of studies about psychosocial risk factors and sick leave. This applies both to population surveys, but also to more specific sector studies. In a 2004-review, the best-documented risk factor for sick leave was job control (2). The authors called for more prospective studies, with registered sick leave as an outcome. In a recent review of prospective studies and sick leave, job control, job strain, control over working hours, and bullying were identified as risk factors that increase sick leave with the strongest evidence possible in observation studies (4). Most of the studies included in the review measured the Karasek dimensions job control, job demand and social support. Although emotional demands, role conflict, bullying and violence were measured in some studies, factors related to the Karasek model still dominate the research field. In this dissertation, additional factors to those included in the demand–control model such as role conflict, emotional demands, supportive leadership, and violence and threats contributed the most in explaining work-related sick leave in the Norwegian working population. More studies should take into account factors beyond the traditional model in order to fully examine the variety of psychosocial factors in the work environment and their impact on subsequent sick leave. This should be done in both general populations and specific populations.

The increasing interest in studying psychosocial risk factors for sick leave somehow reflects the changing world of work and the concern for potential adverse health outcomes caused by psychosocial factors. More and more people are working in occupations handling patients or clients that require skills and personal qualifications other than those found in traditional manual work. Emotionally demanding work, violence and threats, and the effects on health and sick leave should, therefore, attract more attention in occupational health research.

Clinical and practical implications for the work organization

The results from this dissertation highlight the importance of focusing on psychosocial factors in the work of prevention. The results are of importance for occupational health services, labour inspection authorities, and for employers and labour unions. This dissertation provides estimates of how much sick leave could theoretically be prevented, by focusing on emotional demands, supportive leadership and role conflict in the general working population and on violence and threats in the specific population of female health and social workers. Such estimates have not previously been provided in the Norwegian working population and should lead to more targeted interventions. To prevent role conflict and low supportive leadership in organizations there should be a focus on developing clear job descriptions, and providing sufficient training for leaders in handling interpersonal relationships with an emphasis on the importance of feedback, trust and fairness. An increasing number of employees are exposed to emotional demands, and it is most important to first recognize that such demands can cause adverse health problems and in turn sick leave. This should motivate identifying strategies for handling such demands, and to provide this knowledge and competence to those who are affected. To prevent violence and threats at the workplace there should be a sufficient number of competent and trained employees at the work site to handle potential episodes. This applies, in particular, to institutions with demanding and violent patients with psychiatric disorders, both in the health and the social sectors. There is also a need to focus on the contribution of mechanical factors such as awkward lifting, in addition to psychosocial factors, to explain the higher risk of LTSL among female health and social workers compared to women working elsewhere. Nursing homes are often undersized and an extra pair of hands is, therefore, highly required to help handle immobilized patients that are totally dependent on full daily care. This implies frequent heavy lifts, and there should at least be more and easily accessible mechanical facilities such as sufficient electronic lifting arrangements.

Conclusions

This dissertation adds new knowledge that psychosocial factors, especially related to handling patients, clients or customers, are of significant importance for sick leave in the Norwegian working population. The most robust risk factors for LTSL in the general working population was high emotional demands, high role conflict and low supportive leadership. Violence and threats of violence were the most important risk factor for LTSL among female health and social workers. Moreover, our results suggest that psychosocial factors especially emotional demands and violence and threats in addition to awkward lifting were most important in explaining the excess risk for LTSL among female health and social workers compared to other working women.

APPENDIX

Table 1 Factor loadings in a principal component analysis (Oblimin rotation)

	Job control	Quantitative demands	Supportive leadership	Emotional demands	Bullying	Role conflict	Possibilities for development
To what extent are you free to decide how to go about doing your work	,816						
To what extent are you free to decide your own tasks	,736						
To what extent can you decide the pace at which you work	,696	-,224		-,153			
To what extent can you influence decisions that are important to your work	,678						,139
How often is it necessary to work at a rapid pace		-,905					
How often do you have too much to do		-,847					
Does your immediate superior treat employees fairly and equally			,802				
Are your work achievements appreciated by your immediate superior			,799				
Does your immediate superior treat employees fairly and equally			,769				
In your work, to what extent do you need to deal with strong feelings such as sorrow, anger, desperation, frustration and so on from customers, clients or other people who are not employed at your workplace				,889			
In your work, to what extent do you need to conceal negative feelings such as anger, irritation, frustration, and so on for customers, clients, or other people who are not employed at your workplace				,857			
Do you yourself sometimes get bothered or teased in an unpleasant way by your colleagues					,828		
Do you yourself sometimes get bothered or teased in an unpleasant way by superiors					,799		
How often do you receive incompatible requests from two or more different people						,769	
How often are you given assignments without adequate resources to complete them						,764	
How often do you have to do things that you feel should be done differently						,745	
In your job how good are your opportunities to develop your skills in the areas that interest you							,881
In your job how good are your opportunities to make use of skills, knowledge and experience that you have gained through your education and past work							,878
Sums of squared loadings	2,5	1,9	2,3	1,8	1,4	2,2	2
% variance	19	13	9,1	6,9	6,8	6,1	5,6

Table 2 Items measured in the dissertation

Items	Response categories and their value labels
Job control (α = 0.71)	
To what extent can you decide the pace at which you work?	1=very seldom or never, 2= seldom, 3=sometimes, 4=rather often, 5=quite often or always
To what extent can you influence decisions that are important to your work?	(same categories)
To what extent are you free to decide how to go about doing your work?	(same categories)
To what extent are you free to decide your own tasks?	(same categories)
Role conflict (α = 0.64)	
How often do you have to do things that you feel should be done differently?	1=very seldom or never, 2= seldom, 3=sometimes, 4=rather often, 5=quite often or always
How often are you given assignments without adequate resources to complete them?	(same categories)
How often do you receive incompatible requests from two or more different people	(same categories)
Emotional demands (α 0.69)	
In your work, to what extent do you need to deal with strong feelings such as sorrow, anger, desperation, frustration and so on from customers, clients or other people who are not employed at your workplace?	1=to a very great extent, 2=to a great extent, 3=to some extent, 4=to a little extent, 5=not at all
In your work, to what extent do you need to conceal negative feelings such as anger, irritation, frustration, and so on for customers, clients, or other people who are not employed at your workplace?	1=to a great extent, 2=to some extent, 3=to a little extent, 4=not at all
Quantitative demands (α = 0.70)	
How often is it necessary to work at a rapid pace?	1= very seldom or never, 2 =seldom, 3 = sometimes, 4 =rather often, 5=quite often or always
How often do you have too much to do?	(same categories)
Supportive leadership (α = 0.70)	
If needed, how often can you get support and help with your work from your immediate superior?	1=very seldom or never, 2= seldom, 3=sometimes, 4=rather often, 5=quite often or always
Are your work achievements appreciated by your immediate superior?	(same categories)
Does your immediate superior treat employees fairly and equally?	(same categories)

Possibilities for development (0.72)		
	In your job how good are your opportunities to develop your skills in the areas that interest you?	1=very good, 2=good, 3=poor, 4=very poor
	In your job how good are your opportunities to make use of skills, knowledge and experience that you have gained through your education and past work?	(same categories)
Bullying		
	Do you yourself sometimes get bothered or teased in an unpleasant way by your colleagues?	1=yes, once or more a week, 2=yes, once or more a month, 3=no
	Do you yourself sometimes get bothered or teased in an unpleasant way by superiors?	
Violence and threats of violence		
	Over the past 12 months have you been the victim of violence at the workplace that caused visible marks or physical damage?	1=yes, 2=no
	Over the past 12 months have you been the victim of violence at the workplace that did not cause visible marks?	1=yes, 2=no
	Over the last 12 months have you been threatened at the workplace in such a way that you felt scared?	1=yes, 2=no
Organizational variables		
Working hours	How many hours do you normally work per week in your main job? Include paid overtime and extra work done at home related to this job	continous
Job insecurity	Do you believe that you are at risk of losing your job due to your company`s closing, downsizing, or other reasons over the coming 3 years?	1= yes, due yo its closing, 2=yes, due to downsizing, 3= yes, due to other reasons, 4=no Recoded into one dichotomous variable yes=1, no =0)
Shift work	What are your normal working hours?	1=Daytime, 2=shift, 3=other arrangements Recoded into one dichotomous variable Yes=1, no=0
Reorganization	Do you believe that you are at risk of losing your job due to your company`s closing, downsizing, or other reasons over the coming 3 years?	1=yes, in my department, 2=yes in other departments at the company, 3=no Recoded into one dichotomous variable Yes=1, no=0
Downsizing	Has the company where you current work implemented downsizing at any point during the past three years?	1= yes, in my department, 2=yes, in other departments at the company, 3=no Recoded into one dichotomous variable Yes=1, no=0

Demographic variables

Cohabitation	Are you married or cohabiting with a partner?	1=yes, married/registered partner, 2=yes, cohabiting with a partner, 3=no Recoded into one dichotomous variable Yes=1, no=0
Children in the household	How many people are there in your household" if the interviewee live with several people in the household, a follow up question is asked "What family relationship does he/she have to the interviewee" among several categories we have used the answer category. "Son/daughter" and "Step-son/step-daughter" and computed the variable into "Children in the household" "yes=1" and no=0". Information about members of the household is compared to the central register.	1=yes, 0=no
Chronic health complaints	Do you have any long-term illnesses or health problems? This includes any illnesses or problems that are seasonal, or that are intermittent. The prerequisite is that the condition must have lasted, or be expected to last, at least 6 months	1=yes, 0=no
Disability	Are you disabeled, or do you suffer pain as a result of an injury? This includes paines that are intermittent	1=yes, 0=no
Smoking	Do you sometimes smoke?	No=1, Occasionally=2; every day=3 Recoded into one dichotomous variable Yes=1, no=0
Mechanical exposures	The response categories were yes or no. "Yes" respondents were asked to estimate the proportion of the working day during which they were exposed	Almost the whole time, ¾ of the workday, ½ of the workday, ¼ of the workday, and very little of the workday).
Hands above shoulders	Do you work with your hands raised to shoulder height or higher	Scores were recoded and categorized into 1=none or very little of the work day,2= 1/4 of the workday,3= 1/2 of the workday, 4= 3 /4 of the workday or more,
Awkward lifting	Do you have to lift things in uncomfortable positions?	(same category)
Squatting/kneeling	Do you need to squat or kneel in the course of your work?	(same category)
Neck flexion	Do you work with your head bent forward?	(same category)
Standing	Do you work standing up?	(same category)
Upper body forward bend	Do you work in positions where you are leaning forward without supporting yourself on your hands or arms?	(same category)
Hand arm repetition	Does your work involve repeated hand or arm movement? (hand/arm repetition	Yes=1, no=0
Heavy lifting	Do you have to lift anything that weighs >20 kg on a daily basis?	Response categories: 4=>20 times a day,3= 5-19 times, 2=1-4 times,1=no.

REFERENCES

1.   Claussen B. Sosiale ulikheter og helse: Unipub; 2008.

2.   Allebeck P, Mastekaasa A. Swedish Council on Technology Assessment in Health Care (SBU). Chapter 5. Risk factors for sick leave - general studies. Scandinavian Journal of Public Health Supplement. 2004;63:49-108.

3.   Duijts SF, Kant I, Swaen GM, van den Brandt PA, Zeegers MP. A meta-analysis of observational studies identifies predictors of sickness absence. Journal of Clinical Epidemiology. 2007;60(11):1105-15.

4.   Knardahl S, Sterud T, Nielsen MB, Nordby K-C. Arbeidsplassen og sykefravær-Arbeidsforhold av betydning for sykefravær. Tidsskrift for velferdsforskning. 2016;1(02):179-99.

5.   Luz J, Green MS. Sickness absenteeism from work--a critical review of the literature. Public Health Reviews. 1997;25(2):89-122.

6.   Labriola M. Conceptual framework of sickness absence and return to work, focusing on both the individual and the contextual level. Work. 2008;30(4):377-87.

7.   Lund T, Kivimaki M, Labriola M, Villadsen E, Christensen KB. Using administrative sickness absence data as a marker of future disability pension: the prospective DREAM study of Danish private sector employees. Occupational and Environmental Medicine. 2008;65(1):28-31.

8.   Hauke A, Flintrop J, Brun E, Rugulies R. The impact of work-related psychosocial stressors on the onset of musculoskeletal disorders in specific body regions: A review and meta-analysis of 54 longitudinal studies. Work & Stress. 2011;25(3):243-56.

9.   Lang J, Ochsmann E, Kraus T, Lang JW. Psychosocial work stressors as antecedents of musculoskeletal problems: A systematic review and meta-analysis of stability-adjusted longitudinal studies. Social Science & Medicine. 2012;75(7):1163-74.

10.   McLean SM, May S, Klaber-Moffett J, Sharp DM, Gardiner E. Risk factors for the onset of non-specific neck pain: a systematic review. Journal of Epidemiology and Community Health. 2010;64(7):565-72.

11.   Landsbergis PA, Dobson M, Koutsouras G, Schnall P. Job Strain and Ambulatory Blood Pressure: A Meta-Analysis and Systematic Review. American Journal of Public Health. 2013;103(3):e61-e71.

12.   Eller NH, Netterstrøm B, Gyntelberg F, Kristensen TS, Nielsen F, Steptoe A, et al. Work-related psychosocial factors and the development of ischemic heart disease: a systematic review. Cardiology in Review. 2009;17(2):83-97.

13.   Bonde JP. Psychosocial factors at work and risk of depression: a systematic review of the epidemiological evidence. Occupational and Environmental Medicine. 2008;65(7):438-45.

14. Kivimäki M, Nyberg ST, Batty GD, Fransson EI, Heikkilä K, Alfredsson L, et al. Job strain as a risk factor for coronary heart disease: a collaborative meta-analysis of individual participant data. The Lancet. 2012;380(9852):1491-7.

15. Karasek Jr RA. Job demands, job decision latitude, and mental strain: Implications for job redesign. Administrative Science Quarterly. 1979:285-308.

16. Karasek RA, Theorell T. Stress, Productivity, and the reconstruction of working life United States of America: Basic Books; 1990.

17. Mark GM, Smith AP. Stress models: A review and suggested new direction. Occupational Health Psychology. 2008;3:111-44.

18. Aagestad C, Sterud T,Tynes T, Johannessen JA, Gravseth HM, Løvseth EK, Alfonso JH, Aasnæss S. Faktabok om arbeidsmiljø og helse 2015 status og utviklingstrekk. Oslo: STAMI-rapport, 2015.

19. Arbeids- og sosialdepartementet . Lov om folketrygd (folketrygdloven) 2016.

20. World Health Organization. Identification and control of work-related diseases. Report nr 714 Geneve: World Health Organization, 1985

21. Markussen S, Røed, K., Røgeberg, O.J., Gaure. S. The anatomy of absenteeism. Journal of Health Economics. 2011;30:277-92.

22. Arbeids- og sosialdepartementet IA-avtalen 2014-2018: Arbeids- og sosialdepartementet;2016

23. Mehlum I. How much sick leave is work-related? Tidsskrift for den Norske laegeforening: tidsskrift for praktisk medicin, ny raekke. 2011;131(2):122-5.

24. Ihlebaek C, Brage S, Eriksen HR. Health complaints and sickness absence in Norway, 1996-2003. Occupational Medicine. 2007;57(1):43-9.

25. Brage S, Nossen JP, Thune O. Legemeldt sykefravær 2000-2012. Flere blir sykmeldt for symptomer og plager. Arbeid og velferd. 2013;2:88-98.

26. Markussen S. Da sykefraværet falt som en stein. Samfunnsøkonomen. 2010;3:18-23.

27. NAV. https://www.nav.no/no/NAV+og+samfunn/Statistikk/Sykefravar+-+statistikk/Relatert+informasjon/arkiv-sykefrav%C3%A6rsstatistikk-per-3.kvartal-2005-2014 2015

28. Lund T, Labriola M, Villadsen E. Who is at risk for long-term sickness absence? A prospective cohort study of Danish employees. Work. 2007;28(3):225-30.

29. Krane l, Fleten, N., Stapelfeldt, C.M., Nielsen, C.V., Jensen, C., Johnsen, R., Braaten, T. Comparison of sick leave patterns between Norway and Denmark in the health and care sector: A register study. Scandinavian Journal og Public Health. 2013;41:684-91.

30. Thorsen SV FC, Lundstrøm B, Kausto J, Örnelius K, Sundell T, Kalstø ÅM, Thune O, Gross BO, Petersen H, Haram Ö. Sickness Absence in the Nordic Countries. Copenhagen: Nordic Social Statistical Committee, 2015.

31.   Bruusgaard D. Årsak til eller konsekvens av? Tidsskrift for den Norske legeforening. 2011;131(2):109.

32.   Fahlén G, Goine H, Edlund C, Arrelöv B, Knutsson A, Peter R. Effort-reward imbalance,"locked in" at work, and long-term sick leave. International Archives of Occupational and Environmental Health. 2009;82(2):191-7.

33.   Lenssinck M-LB, Burdorf A, Boonen A, Gignac MA, Hazes JM, Luime JJ. Consequences of inflammatory arthritis for workplace productivity loss and sick leave: a systematic review. Annals of the Rheumatic Diseases. 2013;72(4):493-505.

34.   Haukka E, Kaila-Kangas L, Ojajärvi A, Miranda H, Karppinen J, Viikari-Juntura E, et al. Pain in multiple sites and sickness absence trajectories: A prospective study among Finns. Pain. 2013;154(2):306-12.

35.   Mykletun A, Overland S, Dahl AA, Krokstad S, Bjerkeset O, Glozier N, et al. A population-based cohort study of the effect of common mental disorders on disability pension awards. The American Journal of Psychiatry. 2006;163(8):1412-8.

36.   Steers RM, Rhodes SR. Major influences on employee attendance: A process model. Journal of Applied Psychology. 1978;63(4):391.

37.   Laaksonen M, Piha K, Martikainen P, Rahkonen O, Lahelma E. Health-related behaviours and sickness absence from work. Occupational and Environmental Medicine. 2009;66(12):840-7.

38.   Lund T, Kivimaki M, Christensen KB, Labriola M. Socio-economic differences in the association between sickness absence and mortality: the prospective DREAM study of Danish private sector employees. Occupational and Environmental Medicine. 2009;66(3):150-3.

39.   Weng SF, Ali S, Leonardi-Bee J. Smoking and absence from work: Systematic review and meta-analysis of occupational studies. Addiction. 2013;108(2):307-19.

40.   Stansfeld S, Candy B. Psychosocial work environment and mental health—a meta-analytic review. Scandinavian Journal of Work, Environment & Health. 2006; 32(6)443-62.

41.   Finne LB, Knardahl S, Lau B. Workplace bullying and mental distress - a prospective study of Norwegian employees. Scandinavian Journal of Work, Environment & Health. 2011;37(4):276-87.

42.   Johannessen HA, Tynes T, Sterud T. Effects of occupational role conflict and emotional demands on subsequent psychological distress: a 3-year follow-up study of the general working population in norway. Journal of Occupational and Environmental Medicine / American College of Occupational and Environmental Medicine. 2013;55(6):605-13.

43.   Sterud T, Johannessen HA, Tynes T. Work-related psychosocial and mechanical risk factors for neck/shoulder pain: a 3-year follow-up study of the general working population in Norway. International Archives of Occupational and Environmental Health. 2014;87(5):471-481.

44.   Kasl SV. Measuring job stressors and studying the health impact of the work environment: An epidemiolgic commentary. Journal of Occupational Health Psychology. 1998;3(4) 390-409.

45.   Saksvik Ø, Nytrø K. Ny personalpsykologi for et arbeidsliv i endring: Nye perspektiver på samspillet organisasjon og menneske. Oslo: Cappelen Akademisk Forlag. 2006.

46.   Warren N. Psychosocial and work organizational risk factors for work related musculoesqueletal disorders. International encyclopedia of ergonomics and human factors. 2010:1299-302.

47.   Cox T, Griffiths A, Rial E. Work related stress. Occupational Health Psychology. 2010:31-56.

48.   Flier JS, Underhill LH, McEwen BS. Protective and damaging effects of stress mediators. New England Journal of Medicine. 1998;338(3):171-9.

49.   Sterling P, Eyer J. Allostasis: A new paradigm to explain arousal pathology. In S.Fisher & J Reason (Eds.),Handbook of life stress, cognition and health 1988:629-649.

50.   Siegrist J. Adverse health effects of high-effort/low-reward conditions. Journal of Occupational Health Psychology. 1996;1(1):27-41.

51.   Theorell T, Karasek RA. Current issues relating to psychosocial job strain and cardiovascular disease research. Journal of Occupational Health Psychology. 1996;1(1):9-26.

52.   Rugulies R, Aust B, Pejtersen JH. Do psychosocial work environment factors measured with scales from the Copenhagen Psychosocial Questionnaire predict register-based sickness absence of 3 weeks or more in Denmark? Scandinavian Journal of Public Health. 2010;38:42-50.

53.   Niedhammer I, Chastang JF, Sultan-Taieb H, Vermeylen G, Parent-Thirion A. Psychosocial work factors and sickness absence in 31 countries in Europe. European Journal of Public Health. 2013;23(4):622-9.

54.   Janssens H, Clays E, De Clercq B, Casini A, De Bacquer D, Kittel F, et al. The relation between psychosocial risk factors and cause-specific long-term sickness absence. European Journal of Public Health. 2014;24(3):428-33.

55.   Ortega A, Christensen KB, Hogh A, Rugulies R, Borg V. One-year prospective study on the effect of workplace bullying on long-term sickness absence. Journal of Nursing Management. 2011;19(6):752-9.

56.   Spector PE, Zhou ZE, Che XX. Nurse exposure to physical and nonphysical violence, bullying, and sexual harassment: A quantitative review. International Journal of Nursing Studies. 2014;51(1):72-84.

57.   Formazin M, Burr H, Aagestad C, Tynes T, Thorsen SV, Perkio-Makela M, et al. Dimensional comparability of psychosocial working conditions as covered in European monitoring questionnaires. BMC Public Health. 2014;14(1):1.

58.   Head J, Kivimaki M, Martikainen P, Vahtera J, Ferrie JE, Marmot MG. Influence of change in psychosocial work characteristics on sickness absence: The Whitehall II Study. Journal of Epidemiology & Community Health. 2006;60(1):55-61.

59.   North FM, Syme S, Feeney A, Shipley M, Marmot M. Psychosocial work environment and sickness absence among British civil servants: The Whitehall II study. American Journal of Public Health. 1996;86(3):332-40.

60.   Moreau M, Valente F, Mak R, Pelfrene E, de Smet P, De Backer G, et al. Occupational stress and incidence of sick leave in the Belgian workforce: the Belstress study. Journal of Epidemiology & Community Health. 2004;58(6):507-16.

61.   Clumeck N, Kempenaers C, Godin I, Dramaix M, Kornitzer M, Linkowski P, et al. Working conditions predict incidence of long-term spells of sick leave due to depression: results from the Belstress I prospective study. Journal of Epidemiology & Community Health. 2009;63(4):286-92.

62.   Niedhammer I, Bugel I, Goldberg M, Leclerc A, Gueguen A. Psychosocial factors at work and sickness absence in the Gazel cohort: a prospective study. Occupational and Environmental Medicine. 1998;55(11):735-41.

63.   Melchior M, Krieger N, Kawachi I, Berkman LF, Niedhammer I, Goldberg M. Work factors and occupational class disparities in sickness absence: findings from the GAZEL cohort study. American Journal of Public Health. 2005;95(7):1206-12.

64.   Foss L, Gravseth HM, Kristensen P, Claussen B, Mehlum IS, Skyberg K. Risk factors for long-term absence due to psychiatric sickness: a register-based 5-year follow-up from the Oslo health study. Journal of Occupational and Environmental medicine / American College of Occupational and Environmental Medicine. 2010;52(7):698-705.

65.   Foss L, Gravseth HM, Kristensen P, Claussen B, Mehlum IS, Knardahl S, et al. The impact of workplace risk factors on long-term musculoskeletal sickness absence: a registry-based 5-year follow-up from the Oslo health study. Journal of Occupational and Environmental medicine. 2011;53(12):1478-82.

66.   Strømholm T, Pape K, Ose SO, Krokstad S, Bjørngaard JH. Psychosocial Working Conditions and Sickness Absence in a General Population: A Cohort Study of 21,834 Workers in Norway (The HUNT Study). Journal of Occupational and Environmental Medicine. 2015;57(4):386-92.

67.   Wang MJ, Mykletun A, Moyner EI, Overland S, Henderson M, Stansfeld S, et al. Job strain, health and sickness absence: results from the Hordaland Health Study. PLoS ONE 2014;9(4):e96025.

68.   Mather L, Bergstrom G, Blom V, Svedberg P. High job demands, job strain, and iso-strain are risk factors for sick leave due to mental disorders a prospective Swedish twin study with a 5-year follow-up. Journal of Occupational and Environmental Medicine. 2015;57(8):858-65.

69.   Magee C, Stefanic N, Caputi P, Iverson D. Occupational factors and sick leave in Australian employees. Journal of Occupational & Environmental Medicine. 2011;53(6):627-32.

70.   Natti J, Oinas T, Anttila T. Time pressure, working time control and long-term sickness absence. Occupational & Environmental Medicine. 2015;72(4):265-70.

71.   Labriola M, Lund T, Burr H. Prospective study of physical and psychosocial risk factors for sickness absence. Occupational Medicine. 2006;56(7):469-74.

72.   Lund T, Labriola M, Christensen KB, Bultmann U, Villadsen E, Burr H. Psychosocial work environment exposures as risk factors for long-term sickness absence among Danish employees: results from DWECS/DREAM. Journal of Occupational and Environmental medicine / American College of Occupational and Environmental Medicine. 2005;47(11):1141-7.

73.   Karasek R, Brisson C, Kawakami N, Houtman I, Bongers P, Amick B. The Job Content Questionnaire (JCQ): an instrument for internationally comparative assessments of psychosocial job characteristics. Journal of Occupational Health Psychology. 1998;3(4):322-55.

74.   Christensen JO, Knardahl S. Work and neck pain: a prospective study of psychological, social, and mechanical risk factors. Pain. 2010;151(1):162-73.

75.   Christensen JO, Knardahl S. Work and headache: a prospective study of psychological, social, and mechanical predictors of headache severity. Pain. 2012;153(10):2119-32.

76.   Finne LB, Christensen JO, Knardahl S. Psychological and social work factors as predictors of mental distress: a prospective study. PloS one. 2014;9(7):e102514.

77.   Ndjaboué R, Brisson C, Vézina M. Organisational justice and mental health: a systematic review of prospective studies. Occupational and Environmental Medicine. 2012;69:694-700.

78.   Elovainio M, Kivimaki, M., & Vathera, J.Organizational justice: Evidence of a new psychosocial predictor of health. American Journal of Public Health. 2002; 92:105-108.

79.   Christensen JO, Knardahl S. Work and back pain: A prospective study of psychological, social and mechanical predictors of back pain severity. European Journal of Pain. 2012;16(6):921-933.

80.   Sterud T. Work-related psychosocial and mechanical risk factors for work disability: a 3-year follow-up study of the general working population in Norway. Scandinavian journal of work, Environment & Health. 2013;39(5):468-76.

81.   Gray B. The emotional labour of nursing 1: exploring the concept. Nursing Times. 2009;105(8):26-9.

82.   Tyssen R, Vaglum P, Grønvold NT, Ekeberg Ø. The impact of job stress and working conditions on mental health problems among junior house officers. A nationwide Norwegian prospective cohort study. Medical Education. 2000;34(5):374-84.

83.   Clausen T, Karina N, Carneiro I, G , Borg V. Job demands, job resources and long-term sickness absence in the Danish eldercare services: a prospective analysis of register- based outcomes. Journal of Advanced Nursing. 2011:127-35.

84.   Verhaeghe R, Vlerick P, Gemmel P, Van Maele G, De Backer G. Impact of recurrent changes in the work environment on nurses' psychological well-being and sickness absence. Journal of Advanced Nursing. 2006;56(6):646-56.

85.   Kivimaki M, Elovainio M, Vahtera J. Workplace bullying and sickness absence in hospital staff. Occupational and Environmental Medicine. 2000;57(10):656-60.

86.   Roelen C, van Rhenen W, Schaufeli W, van der Klink J, Mageroy N, Moen B, et al. Mental and physical health-related functioning mediates between psychological job demands and sickness absence among nurses. Journal of Advanced Nursing. 2014;70(8):1780-92.

87.   Verhaeghe R, Mak R, Van Maele G, Kornitzer M, De Backer G. Job stress among middle-aged health care workers and its relation to sickness absence. Stress Health. 2003;19(5):265-74.

88.   Bourbonnais R, Mondor M. Job strain and sickness absence among nurses in the province of Québec. American Journal of Industrial Medicine. 2001;2(39):194-202.

89.   Trybou J, Germonpre S, Janssens H, Casini A, Braeckman L, Bacquer DD, et al. Job-Related Stress and Sickness Absence Among Belgian Nurses: A Prospective Study. Journal of nursing scholarship. 2014;46(4):292-301.

90.   Rugulies R, Christensen KB, Borritz M, Villadsen E, Bultmann U, Kristensen TS. The contribution of the psychosocial work environment to sickness absence in human service workers: Results of a 3-year follow-up study. Work & Stress. 2007;21(4):293-311.

91.   Tuchsen F, Christensen KB, Lund T. Shift work and sickness absence. Occupational Medicine. 2008;58(4):302-4.

92.   Tuchsen F, Christensen KB, Nabe-Nielsen K, Lund T. Does evening work predict sickness absence among female carers of the elderly? Scandinavian Journal of Work, Environment & Health. 2008;34(6):483-6.

93.   Ingelsrud MH. Reorganization increases long-term sickness absence at all levels of hospital staff: panel data analysis of employees of Norwegian public hospitals. BMC Health Services research. 2014;14:411.

94.   Bernstrøm VH, Kjekshus LE. Effect of organisational change type and frequency on long-term sickness absence in hospitals. Journal of Nursing Management. 2015;23(6):813-22.

95.   Natarajan S, Lipsitz SR, Rimm E. A simple method of determining confidence intervals for population attributable risk from complex surveys. Statistics in Medicine. 2007;26(17):3229-39.

96.   Miettinen OS. Proportion of disease caused or prevented by a given exposure, trait or intervention. American Journal of Epidemiology. 1974;99(5):325-32.

97.   Norges offentlige utredninger. Working for health. Sickness absence and exclusion in the health care sector (in Norwegian). Oslo: Ministry of Health and Care Services, 2010.

98.   Bang Christensen K, Lund T, Labriola M, Villadsen E, Bultmann U. The fraction of long-term sickness absence attributable to work environmental factors: prospective results from the Danish Work Environment Cohort Study. Occupational and Environmental Medicine. 2007;64(7):487-9.

99.   Laaksonen M, Pitkaniemi J, Rahkonen O, Lahelma E. Work arrangements, physical working conditions, and psychosocial working conditions as risk factors for sickness absence: Bayesian analysis of prospective data. Annals of Epidemiology. 2010;20(5):332-8.

100. Sterud T. Work-related mechanical risk factors for long-term sick leave: a prospective study of the general working population in Norway. European Journal of Public Health. 2014;24(1): 111-116.

101. Statistics Norway. Samordnet levekårsundersøkelse 2009- Tverrsnitt. Tema: Arbeidsmiljø. Report in Norwegian. Oslo: Statistics Norway, 2010.

102. Dallner ME, A.L., Gamberale, F., Hottinen, V. Knardahl, S., Lindstøm, K., Skogstad, A. & Ørhede, E. Validation of the General Nordic Questionnaire (QPS Nordic) for Psychological and Social Factors at Work; 2000

103. Orhede E. Nordic cooperation in research on the work environment. Scandinavian Journal of Work, Environment & Health. 1994;20(1):65-6.

104. Rothman K, Greenland S, Lash TL. Modern Epidemiology. Philadelphia: Lippicott Williams & Wilkins; 2008.

105. Rugulies R, Christensen KB, Borritz M, Villadsen E, Bültmann U, Kristensen TS. The contribution of the psychosocial work environment to sickness absence in human service workers: Results of a 3-year follow-up study. Work & Stress. 2007;.21(4):293-311

106. Tang K. A reciprocal interplay between psychosocial job stressors and worker well-being? A systematic review of the "reversed" effect. Scandinavian Journal of Work Environment and Health. 2014;40(5):441-56.

107. Ahrens W, Pigeot I. Handbook of epidemiology: Springer; 2005.

108. Ho PM, Peterson PN, Masoudi FA. Evaluating the Evidence Is There a Rigid Hierarchy? Circulation. 2008;118(16):1675-84.

109. Podsakoff PM, MacKenzie SB, Lee JY, Podsakoff NP. Common method biases in behavioral research: a critical review of the literature and recommended remedies. The Journal of Applied Psychology. 2003;88(5):879-903.

110. Spector PE. Method variance in organizational research truth or urban legend? Organizational Research Methods. 2006;9(2):221-32.

111. Rugulies R. Studying the effect of the psychosocial work environment on risk of ill-health: towards a more comprehensive assessment of working conditions. Scandinavian Journal of Work, Environment & Health. 2012;38(3):187-91.

112. Kompier M. Assessing the psychosocial work environment—" subjective" versus" objective" measurement. Scandinavian Journal of Work, Environment & Health. 2005:405-8.

113. Roelen CA, Koopmans PC, Schreuder JA, Anema J, van der Beek AJ. The history of registered sickness absence predicts future sickness absence. Occupational Medicine. 2011;61(2):96-101.

114. Lahelma E, Laaksonen M, Aittomaki A. Occupational class inequalities in health across employment sectors: the contribution of working conditions. International Archives of Occupational and Environmental Health. 2009;82(2):185-90.

115.   Vingard E, Lindberg P, Josephson M, Voss M, Heijbel B, Alfredsson L, et al. long-term sick-listing among women in the public sector and its associations with age, social situation. Scandinavian Journal of Public Health. 2005;33(5):370-5.

116.   Messing K, Punnett L, Bond M, Alexanderson K, Pyle J, Zahm S, et al. Be the fairest of them all: challenges and recommendations for the treatment of gender in occupational health research. American Journal of Industrial Medicine. 2003;43(6):618-29.

117.   Kamangar F. Confounding variables in epidemiologic studies: basics and beyond. Archives of Iranian Medicine. 2012;15(8):508.

118.   Moens G, Van Gaal L, Muls E, Viaene B, Jacques P. Body mass index and health among the working population. The European Journal of Public Health. 1999;9(2):119-23.

119.   Gustavson K, von Soest T, Karevold E, Røysamb E. Attrition and generalizability in longitudinal studies: findings from a 15-year population-based study and a Monte Carlo simulation study. BMC Public Health. 2012;12(1):1-11.

120.   Hill AB. The environment and disease: association or causation? Proceedings of the Royal Society of Medicine. 1965;58(5):295.

121.   Clausen T, Nielsen K, Carneiro IG, Borg V. Job demands, job resources and long-term sickness absence in the Danish eldercare services: a prospective analysis of register-based outcomes. Journal of Advanced Nursing. 2012;68(1):127-36.

122.   Maslach C, Jackson SE. The measurement of experienced burnout. Journal of Organisational Behavior. 1981;2(2):99-113.

123.   Borritz M, Rugulies R, Bjorner JB, Villadsen E, Mikkelsen OA, Kristensen TS. Burnout among employees in human service work: design and baseline findings of the PUMA study. Scandinavian Journal of Public Health. 2006;34(1):49-58.

124.   Christensen KB, Nielsen ML, Rugulies R, Smith-Hansen L, Kristensen TS. Workplace levels of psychosocial factors as prospective predictors of registered sickness absence. Journal of Occupational and Environmental Medicine / American College of Occupational and Environmental Medicine. 2005;47(9):933-40.

125.   Roelen CA, Koopmans PC, Bultmann U, Groothoff JW, van der Klink JJ. Psychosocial work conditions and registered sickness absence: a 3-year prospective cohort study among office employees. International Archives of Occupational and Environmental health. 2009;82(9):1107-13.

126.   Nielsen MB, Einarsen S. Outcomes of exposure to workplace bullying: A meta-analytic review. Work & Stress. 2012;.26(4):309-332

127.   Voss M, Floderus B, Diderichsen F. Physical, psychosocial, and organisational factors relative to sickness absence: a study based on Sweden Post. Occupational and Environmental Medicine. 2001;58(3):178-84.

128. Nielsen ML, Rugulies R, Smith-Hansen L, Christensen KB, Kristensen TS. Psychosocial work environment and registered absence from work: estimating the etiologic fraction. American Journal of Industrial Medicine. 2006;49(3):187-96.

129. Northridge ME. Public health methods--attributable risk as a link between causality and public health action. American Journal of Public Health. 1995;85(9):1202-4.

130. Milczarek M. Workplace violence and harassment: a European picture: Publications Office of the European Union; 2010.

131. Yang L-Q, Spector PE, Gallant-Roman M, Powell J. Psychosocial precursors and physical consequences of workplace violence towards nurses: a longitudinal examination with naturally occurring groups in hospital settings. International Journal of Nursing Studies. 2012;49(9):1091-102.

132. Melin B, Lundberg U: A biopsychosocial approach to work-stress and musculosketal disorders. Journal of Psychophysiology. 1997;11(3):238-247

133. Merkus SL, van Drongelen A, Holte KA, Labriola M, Lund T, van Mechelen W, et al. The association between shift work and sick leave: a systematic review. Occupational and Environmental Medicine. 2012;69(10):701-12.

134. Kjekshus EL, Bernstrøm VH, Dahl E, Lorentzen T. The effect of hospital mergers on long-term sickness absence among hospital employees: a fixed effects multivariate regression analysis using panel data. BMC Health Services Research. 2014;14:50:1-10.

135. Sterud T. Work related gender differences in physician-certified sick leave: a prospective study of the generel working population in Norway. Scandinavian Journal of Work Environment and Health. 2014;40(4):361-9.

136. Labriola M, Holte KA, Christensen KB, Feveile H, Alexanderson K, Lund T. The attribution of work environment in explaining gender differences in long-term sickness absence: results from the prospective DREAM study. Occupational and Environmental Medicine. 2011;68(9):703-5.