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Work Related Risk Factors and Disability Pension in the Nordland Health Study

Thesis for the degree of Philosophiae Doctor

Trondheim, Autumn 2013

Norwegian University of Science and Technology
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Arbeidsrelaterte årsaker til uføretrygding

Avhandlingen undersøker lokale, kontekstuelle årsaker til uføretrygding, og fokuserer på tre dimensjoner; risiko for uføretrygd etter *arbeidsledighet*; *forskjeller mellom kommuner* i risiko for uføretrygding, og rehabiliteringslengde før uføretrygding; samt *arbeidsmiljøfaktorer* som risiko for uføretrygding.

Helse i form av sykdom og skade er en forutsetning for å bli uføretrygdet, og det er blitt forsket mye på individuelle helseaspekter som risikofaktorer for uføretrygd. Hvis årsakene til uførhet også skyldes faktorer på arbeidsplassen eller i nærmiljøet, vil en slik individualistisk tilnærming være utilstrekkelig. Det er derfor viktig med studier som ser på helse og individuell risiko i et større rammeverk.

Data er hentet fra Nordlandsundersøkelsen, som var en del av Statens helseundersøkelser for 40-42-åringer. Data fra denne undersøkelsen kobles med informasjon fra FD-trygd og oppfølgingstiden er fra 1992-2007.

Resultatene viser at arbeidsledighet og muligheter på arbeidsmarkedet kan være medvirkende faktorer til økningen i andelen mennesker på uføretrygd i oppfølgingsperioden, men også at helse og sosioøkonomisk status synes å være en felles årsak til både arbeidsledighet og uføretrygd. Det er små forskjeller mellom kommunene i risiko for uføretrygding, samt lengde på rehabilitering for de som endte opp med uføretrygd. Arbeidsmiljøfaktorer kan være medvirkende årsaker til uføretrygd, men selvrapportert arbeidsmiljø ser også ut til å være relatert til egen helse.

Ovennevnte avhandling er funnet verdig til å forsvares offentlig for garden PhD i samfunnsmedisin. Disputas finner sted i Auditoriet Medisinsk teknisk forskningssenter (MTA) fredag 22. november 2013.

PREFACE

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Trondheim, November 2013

Morten Støver

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1. Introduction

This dissertation investigates local contextual risk factors for disability pensioning. Three dimensions are explored, the risk of disability after *unemployment*; *differences between municipalities* in the risk of receiving a disability pension as well as in length of rehabilitation before receiving disability pension; and the importance of characteristics of the *work environment* (physical and psychosocial). Individual health, in terms of illness, injury or disability, is a prerequisite for being granted a disability pension, and individual health-related risk factors for disability pension have been studied extensively (1). If the causes of work disability are also inherent in the structures of local communities and/or in the work environments, an individualistic approach may be insufficient. Thus, it is important with studies that put health and individual risk in a contextual framework.

This thesis is consists of three papers. Paper I investigated the association between unemployment and subsequent disability pension, and the importance of local contextual risk factors measured as the differences in disability risk between municipalities (2). Paper II investigated predictors of length of rehabilitation time among those who received disability pension (3). This article also assessed municipality differences. Paper III assessed physical and psychosocial risk factors at the work place and the risk of subsequent disability pension (4). In all three papers, individual health at baseline was accounted for.

The studies in this thesis used a questionnaire from the Nordland Health Study performed in 1988-89 (5). Although there has been previous research concerning the issues of unemployment and work environmental factors as risk factors for disability pension, the studies presented in this thesis have baseline health information and were conducted in a heterogeneous study area that has undergone many structural and social changes during the follow-up period. With a follow-up time of 18 years, the studies presents additional knowledge on issues that have been studied earlier, as well as adding new information on risk factors, and combinations of them, that to a minor degree have been acknowledged previously.

2. Background

2.1 Disability pension in Norway

In Norway, about one out of ten members of the workforce receives a disability pension (6). This places Norway among the countries with the highest working disability prevalence in Europe. Work disability is a major challenge all over Europe, and until the recent recession that struck the labour market in 2008, disability pension had a much higher prevalence than unemployment across the OECD countries (7). With the changing demographics and an ageing population, European countries will face an increasing challenge in keeping employees healthy and longer participating in the labour market. The increasing number of people who are granted a disability pension is an important issue for policy makers. It represents an economic challenge for society, contributes to a widening of socioeconomic inequalities in the population (8), and leads to social and economic decline at the individual level. When considering this challenge for the society and the welfare state, it is important to examine risk factors on several levels. Risk factors on the personal level can be health, diseases, lifestyle and education. Risk factors in the workplace can be the physical and psychosocial work environment, including the possibility of adjusting one's job duties when pain, injury or disease occurs. On other levels, social position, social security, place of residence, and availability of jobs can be risk factors for disability pension.

The disability pension was introduced in 1961 and included everyone of working age (from 1967 all residents in Norway), regardless of level of income (9). Despite later reforms, the basic characteristics of the disability pension have always been the same; the Norwegian disability pension is part of a national insurance system funded by a compromise between the insurance principle and the tax principle, and it partly works as a vertical redistribution from the rich to the poor. It is universal, and it is only to a minor degree a means-tested benefit, which means that both rich and poor have the same rights (10). All residents with residence permit in Norway are members of the National Insurance Scheme. This government social security grants people the right to disability pension, and other social benefits.

The Norwegian disability pension

Disability pension in Norway is universal and is granted to all applicants, regardless of their having been previously employed or not, whose ability to work is permanently reduced primarily because of "illness, injury or disability" (9).

Who can receive the disability pension?

Eligibility for a disability pension depends on meeting the following conditions:

- The applicant must be between 18 and 67 years of age
- The applicant must have been a member of the national insurance scheme for at least three years
- The illness, injury or disability must be the main reason for the impaired earning ability
- The applicant must have undergone appropriate medical treatment and rehabilitation in order to improve his or her earning ability.
- The applicant's ability to work must be permanently reduced by 50% or more

During the 70s and 80s there was a gradual expansion of the medical disease concept to accepting illnesses combined with more liberal practices, which have been suggested as causing an increase in the granting of disability pensions (9). Through the 90s there were several legal amendments, through which the authorities attempted to reduce the inflow into the disability pension (11). In 1991, a regulation demanding the medical condition as the main reason for the reduced work capacity was introduced. The regulations legally established the acceptable illnesses, injuries and disabilities in terms of inborn defects. For diseases without objectively diagnosed symptoms, it became more difficult to fulfil the medical requirements for disability pension approval (12). This resulted in an increase in rejections from 8 to 18.5 per cent from 1988 to 1992 (12). A court ruling in 1994 resulted in modifications to the previous regulations in 1995, after which diseases without objectively diagnosed symptoms could be accepted without the previous rule of "broad medical professional agreement" that had been introduced in 1991. Still, the new legal amendment emphasised that social and economic problems alone did not qualify people for disability pension (12).

In later years, there have also been several changes in the National Insurance Scheme to provide incentives for people who already have a disability pension to return to work. One

example is the possibility of attempting to return to work without losing the right to the disability pension. Before 1997, disability pension recipients could return to work for a year without a new assessment of their work capacity, and this was later increased to three years in 1997 and five years in 2006 (9). In 2001 new economic rules were introduced that allowed disability pension recipients to earn more adjacent to their pension (13). Several financial incentives for employers who are willing to hire disability recipients who want to test their work capacity have also been introduced (14). Despite the flow of different enticements, very few disability recipients have been able to return to work (12).

2.2 Time trends in the use of disability pension, 1992-2007.

Figure 1 presents the prevalence and incidence rates in Norway during the time period 1992-2007. Incidence is a measure of the risk of developing a new condition (disability pension) within a specified period of time. The incidence rate is measured as new disability recipients per 1000 person years. The prevalence is the proportion of the population that was found to have disability pension at one time point. The decrease in prevalence and disability rates from 2004 onwards was mainly a result of the introduction of the time-limited disability pension introduced the same year. The disability prevalence in 2007 was 11 per cent when the time-limited disability pension was included (www.nav.no). The time-limited disability pension was discontinued in 2010, and is now a part of the work assessment allowance.

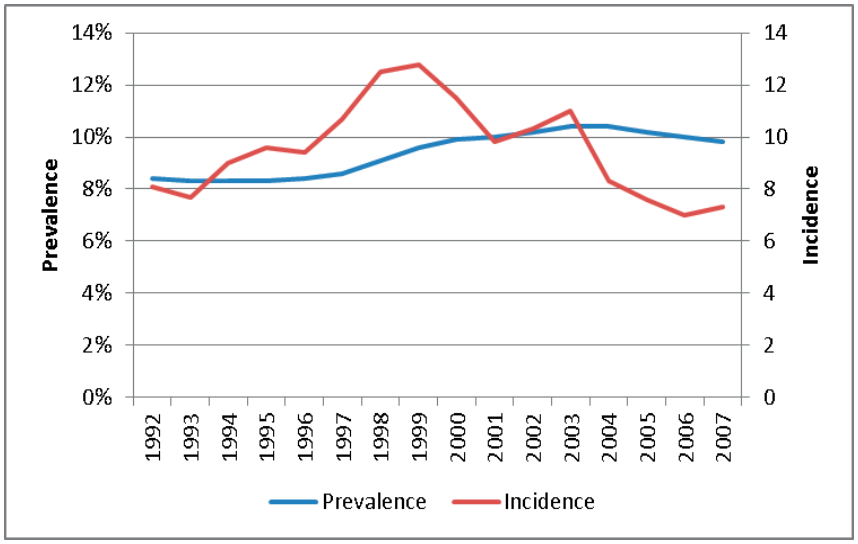

Figure 1: Disability pension 1992-2007. Prevalence in % and incidence rates per 1000 person years. In 1998 the minimum age for receiving disability was raised from 16 to 18 years of age.

A considerable part of the growth in work disability is related to the aging population (15). Because of the general decrease in health as age increases, receiving a disability pension is more common among the oldest age groups.

Although older people are the majority of those receiving disability pensions, younger age groups have had the highest relative increase in receiving disability pension in the last decade. Tables with the prevalence and incidence rates for different age groups are presented in appendix 3.

A Norwegian study has, however, questioned the real influence of the aging population on work disability because the level of education has increased in the same period (16). People of low socio-economic status (17-19) and those with low level of education (20-23), income (24) have a higher risk of receiving a disability pension than those with higher socio-economic status, education and income. Low social status can work through several mechanisms, such as poorer health, poorer health behaviour, reduced access to health care, and working at occupations with higher health risks than those faced by people with higher social status.

Since the mid 70s, more women than men have received disability pension and a number of suggestions have been put forth to explain this. Women tend to rate their health slightly poorer than men (25). In Norway, the proportion of women participating in the labour force has increased from 60 % in 1979 to 75 % in 2009, and one possible explanation is the entry of less healthy women into the labour market (26). Another possible explanation is that women are more often occupied in the health and social sectors, which are known to have high inflows to disability pension (27, 28). Others have discussed parenthood (29) and suggested that women have a "double burden" in combining family and work (30), because women's integration into the labour market happened without a corresponding decrease in their share of family and household duties.

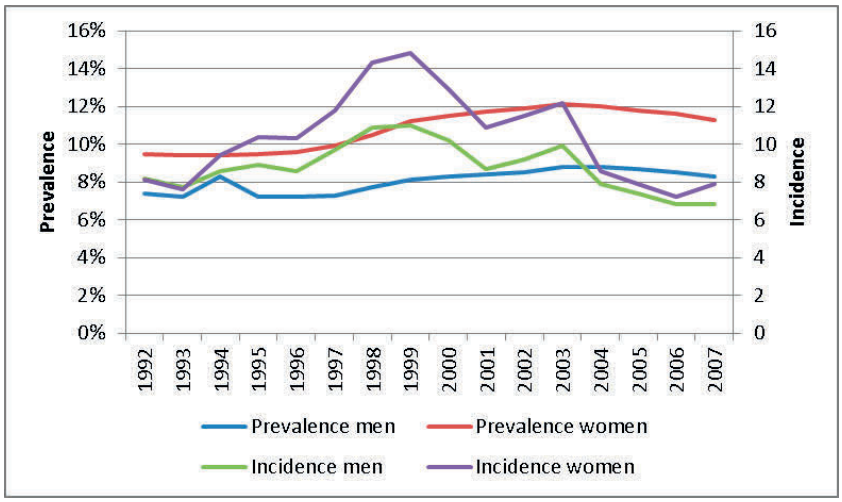

Figure 2: Disability pension for men and women 1992-2007. Prevalence in % and incidence rates pr 1000 person years.

Although the proportion of people who consider their health to be good has been stable over the last decades (25), the diagnostic reasons for disability have changed. Disability pensions have most often been legitimated by musculoskeletal and mental diagnoses. Although musculoskeletal diagnoses have been most common in Norway, mental disorders have had the strongest increase in the last decades, especially in the youngest age groups (31). A Norwegian report that analysed new cases of disability pension approvals from 1992 to 2003 disclosed that whereas in 1992, 18.2 % of new disability pensions were granted on the basis of a primary diagnosis of a mental health issue, this number increased to 24.4% in 2003 (31). The same pattern is found in other countries (32), and some of these mental disorders are now the most common reasons for receiving a disability pension (33). This is of particular concern

because these diagnoses more often affect people in early adulthood and thus cause people to lose more productive years because of work disability. In a Norwegian study of people under the age of 40, women with low levels of income and musculoskeletal disorders, and men with mental disorders had the highest risk of receiving a disability pension (24).

Another explanation for the increase in the number of disability pension recipients may be found in changes in the labour market. Several studies have indicated considerable differences in risk of disability pension requests between occupational groups: unskilled manual workers have been shown to be at greater risk for receiving disability pensions than are professionals (20, 34), and blue-collar workers are at greater risk than are white-collar workers (21). Studies from Denmark (35) and Sweden (36) have also indicated considerable differences between occupational groups. Recent numbers from the Norwegian Labour and Welfare Service revealed considerable differences in disability incidence between occupational groups. For people working in the primary industries, transport and education, 1.8 to 1.9% left the labour market in 2009, in contrast to the mining, finance, information and communication services industries, in which 0.5 to 0.8% of employees were granted disability pensions in the same year (37). A Norwegian report on changes in industrial structure showed that through the last decades, a growing number of people have been employed in the service industries, while there has been a decrease of people employed in industry, forestry, agriculture and fishing (38).

A recent report concluded that even though the total numbers of disability pension recipients has increased the last years, the prevalence of people receiving disability pension has been stable since 2009. The report also showed that the proportion of younger people under 25 years of age receiving disability pension is increasing while the proportion of the oldest age groups is decreasing (39).

2.3 Unemployment and disability pension

Statistics Norway defines unemployment as persons without income-earning employment who attempt to gain employment, and who could start an employment immediately.

Unemployment rates are the numbers of unemployed in per cent of the total work force (www.ssb.no).

Several studies have indicated that organisational downsizing and unemployment are associated with subsequent disability pension (40-43). A Norwegian study (44) suggested that higher demands for education, efficiency and mobility have been contributing factors to the increase in the number of people excluded from the labour market. Figure 3 presents the prevalence of unemployment and disability pension in Norway during the follow-up time for the studies presented. Whereas unemployment has decreased from nearly 6 to about 2 per cent of the total work force, disability prevalence rates have risen from around 8 to 11 per cent in the same period. The opposing trends in disability and unemployment might indicate that in some cases, work disability may act as a substitute for unemployment and that work disability may not be strictly a function of medical conditions, but rather may stem from a combination of health problems and poor employment opportunities (16). There have been several Norwegian studies suggesting that unemployment may be an important factor in labour market detachment which ultimately leads to disability pensioning (42, 45, 46).

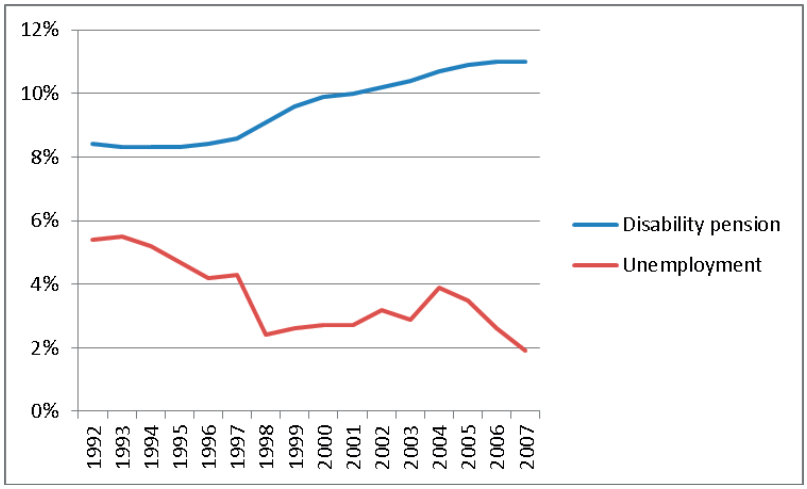

Figure 3: Prevalence of unemployment (number of unemployed divided by the number of the total work force) and disability pension in Norway 1992-2007. Disability pension prevalence includes time-limited disability pension from 2004).

The association between unemployment and risk of disability pension may also be confounded by ill health, socioeconomic and work place factors. Several studies have indicated a positive association between unemployment and poor health (47-52).

Employment normally means more economic independence, and it increases social status and social support. These are benefits that may translate to better self-identity, health and well-being (53, 54). Likewise, several studies have demonstrated an association between unemployment and poor health (55, 56), where good health is likely to increase the chances of finding and keeping a job. People with diseases and disabilities may have more problems maintaining or obtaining employment.

A Norwegian study (27) investigated employed persons between 30 and 55 years of age in 1992, and their risk of receiving a disability pension in 2003. The results revealed that the risk for becoming a disability pension recipient was higher for those who had experienced workforce cuts. The authors suggested that roughly 5 per cent of the inflow to disability pension between 1992 and 2003 could be attributed to workforce cuts. Another Norwegian study investigated the effect of workplace downsizing on disability pension (42). The study showed that workplace downsizing increased the disability entry rate of workers in the affected work establishments substantially. Those employed in establishments that were closed between 1993 and 1998 were 28 per cent more likely to receive a disability pension in 1999. Those who were employed in establishments with a 65 to 95 per cent staff reduction were more likely to receive disability pension than were those who had been originally employed in establishments that were fully closed. Other Norwegian studies have also indicated that losing one's job is associated with an increased risk of a permanent detachment from the labour market (43, 57).

In Norway, as in many other countries, a reduction of disability pension use is an important political issue. In 2001, a programme was started called "Inclusive Workplace"; it was a collaboration between the authorities and major labour market partners with the aim of reducing the outflow from the labour market into health-related benefits and early retirement programmes. Since this collaboration began, Norway has had a period of very low unemployment, varying from 1.7% to 3.9% between 2001 and 2009; at the same time the numbers of work-related disabilities have increased. These numbers, and the recent economic recession, argue for an increased focus on preventing further inflows from unemployment into work disability.

2.4 Geographical differences in disability pensioning

In Norway, 7.4 % of the inhabitants of Akershus county received a disability pension in 2007, and the prevalence was nearly twice as high in other counties with almost 12.7 % in Nordland County as the most extreme. The differences between municipalities and counties have been relatively stable over time (58). Figure 4 shows the time trends in the counties with the highest and lowest prevalence of disability pension recipients from 1992 to 2007. Tables with the prevalence and incidence rates for all counties in the study period are presented in appendix 3.

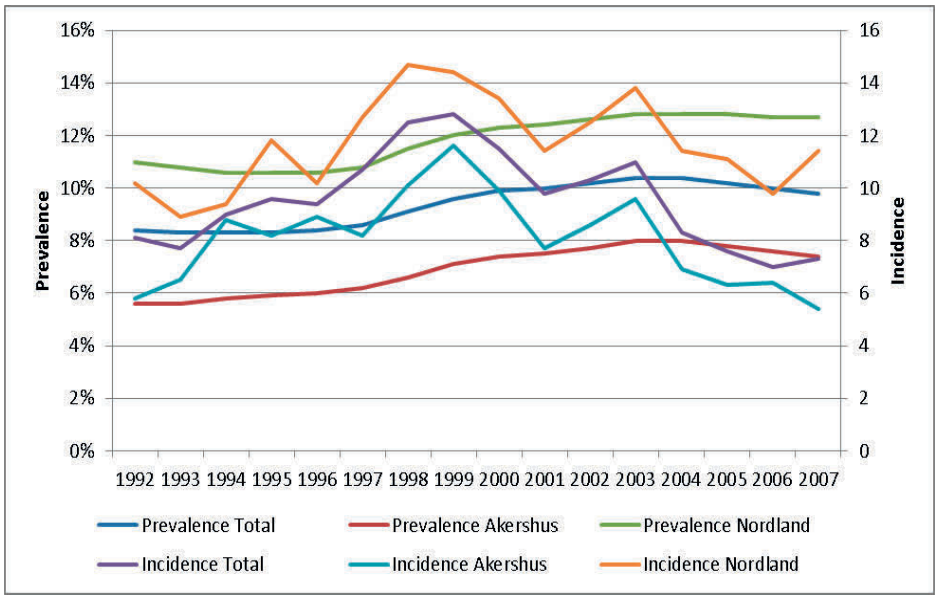

Figure 4: Prevalence of inhabitants receiving disability pension for the country as a whole and for Akershus and Nordland County from 1992 to 2007. Prevalence in % and incidence rates pr 1000 person years.

The counties are of different compositions concerning age, and using age-standardised prevalence, gives a somewhat different picture (59). Whereas Nordland (11.7 %) is among the counties with the highest prevalence, Østfold (11.8 %), Vest-Agder (11.8 %), Aust-Agder (11.9 %), and Finnmark (12.2 %) all have higher proportions of disability pension recipients.

Using age-standardised prevalence, Akershus (7.3 %) is still the county with the lowest proportion of disability pension recipients.

A report from the Norwegian directorate for work and welfare has analysed the effect of the local work markets in municipalities on inflow into disability pension (58). Their analysis showed that during positive economical conjectures, an increase in local unemployment rates lead to increased inflow to disability pension three years later. This was the case for women only, and the authors suggested that this was because women are less mobile than men because of family obligations. There is also a positive association between disability pension and the expenditure of social security benefit and sick leave pay (58). Changes in education levels in the municipalities or changes in the income level of the municipalities did not seem to have an influence on disability pension inflow. Migration to the municipalities was negatively associated with disability pension inflow, suggesting that positive demographic changes stemming from migration most likely contributes to a younger and healthier population at risk (58).

Possible administrative conditions also have a potential influence on differences in work disability between municipalities. Furthermore, an accumulation of disability pension applications, or periods of intensive focus on processing outstanding applications, can determine in which year people are registered as disability pension recipients, this can also contribute to increased variation within the municipalities over time (58).

Because local employment and welfare offices to a certain degree can use discretion when deciding whether a disability pension is granted or refused, it is likely that knowledge of local employment opportunities will have an influence. Although the evaluation of the casual relationship between health impairment and reduced work ability should be independent of age, employment opportunities or other social factors, the subsequent assessment of the disability level should be determined based on a total evaluation of the person's ability to obtain paid employment (11). In practice, this means that the regulations leave room for variations between municipalities owing to employment opportunities, vocational rehabilitation potential, etc.

Some authors have suggested that local differences in attitudes towards disability pension can result in differences between areas (60). In a municipality where there is common acceptance

of disability pension there can be a lower threshold for applying for a disability pension than in a municipality in which paid employment is more important for social acceptance. Rege et al. (60) suggested a social interaction effect in disability pension participation, whereby a person's propensity to receive a disability pension might be affected by the number of disability recipients in his or hers neighbourhood.

A Swedish study (61) on the importance of macro-organisational factors found a positive relationship between receiving disability pension and sparsely populated areas. A study from a mid-Swedish county (62) demonstrated considerable geographical variations in praxis of rejection of applicants between Social Insurance boards in different areas for reasons other than medical. Studies by Anderson et al. (63, 64) showed that whereas individuals living in semi-rural regions in Norway was more likely to receive disability pension for psychiatric disorders compared with people living in urban areas, Swedes living in urban areas had the highest risk of being work disabled for mental disorders.

Different possible explanations for the geographical differences in disability rates have been suggested (65). Compositional explanations relate to differences in the populations at risk where the risk of work disability could be a result of a population with a higher age, poorer health or lower level of education or income. Contextual explanations refers to features of the social, political or economic environment that influence the health and work ability of the inhabitants, such as health services, settlement patterns, size, central situation, economic prosperity, employment opportunities and levels of unemployment. Contextual characteristics will also have different implications for the populations (58). Low income levels could be less of a disadvantage in municipalities with low living expenses and good public services, and a particular medical condition might be less disabling in a municipality with a good health service or good employment opportunities.

A Norwegian study (66) found a higher risk of work disability among people living in deprived municipalities. Bratberg et al. (67) investigated individual and contextual predictors of work disability among people sick-listed with a psychiatric diagnosis, and found that the contextual effect of county deprivation had a marginal effect on women only. A Danish study that investigated the risk of labour market exclusion for ischemic heart disease concluded that regional characteristics had an independent effect on labour market exclusion (68).

A report from the Norwegian Labour and Welfare Administration, NAV, presented substantial differences in disability pension prevalence between both counties and municipalities (58). Numbers from 1997 to 2004 show differences between municipalities according to main industries; the most centrally situated municipalities dominated by service industries and also the municipalities dominated by manufacturing have considerably lower incidence of disability pension, whereas those dominated by agriculture and fishing have considerably higher incidence rates of disability pension participation compared with overall Norwegian figures.

Based on what is known about the consequences for people affected by reorganisations and workplace cuts and closings, it seems likely that municipalities that are affected by work market recessions will have greater inflows to disability pension in the following years. Although the local work market in most cases is larger than the municipality itself, it is most likely that the effect of a workplace shutdown is most prominent for the unemployment rates and disability inflow in the municipality where the company is situated. Depending on the national work market, an increase in local unemployment rates, can contribute to a migration from the municipality (58). Studies have showed that net migration to a region increases when unemployment numbers decrease and numbers of vacancies increase (69).

Although there have been geographical differences in disability pension granting, few studies have investigated these differences within a multi level analytical framework while taking into account both individual and municipality variability in the propensity to receive a disability pension.

2.5 Rehabilitation and disability

When people in Norway leave the labour market and ends up receiving a disability pension, the majority, who do not have serious diseases or injuries, follow a programme that starts with a one-year sick leave, including appropriate medical examinations and treatment, as well as individualised and appropriate vocational rehabilitation (VR) to improve their wage-earning capacity. The length of the rehabilitation process with the medical treatment is a factor that

can influence the incidence rates for receiving disability pension, and this is an issue that to a minor degree has been acknowledged previously. Vocational rehabilitation is a multidisciplinary intervention defined as "medical, psychological, social and occupational activities aiming to re-establish among sick or injured people with previous work history their working capacity and prerequisites for returning to the labour market, i.e. to a job or availability for a job" (70). A VR programme can address vocational assessment, work retraining, education, counselling, work guidance and other forms of preparation for returning to work. In an attempt to reduce the inflow to disability pension, the Norwegian government has increased its funding of the vocational rehabilitation programme (71).

Although the critical factor when people struggle to return to work after a rehabilitation process is the participant's health and work ability, other demographic factors can influence on whether the rehabilitation process succeeds or not. Studies have demonstrated that low local and national unemployment rates increased the probability of returning to work (72-74).

In Norway, each municipality has an employment and welfare office that organizes social welfare decisions. Each municipality also has the responsibility to provide primary health care to its citizens. Although the rules and regulations pertaining to rehabilitation and disability pension are uniform and valid throughout the country, the legislation on vocational rehabilitation functions as a framework law, and the welfare offices can exercise discretion in the rehabilitation process. Factors that may differ between municipalities are the quality of the health care and the medical rehabilitation and local labour market prospects. The employment and welfare offices may put more effort into finding and providing more opportunities for rehabilitation for people with better prospects in the labour market, and disability pensions may be approved more quickly when labour market prospects indicate that a return to work is less likely. A Swedish study on outcomes of vocational rehabilitation in six local national insurance offices in the same county showed major differences in sickness allowance, return to work and disability pension approval (75) Another study demonstrated that people living in rural areas were less likely to return to work (76). This suggests that whether the rehabilitation process is a success or not, may to some extent, be attributable to the participant's place of residence.

2.6 Work environment and disability pension

People spend a considerable amount of time waking hours at the workplace. The workplace may influence people's health by exposing them to physical conditions that have health effects, and also by providing a setting where healthy activities can be promoted (77). Hence, worksite features, the nature of the work and how it is organised could be of importance when assessing possible mechanisms for workforce exclusion (78, 79). A poor work environment can result in poor health, injury or diseases or indirectly if a poor work environment makes it more difficult to maintain work ability when health or levels of functioning are already reduced. Thus a prolonged imbalance between health resources and work environment may lead to loss of work ability and early retirement for work disability.

A theoretical contribution that has had a major influence on the research on work environment is Karasek's demand-control model (80). The model has two dimensions: the degree of the stressful events and their consequences on health and the degree of independence or autonomy in the working situation. The main idea behind the job demand-control model is that control buffers the impact of job demands on strain and can help enhance employees' job satisfaction with the opportunity to engage in challenging tasks and learn new skills. According to the model, the combination of high demand and lack of control will possibly result in high sick leave absence (81). High demand and high control, on the other hand, can positively influence the employees' perceptions of the work environment (82).

Previous research has revealed considerable differences between occupational groups (20, 34) and occupations (35, 36) in the risk of medically based disability pension, and this suggests that characteristics of the workplace might be contributing to work disability. Thus, identification of risk factors in the workplace is needed to target intervention aimed at reducing the disability pension rates. Among physical work environmental factors that have been linked to work disability, are heavy physical work (20, 78, 81, 83), monotonous work (84), whole-body vibrations (85), poor ergonomic work environment (86), work in uncomfortable positions, long working hours, noise at work, and repetitive muscle strain (78).

Indicators of the psychosocial work environment have also been studied in relation to work disability – including interpersonal conflicts (84), poor job satisfaction (87), mental job strain

and lack of social support from supervisors (78). Furthermore, research has revealed a higher risk for disability pension for people with part-time work (20), shift work (88, 89), those who experience transition from public to private sector (90), those who experience high strain (91, 92), low control (81), low control over working times (93), low skill discretion (79), low decision authority (20, 94) and low variation in work (84, 94), and those with non-stimulating work (95).

The studies suggest that when individual health and resources are in balance with the requirements of the working environment, work ability is more likely to be sustained, and that if the physical and mental demands of work increase and working conditions deteriorate; work ability might be compromised. The studies indicate that a satisfactory working environment is important for employee health, and that focus on work environmental factors can be important both improving the health and recovery of injured workers, and also to protect healthy workers by studying the prevention of work-related injury and illness.

Despite the large number of studies on work environment and disability participation, the existing evidence is somewhat limited, since the findings seem inconclusive. A recent Danish study investigated a number of both physical and psychosocial work environmental factors. Despite the inclusion of several work factors that had previously been associated with disability pension, this study could only identify job insecurity and standing work as risk-factors for disability pension (28). A review of various work environmental risk factors only found moderate evidence for the impact of low job control on disability pension, and limited evidence for the impact of physically demanding work (96).

A recent study by Lahelma et al. (81) summarised the previous research and concluded that comprehensive work environment frameworks are lacking. Although several studies have revealed associations between various physical and psychosocial work environmental factors and disability pension, many have investigated only single-factor exposures (84, 85, 87) or focused on either the physical or the psychosocial work environment while neglecting the other (83, 86, 88, 91). Moreover, the researchers argued that proper adjustments for well-known risk factors such as socio-economic status health and health behaviour often are lacking in these kinds of studies. Health is important because it might influence the choice of or the possibilities for occupation. As a conclusion, the authors call attention for a more comprehensive work environment framework in future research.

3. This dissertation's objectives

The aim of this dissertation is to investigate local contextual risk factors for disability pensioning. Three dimensions are explored, namely, the risk of disability after *unemployment*, *differences between municipalities* in the risk of receiving a disability pension as well as in rehabilitation length before receiving the disability pension, and the importance of the characteristics of the *work environment* (physical and psychosocial). In addressing these issues we had longitudinal data from 1988 with baseline information about health and the working environment. We adjusted for baseline health, health behaviour and education, all well-known risk factors for disability pension. Three papers are presented.

- Paper I investigated the association between unemployment and possible contextual effects at the municipality level, and subsequent disability pension.
- Paper II investigated to what extent the length of time of vocational rehabilitation before receiving the disability pension was associated with characteristics of the individual or the local employment office, measured as municipality variance.
-Paper III investigated physical and psychosocial risk factors for disability pension at the workplace.

All studies used a cohort that was 40-42 years old at baseline that was followed from 1992 to 2007.

4. Materials and methods

4.1 The Nordland Health Study.

All of the papers in this dissertation usde data from the Nordland Health Study. In the period from 1985 to 1999 several national health screenings were carried out among 40 to 42-year-olds in all 19 counties in Norway. The health screenings focused mainly on diseases associated with smoking, hypertension and hypercholesterolemia, particularly myocardial infarction and stroke (97, 98). In some counties, it was possible for local health authorities or research groups to add questionnaires and clinical examinations (5). The Nordland Health Study was a part of the national plan for national health screening and the main phase of the screening was carried out from August 1988 to March 1989. Prior to this, a personal letter with an invitation and two questionnaires was sent to each person. The first questionnaire was similar to that used in other county surveys (99) and covered topics including myocardial infarction and angina pectoris, symptoms pointing towards cardiovascular disease, physical activity, diet, smoking and occupational status. The subjects who participated in the screening were asked to fill out an extra questionnaire covering a wide range of information including demographic information, self-rated health status, chronic diseases, pain in the neck and shoulders, use of health care services, social network, lifestyle including diet and physical activity, psychological problems, and work environment (5). The supplementary studies were initiated by local health authorities and the University of Tromsø (5).

Some 10,497 persons, 5,492 men and 5,005 women were invited to the screening. A total of 4,302 men and 4,310 women attended, giving an attendance rate of 78% and 86% for men and women respectively. Of the 10,497 people eligible for the survey, 990 were excluded because they had received their disability pension before the start of the follow-up. A total of 1,522 (16%) of the remaining persons did not answer the questionnaires, leaving us with 7,985 participants for follow-up in paper 1. A total of 2,533 respondents received disability pension during the follow-up period, and these persons were included in paper II. A total of 5,749 persons were employed, and included in paper III. The participants were followed from January 1, 1992, through December 31, 2007.

4.2 The FD-Trygd database

All studies in this thesis used data from FD-Trygd (100). FD-Trygd is a Norwegian historical event database containing information from the whole population beginning in 1992. Information in the database consists of registrations of different events in each personal life span and includes several topics such as demography, migration, social status and education, use of social security benefits, employment, unemployment and income.

In paper I and III, the dependent variable was the first day of work disability. This is defined as the date when a person's earning ability was permanently reduced. In most cases, this date represents the first day of a long-term consecutive sickness period without a subsequent return to work.

In paper II, the dependent variable was the duration of the rehabilitation period before the respondents received the disability pension. The study measured the time span between the first date of the disability pension and the time for the actual granting of the disability pension. The time for granting disability pension is normally set to three months ahead of the date of application for disability pension.

4.3 Study variables

All three papers presented used information on baseline health, health behaviour and socio-economic status.

Health

Baseline health status was assessed using a summation index of the number of self-reported chronic illnesses (yes/no), including the following conditions: myocardial infarction, angina pectoris, stroke/cerebral infarction, diabetes, high blood pressure, chronic bronchitis, arthritis, Bechterew's disease, cancer, epilepsy, migraine and gastro intestinal symptoms. Self-rated health status was assessed by the question, "what is your health condition like?" The question had four answer categories: "Very good", "Good", "Fair" and "Poor". Depression was assessed by the question, "have you been sad or depressed the last 14 days?" and the four

answer categories ranged from "almost all the time" to "never or rarely". Headache and pains in the neck and shoulders were measured with a four-point scale, ranging from "never/rarely" to "daily".

Health behaviour

Health behaviour was assessed by self-reported alcohol use and smoking habits. Alcohol use was assessed on a four-point scale, ranging from "non-drinker" to "daily drinker" Smoking was assessed on a three-point scale with the responses of "non-smoker," "former smoker" and "smoker".

Socio-economic status

Education was used as a measure of socio-economic status and was categorised as primary school, high school, or college/university. Information on education was taken from the National education database (101).

Unemployment

Paper I was based on unemployment data from the FD-Trygd database. The study assessed work disability after unemployment where among participants who had been classified as unemployed the year they started an unemployment period. Unemployment was used as a time-varying covariate with a one-year time lag, and the risk of work disability was measured one year after becoming unemployed. The first day of work disability was used, defined as the date when a person's earning ability was permanently reduced.

Disability pension diagnosis

In paper II, information of the major diagnosis that was considered the main health cause for granting of the disability pension was used. The study retrieved diagnosis information from the ICD-9 and ICD-10 medical classification guides. Diagnoses were split into psychiatric disorders (ICD-9 mental disorder codes 290–319 and ICD-10 mental disorder codes F00-

F99), musculoskeletal disorders (710–739 from ICD-9 and M00-M99 from ICD-10), and "other diagnosis."

Municipality size and vocational rehabilitation rates

Paper II also used information about municipality size, categorising whether the respondents were living in a small, medium or large municipality. It also included information on vocational rehabilitation rates (number of persons on rehabilitation divided by persons aged 18-67 years) for each municipality for every year of the follow-up period.

Work environmental factors

Paper III was based on information about both psychosocial work environment and physical workplace exposures:

Psychosocial work factors

Psychosocial work factors were measured with a four-point scale ranging from "most often" to "never" on following questions: "Do you feel that your work is varied enough?" "Do you get feedback on whether you are doing a good job?" "Are the contact and the co-work with your supervisors good enough?" "Would you consider colleague fellowship and community to be good at your workplace?" "Do you get help and support when you have problems at your workplace?" "Do you have influence on your working conditions in a way that makes you have a convenient working speed?" "Do you have too much to do in your work?" "Is your work too demanding?" "Do you worry that your work will change because of reorganisation?" "Have you been bullied or harassed at work?" On one question: "How satisfied are you with your current work?" the four answer categories ranged from "very satisfied" to "not satisfied".

Physical exposure during work

Physical exposure was assessed with the following variables: Noise, vibrations from equipment or vehicles, climatic changes like heat, cold or draft, radiation (x-ray, glowing metal) exposure, poor lighting, visually intensive work, heavy lifting, monotonous work,

passive smoking, smoke from welding or soldering, exhaust, gasses and solvents, other chemicals. The respondents reported if they had or had not been exposed at the current workplace or a previous workplace, and whether they found each reported exposure discomforting.

4.4 Nordland County

Nordland County is situated in the northern part of Norway. The county has 44 municipalities with some 238 000 inhabitants. Although the overall population has been rather stable since the Nordland Health study was carried out, there have been considerable demographic changes in the county. The administrative capital, Bodø, has increased its population by almost 10 000 inhabitants. Five municipalities had a small increase in inhabitants, whereas the other municipalities had population decreases from 1992 to 2007. At the end of the follow up, 28 of the municipalities had fewer than 3 000 inhabitants (102).

The Norwegian industrial link is a criterion in the Standard Classification of Municipalities. It is assigned by Statistics Norway and expressed in terms of the relative distribution of industries in relation to the working population residing in municipalities on 3 November 1990. It specifies whether the production industries as a whole employ more people than do the service industries. If this is the case, the municipality is given an industry code based on the relationship between the four production industry units. In municipalities where one of the production industry units is responsible for more than 2/3 of the total number of people employed within production industries, the municipality is assigned a code with a letter. In the other cases, the code consists of two letters depending on the relative sizes of the units. In the rest of the municipalities, the service industries employ more people than do the production industries. The industrial link for Nordland County is presented in appendix 4.

In Statistics Norway's categorisation, Nordland County have had an industrial diversity, with municipalities dominated by the fishing, sealing, whaling, agriculture, manufacturing, construction and service industries. The industrial link for Nordland County describing the main industries in each municipality is presented in the appendix. Since 1983, the government has granted considerable funds to adaptation programmes for industrial and commercial

development in municipalities with strong economical declines. The municipalities that were granted these funds, had a 10% decrease in employment in the previous three years, or were single-industry municipalities where the main industry had closed down. In Norway there have been 70 "adaptation municipalities" since the start, and 17 municipalities in Nordland were adaptation municipalities during the follow-up period.

Nordland County had a high incidence and prevalence of disability pension recipients in the follow-up period. Prior to this study, it was our belief that the industrial diversity combined with the demographic shifts, and municipalities with the need for adaptation programmes would make Nordland a favourable county for investigating municipality-level effects on the distribution of disability pension.

4.5 Statistical analyses

Multilevel modelling

Paper I and II in this thesis used multilevel modelling with individuals nested within municipalities. In multilevel models, it is possible to simultaneously analyse both individual and municipality-level predictors and to obtain correct standard error estimates (103). A key question in the first two studies was whether observed municipality differences were "area" effects or just a result of different types of people living in these places, or if people with similar characteristics experienced different health outcomes in different municipalities. To investigate this, a multilevel statistical framework is an appropriate method (104, 105).

In multilevel analyses, the regression intercepts can be allowed to vary randomly across higher-level units, such as municipalities. It is also possible to estimate the variance attributable to a certain level with the intra class correlation coefficient (ICC). The ICCs in the present dissertation measured the degree of the variance that could be attributed to the clustering of outcomes between people living in the same municipality. If, for instance, there were small or no differences between municipalities, the ICC would be close to zero, whereas if all variability was between municipalities the ICC would reach one. When multiplied by 100, ICC can be interpreted as the percentage of variance attributed to the municipality level

The ICC in a multilevel linear regression model is estimated as the between cluster variance divided by the total variance (106):

$$ICC = \frac{U_j}{U_j + e_{ij}}$$

where U_j in the equation is the between-cluster variance and e_{ij} is the within cluster variance. A conditional ICC is suggested for multilevel logistic regression models where U_j in the equation is the between-cluster variance (106):

$$ICC = \frac{U_j}{U_j + \pi^2/3}.$$

The within cluster variance in this model is model specific and constant. The conditional ICC gives an estimate of the relative importance of the between cluster heterogeneity on an individual's propensity to get the outcome of interest (106). This gives a somewhat more theoretical interpretation of the ICC and is not as directly interpretable as the ICC in linear models (107). The conditional ICC from a multilevel logistic regression was estimated in Paper I, and an ICC from a multilevel linear model was estimated in Paper II.

In the first study, multilevel discrete time logistic regression was used, given the dichotomous nature of the outcome (108) . Using this analysis, time is treated as intervals, and it is measured whether an outcome (disability pension) did or did not occur in the interval (the subsequent year). In the analysis we used one-year intervals that corresponded with calendar years. Since the risk of receiving disability pension is closely related to age, we used age during follow-up period and age-squared to assess the combined effect of age and follow-up period.

The analysis in the first study was done using three models. Model 1 was adjusted only for age (i.e., age and period) and sex. In Model 2, baseline health status, health behaviour (as measured by alcohol and smoking behaviour) was also included. In Model 3, education was added to Model 2. The impact of becoming unemployed was hypothesised to influence the risk of receiving a disability pension with some induction time. Hence the risk of work disability was measured one year after becoming unemployed. As sensitivity analyses, we also tested the models without a time lag of unemployment and with a two-year time lag to investigate the effect of unemployment the same year, and the effect of becoming unemployed two years prior to disability pension

In the second study we analysed the length of rehabilitation time before receiving the disability pension. Since the rehabilitation time in days, was strongly positively skewed, we performed a log-transformation of the data. Log transformations can make a positively skewed distribution more normal (109).The logarithm of the length of the rehabilitation time before a disability pension was granted was used, and this was done using a linear multilevel regression analysis, and applied to individuals nested by municipality of residence and year of starting rehabilitation. To capture possible time-dependent variability within the municipalities, the main analyses were performed in a three-level model with individuals nested within years within municipality. The diagnosis-specific analyses showed no sign of time dependent variability and were performed as a two-level analysis.

In this paper, Model 1 was adjusted for age, sex and whether the subject had had an unemployment period during the follow-up period. Model 2, added baseline health status and health behaviour as measured by alcohol and smoking behaviour. In Model 3, education, municipality size and rehabilitation rate in the municipality were added to the parameters in Model 2.

The study used information from the ICD-9 and ICD-10 medical classification guides. Diagnoses were split into musculoskeletal disorders, psychiatric disorders and "other diagnosis". The analyses were done for all respondents and separate analyses for the different diagnoses were done with the same models.

Throughout the follow up period, 2,533 persons received disability pension. Because the study only had complete information on all study variables for 1,757 persons, a complete case analysis on model 1 was performed as a sensitivity analysis for all respondents and for the diagnosis-specific analysis.

Cox regression analysis

In paper III, a Cox proportional hazard regression model was used to estimate the associations between each individual physical and psychosocial work environmental factor, cumulative work environmental exposures and disability pension. The physical work exposures were originally assessed as a model with the answer categories "no", "yes" and "yes, it causes

discomfort". Since the model with three answer categories were not substantially different from a dichotomised "yes/no" model where those reporting exposure and those reporting discomforting exposure were merged together, the latter was used. A summation index of cumulative physical and psychosocial work exposures was calculated based on the number of exposures reported, which ranged from zero to 11 on the psychosocial exposures and zero to 13 on the physical exposures. The estimates were reported as hazard ratios (HRs) with 95% confidence intervals (95% CIs). For the cumulative exposures, the HR was measured per five exposure increase.

The analyses in the last study were performed on three models. Model 1 was adjusted for sex and age as the time axis. In Model 2, baseline health status and health behaviour measured by alcohol and smoking behaviour were added. In model 3, education was added to model 2.

To avoid possible bias and loss of statistical power because of missing data, we performed a multiple imputation as a sensitivity analysis. A multiple imputation creates several different plausible imputed data sets and appropriately combines the results from each of these (110). In the imputation procedure, we included all of the study variables and additional unemployment information from the registry data. The missing data were imputed using the chained equations imputation procedure in STATA statistical software, and 20 datasets were created.

The study tested the proportional hazards assumptions on the basis of Schoenfeld residuals. There was evidence of non-proportional hazard by sex, self-reported health and the summed index of chronic illnesses. In the analysis, the follow-up time was split after ten years, and we included product terms between these variables and follow-up time. With this procedure, the proportional hazards assumptions were met.

All analyses were performed using Stata 11.0 for Windows (Stata Corporation, College Station, Texas).

4.6 Ethics

The Regional Committee for Medical Research Ethics (2009/205-4) approved the study. Because the Nordland Health Study did not ask the participants for general consent about the data being used for research, the Regional Committee for Medical Research Ethics required that the study was publicly announced through the media, and that the respondents were informed about how to withdraw from the study. The four biggest newspapers were contacted about the study, and interviews were given to the main newspaper for the county (Avisa Nordland) on April 16 2009, as well as to the local public broadcast (Nrk Nordland) on May 6 2009. On July 15, 2010, an announcement was published in Avisa Nordland (see appendix 2) that gave information on how to withdraw from the study. None of the participants withdrew.

5. Results

5.1 Summary of paper I

Unemployment and disability pension – an 18-year follow-up study of a 40-year-old population in a Norwegian county

Morten Støver, Kristine Pape, Roar Johnsen, Nils Fleten, Erik Reidar Sund, Bjørgulf Claussen and Johan Håkon Bjørngaard

BMC Public Health. 2012 Feb 28;**12**:148.

Background

This study explored the association of unemployment and an increased risk of receiving disability pension, and the possibility that this risk is attributed to municipality-specific characteristics.

Methods

A cohort of 7,985 40-42 year olds was followed for 18 years in national registers, identifying new episodes of unemployment and cases of disability pension. The association between an unemployment period and disability pension in the subsequent year was estimated using discrete time multilevel logistic regressions and clustering individuals by municipality. The association between unemployment and disability pension was adjusted for age in the follow up-period, sex, baseline health status, health behaviour and education level. A conditional intra-class correlation coefficient (ICC) was estimated as a measure of inter-municipality variance.

Results

In the follow-up period, 2784 (35%) of the participants were granted disability pension. The crude odds ratio for receiving disability pension after unemployment (adjusted for age in follow-up period and sex only) was 1.42 (95% CI 1.1-1.8). Adjusting for baseline health indicators reduced the odds ratio of unemployment to 1.33 (CI 1.1-1.7). A fully adjusted model, including education level, further reduced the odds ratio of unemployment to 1.25 (CI 1.00-1.6). The ICC of the municipality level was approximately 2%.

Conclusions

Becoming unemployed increased the risk of receiving subsequent disability pension. However, adjusting for baseline health status, health behaviour and education attenuated this impact considerably. The multilevel analysis indicated that a minor, yet statistically significant, proportion of the risk of disability pension can be attributed to the municipality of residence.

5.2 Summary of paper II

Rehabilitation time before disability pension.

Morten Støver, Kristine Pape, Roar Johnsen, Nils Fleten, Erik Reidar Sund, Bjørgulf Claussen, Solveig Osborg Ose and Johan Håkon Bjørngaard

BMC Health Services Research. 2012 Oct 30;**12**:375.

Background

The decision to grant a disability pension is usually the end of a long process of medical examinations, treatment and rehabilitation attempts. This study investigates to what extent the time spent on rehabilitation time prior to disability pension is associated with characteristics of the individual or the local employment and welfare office, measured as municipality variance.

Methods

A study of 2,533 40 to 42 year olds who received disability pension over a period of 18 years. The logarithm of the rehabilitation time before granting a disability pension was analysed with multilevel regression.

Results

The rehabilitation time before a disability pension was granted ranged from 30 to 5,508 days. Baseline health characteristics were only moderately associated with rehabilitation time. Younger people and people with unemployment periods had longer rehabilitation time before

a disability pension was granted. There were only minor differences in rehabilitation time between men and women and between different levels of education. Approximately 2% of the total variance in rehabilitation time could be attributed to the municipality of residence.

Conclusions

There is a higher threshold for granting a disability pension to younger persons and those who are expecting periods of unemployment, which is reflected in the extended rehabilitation requirements for these groups. The longer rehabilitation period for persons with psychiatric disorders might reflect a lack of common knowledge on the working capacity of and the fitted rehabilitation programs for people with psychiatric disorders.

5.3 Summary of paper III

Work factors and disability pension

Morten Støver, Kristine Pape, Roar Johnsen, Nils Fleten, Erik Reidar Sund, Solveig Osborg Ose and Johan Håkon Bjørngaard

Scand Journal of Public Health. 2013 May 17. [Epub ahead of print]

Aims

To investigate the associations between work environment indicators and health- related work disability.

Methods

A health survey of 5,749 working 40-42-year-old Norwegians from Nordland County were linked to a national register for disability pension during a follow-up of over 18 years. The risk for disability pension following various self-reported physical and psychosocial work environmental exposures (individual and cumulative) were estimated using Cox regression analysis.

Results

Both cumulative physical and psychosocial work environmental exposures were associated with an increased risk for disability pension, although this association was attenuated for most variables after adjusting for health and education. An increase in five poor psychosocial work environmental exposures was associated with a 22% increased risk for disability (adjusted hazard ratio, aHR, 1.22, 95% CI 1.04-1.44), whereas a similar increase in five poor physical work environmental exposures was associated with a 29% increased risk (aHR, 1.29, 95% CI 1.16-1.44). There were no indications of statistical interaction between either sex or education and work exposures.

Conclusion

People who report a poor work environment are at a higher risk for subsequent work disability. This finding suggests that improving working conditions may be an area of intervention in order to reduce the number of people who leave the labour market with a disability pension.

5.4 Supplementary results

Disability pension risk among non-respondents in the Nordland health study

The last decades the participation rates in epidemiologic studies have declined (111). Non-response bias refers to the bias that exists when respondents to a survey are different to those who did not respond in terms of demographic or attitudinal variables. Of the 10,497 persons who were invited to the study, 990 had disability pension at baseline. Of the 9,507 persons without disability pension at baseline, 1,522 of the remaining persons did not answer the questionnaire. Because we had ethical approval to use information on all cases of disability pension also for this group as well, we could explore whether this group had a higher risk for receiving disability pension during the follow up period. 34.9 % of the respondents was granted disability pension during the follow up period, vs. 35.5 % of the non-respondents. A Cox proportional hazards regression was performed, and the analysis revealed that the hazard ratio of getting a disability pension for the non-respondents was 1.13 (CI 95 % 1.03-1.24) compared with the respondents. In Table 1 we have presented the distribution of diagnosis for the disability pensions. Non-respondents were less likely to get disability pension for musculo-skeletal diagnoses and more likely to get disability pension for psychiatric and other diagnoses.

Table 1. Risk of disability pension for non-respondents

Diagnosis	Respondents	Non-respondents
Musculo-skeletal	1,096 (50.16 %)	152 (36.67 %)
Psychiatric	321 (14.69 %)	87 (20.71 %)
"Other"	768 (35.6 %)	179 (42.62 %)

Paper I: Long-term unemployment and disability pension

Since becoming unemployed probably differs from being unemployed over a long period of time, we tested the risk for disability pension the year after unemployment periods of 3 and 6

months, using the same models presented in article 1. Using the same methods as in the original analysis, unemployment periods of 3 months or more in model 1 gave an OR of 1.42 for disability pension the same year, the same estimate as in the original analysis in paper I. Table 2 shows the association between an unemployment period of 6 months and disability pension within the subsequent year.

Table 2. The association between 6 months unemployment and disability pension. Discrete time, multilevel regression with one-year time intervals. N=1,702

	Model 1 OR (95% CI)	Model 2 OR (95% CI)	Model 3 OR (95% CI)
Unemployment	1.45 (1.09-1.92)	1.34 (1.26-1.41)	1.25 (0.94-1.66)
ICC:	0.02	0.02	0.02

Model 1: Adjusted for age (i.e., age and period) and sex.

Model 2: Adjusted for age, sex, baseline health status, alcohol consumption and behaviour.

Model 3, Adjusted for age, sex, baseline health status, alcohol consumption behaviour and education

Paper III: Discomforting physical work exposures

In paper III, the models were also performed on exposure as measured by three categories, including the category of discomfort, but the results were not substantially different from the two-category models presented in the article.

Table 3: Physical exposures at work and risk of disability pension.

Physical exposure	Model 1		Model 2		Model 3	
	HR	95% CI	HR	95% CI	HR	95% CI
Vibrations (equipment, vehicles)						
No	(ref)		(ref)		(ref)	
Yes	1.75	(1.51-2.03)	1.58	(1.35-1.85)	1.40	(1.20-1.65)
Yes; discomfort	1.66	(1.41-1.95)	1.32	(1.12-1.56)	1.20	(1.02-1.42)
Heavy lifting						
No	(ref)		(ref)		(ref)	
Yes	1.53	(1.37-1.71)	1.42	(1.27-1.58)	1.26	(1.13-1.41)
Yes; discomfort	1.80	(1.59-2.05)	1.45	(1.27-1.65)	1.31	(1.15-1.50)
Exposed to noise						
No	(ref)		(ref)		(ref)	
Yes	1.45	(1.28-1.65)	1.34	(1.17-1.52)	1.24	(1.09-1.42)
Yes; discomfort	1.42	(1.26-1.60)	1.24	(1.10-1.40)	1.23	(1.19-1.40)
Climatic changes (cold, heat, draft, etc.)						
No	(ref)		(ref)		(ref)	
Yes	1.56	(1.37-1.77)	1.39	(1.21-1.58)	1.26	(1.10-1.44)
Yes; discomfort	1.45	(1.29-1.62)	1.19	(1.06-1.34)	1.15	(1.02-1.30)
Exhaust						
No	(ref)		(ref)		(ref)	
Yes	1.39	(1.15-1.69)	1.26	(1.03-1.55)	1.11	(0.90-1.37)
Yes; discomfort	1.61	(1.37-1.89)	1.32	(1.11-1.56)	1.21	(1.02-1.44)

Poor lightening						
No	(ref)		(ref)		(ref)	
Yes	1.33	(1.13-1.56)	1.19	(1.02-1.39)	1.18	(1.01-1.38)
Yes; discomfort	1.19	(0.99-1.42)	1.05	(0.87-1.26)	1.09	(0.90-1.31)
Smoke from welding or soldering						
No	(ref)		(ref)		(ref)	
Yes	1.22	(1.00-1.49)	1.09	(0.89-1.32)	1.03	(0.84-1.25)
Yes; discomfort	1.48	(1.21-1.80)	1.27	(1.04-1.56)	1.22	(1.00-1.50)
Other chemicals						
No	(ref)		(ref)		(ref)	
Yes	1.17	(0.99-1.39)	1.13	(0.95-1.34)	1.09	(0.92-1.29)
Yes; discomfort	1.34	(1.10-1.64)	1.10	(0.90-1.35)	1.10	(0.87-1.30)
Gases and solvents						
No	(ref)		(ref)		(ref)	
Yes	1.18	(0.98-1.42)	1.11	(0.92-1.35)	1.06	(0.87-1.28)
Yes; discomfort	1.42	(1.21-1.68)	1.15	(0.97-1.37)	1.11	(0.93-1.31)
Passive smoking						
No	(ref)		(ref)		(ref)	
Yes	1.24	(1.11-1.38)	1.10	(0.98-1.23)	1.10	(0.99-1.24)
Yes; discomfort	1.02	(0.87-1.20)	1.05	(0.89-1.24)	1.06	(0.89-1.25)
Visually intensive work						
No	(ref)		(ref)		(ref)	
Yes	1.07	(0.96-1.20)	1.00	(0.89-1.12)	1.03	(0.91-1.16)
Yes; discomfort	1.25	(1.05-1.48)	1.06	(0.89-1.26)	1.10	(0.92-1.31)
Monotonous work						
No	(ref)		(ref)		(ref)	
Yes	1.38	(1.24-1.55)	1.16	(1.03-1.30)	1.05	(0.93-1.18)
Yes; discomfort	1.42	(1.20-1.69)	1.06	(0.89-1.26)	1.01	(0.85-1.20)
Radiation (x-ray, glowing, metal, etc)						
No	(ref)		(ref)		(ref)	
Yes	1.03	(0.79-1.34)	0.98	(0.75-1.28)	0.99	(0.76-1.29)
Yes; discomfort	1.52	(1.05-2.19)	1.10	(0.76-1.59)	1.08	(0.75-1.55)

Model 1: Adjusted for sex and age (time axis)

Model 2: Adjusted for sex, age (time axis), baseline health, smoking and alcohol consumption

Model 3: Adjusted for sex, age (time axis), baseline health, smoking, alcohol consumption and education

Paper III: Analysis performed on imputed data

In paper III, the analysis was also performed on imputed data as a sensitivity analysis. The results from the analysis performed on the imputed data were excluded from the article because of journal policy regarding the total number of tables. The results presented in Table 4 and Table 5 were not substantially different from the main results.

Table 4: Hazard ratios for disability pension according to self-reported psychosocial work factors. Analysis done on imputed data

	Model 1		Model 2		Model 3	
	HR	95% CI	HR	95% CI	HR	95%CI
Cumulative psychosocial exposures/5 [1]	1.58	(1.37-1.83)	1.22	(1.05-1.41)	1.20	(1.03-1.40)
Would you consider co-work and fellowship/community to be good at your workplace?						
Most often	1.00	(ref)	1.00	(ref)	1.00	(ref)
Sometimes	1.10	(0.97-1.27)	1.04	(0.91-1.19)	1.12	(0.98-1.28)
Rarely/Never	1.52	(1.18-1.97)	1.40	(1.08-1.81)	1.44	(1.12-1.87)
Do you worry that your work will change because of reorganisation?						
Never	1.00	(ref)	1.00	(ref)	1.00	(ref)
Rarely	0.96	(0.86-1.07)	0.97	(0.87-1.09)	1.02	(0.91-1.14)
Sometimes/often	1.23	(1.10-1.38)	1.16	(1.03-1.30)	1.17	(1.04-1.31)
How satisfied are you with your current work?						
Very satisfied	1.00	(ref)	1.00	(ref)	1.00	(ref)
Satisfied	1.14	(1.04-1.25)	1.04	(0.94-1.15)	1.05	(0.95-1.16)
Less satisfied/Not satisfied	1.52	(1.27-1.82)	1.10	(0.91-1.33)	1.09	(0.90-1.32)
Are the contact and the co-work with your supervisors good enough?						
Most often	1.00	(ref)	1.00	(ref)	1.00	(ref)
Sometimes	1.06	(0.93-1.21)	0.99	(0.87-1.13)	1.05	(0.92-1.20)
Rarely/Never	1.33	(1.12-1.58)	1.11	(0.93-1.33)	1.12	(0.94-1.34)
Do you feel that your work is varied enough?						
Most often	1.00	(ref)	1.00	(ref)	1.00	(ref)
Sometimes	1.15	(1.03-1.28)	1.02	(0.91-1.14)	0.98	(0.88-1.10)
Rarely/Never	1.56	(1.38-1.76)	1.26	(1.11-1.42)	1.12	(0.99-1.27)
Have you been bullied or harassed at work?						
Never	1.00	(ref)	1.00	(ref)	1.00	(ref)
Rarely	1.02	(0.89-1.17)	0.91	(0.79-1.05)	0.94	(0.81-1.08)
Sometimes/often	1.32	(1.05-1.67)	1.05	(0.83-1.34)	1.09	(0.86-1.39)
Do you get help and support when you have problems at your workplace?						
Most often	1.00	(ref)	1.00	(ref)	1.00	(ref)
Sometimes	0.95	(0.85-1.07)	0.86	(0.76-0.97)	0.91	(0.81-1.02)
Rarely/Never	1.31	(1.13-1.51)	1.07	(0.92-1.24)	1.11	(0.96-1.29)
Do you have an influence on your working conditions in a way that makes you have a convenient working speed?						
Most often	1.00	(ref)	1.00	(ref)	1.00	(ref)
Sometimes	0.98	(0.88-1.09)	0.92	(0.83-1.03)	0.95	(0.85-1.06)
Rarely/Never	1.10	(0.98-1.23)	0.99	(0.89-1.11)	1.04	(0.92-1.17)
Is your work too demanding?						
Most often	1.00	(ref)	1.00	(ref)	1.00	(ref)
Sometimes	0.93	(0.81-1.08)	0.92	(0.80-1.07)	1.00	(0.87-1.16)
Rarely/Never	0.97	(0.84-1.11)	0.90	(0.78-1.04)	1.03	(0.89-1.19)
Do you have too much to do in your work?						
Most often	1.00	(ref)	1.00	(ref)	1.00	(ref)
Sometimes	1.04	(0.93-1.16)	1.10	(0.99-1.23)	1.03	(0.92-1.15)
Rarely/Never	1.03	(0.89-1.18)	1.13	(0.98-1.29)	0.99	(0.86-1.14)
Do you get feedback whether you are doing a good job?						
Most often	1.00	(ref)	1.00	(ref)	1.00	(ref)
Sometimes	0.96	(0.85-1.07)	0.95	(0.85-1.07)	1.00	(0.89-1.12)
Rarely/Never	1.04	(0.93-1.17)	0.95	(0.85-1.08)	0.96	(0.87-1.10)

Model 1: Adjusted for sex and age (time axis)
Model 2: Adjusted for sex, age (time axis), baseline health, smoking and alcohol consumption
Model 3: Adjusted for sex, age (time axis), baseline health, smoking, alcohol consumption and education
[1] Cumulative index divided by 5

Table 5: Hazard ratios for disability pension according to self-reported physical work exposures. Analysis done on imputed data.

	Model 1		Model 2		Model 3	
	HR	95% CI	HR	95% CI	HR	95% CI
Cumulative physical exposures /5 [1]	1.55	(1.42-1.69)	1.31	(1.19-1.43)	1.23	(1.12-1.34)
Vibrations (equipment, vehicles)						
No	1.00	(ref)	1.00	(ref)	1.00	(ref)
Yes	1.39	(1.29-1.50)	1.25	(1.15-1.36)	1.17	(1.08-1.27)
Exhaust						
No	1.00	(ref)	1.00	(ref)	1.00	(ref)
Yes	1.29	(1.19-1.40)	1.18	(1.08-1.28)	1.12	(1.03-1.22)
Heavy lifting						
No	1.00	(ref)	1.00	(ref)	1.00	(ref)
Yes	1.37	(1.29-1.46)	1.24	(1.16-1.32)	1.17	(1.10-1.25)
Exposed to noise						
No	1.00	(ref)	1.00	(ref)	1.00	(ref)
Yes	1.21	(1.14-1.28)	1.13	(1.07-1.20)	1.12	(1.06-1.19)
Climatic changes (cold, heat, draft, etc)						
No	1.00	(ref)	1.00	(ref)	1.00	(ref)
Yes	1.22	(1.15-1.29)	1.12	(1.06-1.18)	1.09	(1.03-1.16)
Poor lightening						
No	1.00	(ref)	1.00	(ref)	1.00	(ref)
Yes	1.14	(1.05-1.24)	1.07	(0.99-1.16)	1.08	(1.00-1.18)
Smoke from welding or soldering						
No	1.00	(ref)	1.00	(ref)	1.00	(ref)
Yes	1.20	(1.09-1.32)	1.11	(1.01-1.23)	1.09	(0.99-1.21)
Other chemicals						
No	1.00	(ref)	1.00	(ref)	1.00	(ref)
Yes	1.16	(1.06-1.27)	1.06	(0.97-1.17)	1.04	(0.95-1.14)
Gases and solvents						
No	1.00	(ref)	1.00	(ref)	1.00	(ref)
Yes	1.14	(1.05-1.23)	1.04	(0.95-1.13)	1.02	(0.94-1.10)
Passive smoking						
No	1.00	(ref)	1.00	(ref)	1.00	(ref)
Yes	1.05	(0.99-1.13)	1.04	(0.96-1.11)	1.05	(0.98-1.13)
Visually intensive work						
No	1.00	(ref)	1.00	(ref)	1.00	(ref)
Yes	1.09	(1.01-1.18)	1.02	(0.95-1.10)	1.05	(0.98-1.14)
Radiation (x-ray, glowing, metal, etc)						
No	1.00	(ref)	1.00	(ref)	1.00	(ref)
Yes	1.18	(1.01-1.37)	1.06	(0.91-1.23)	1.05	(0.90-1.22)
Monotonous work						
No	1.00	(ref)	1.00	(ref)	1.00	(ref)
Yes	1.26	(1.17-1.25)	1.08	(1.00-1.16)	1.02	(0.95-1.10)

Model 1: Adjusted for sex and age (time axis)
Model 2: Adjusted for sex, age (time axis), baseline health, smoking and alcohol consumption
Model 3: Adjusted for sex, age (time axis), baseline health, smoking, alcohol consumption and education
[1] Cumulative index divided by 5

6. Discussion

6.1 Main findings

Our overall aim was to explore the local contextual risk factors for disability pensioning. Briefly, our main findings can be summarised as follows: *Unemployment* is associated with subsequent disability pension. We observed small *differences between the municipalities* in the risk of disability pensioning. We also observed small *differences between the municipalities in rehabilitation length before disability pension*. Several characteristics of the *work environment* were associated with disability pension.

In paper I, health status and lifestyle could be interpreted as important risk factors for both unemployment and for later disability pension. The differences in risk of unemployment between municipalities could, to a certain extent, reflect the opportunities for staying in work. In the multilevel analyses, taking into account the risk of unemployment influenced the small but statistically significant differences between municipalities only marginally. The findings lent only minor support to the assumption that the local labour market differences, assessed as in the municipality of residence, could reflect risk in disability pensioning rates. In paper II, larger municipalities had a considerably shorter rehabilitation time before the granting of a disability pension. We found longer rehabilitation periods for persons with psychiatric diagnosis. Most of the variance in rehabilitation periods between 1 month and 15 years could be ascribed to individual factors, such as age and disease, and not to municipality level factors, which suggests that social services officers treat persons with comparable diseases and work capacities similarly. In paper III, both single work environment factors as well as cumulative exposures were associated with an increased risk for disability pension. Adjusting for baseline health, health behaviour and education attenuated this impact considerably, and again, a possible interpretation of the findings is that ill health is a common risk factor for experiencing work burdens and risk for being disability pensioned.

6.2 Methodological considerations

Strengths

One of the main strengths of the studies presented was the population-based design with a long follow-up period, a high response rate, and a high-quality end-point register covering the total population. The Nordland study covered a total county population aged 40-42 without disability pension at baseline who had resided in the same county during the 18-year follow-up period. Because respondents were 40-42 years old at baseline, this age range might have reduced the risk of a healthy worker bias. Despite considerable demographical changes in the county, only 6% of the population moved within the county, and 4% emigrated from the county during the follow-up period. Additionally, the end-point and some of the exposure information in this study were obtained from a highly reliable source established by Statistics Norway and the Norway Social Insurance Service.

Precision

Random error and precision of estimates refers to the degree of chance variation in measurement and precision is mainly related to the study size (112). There is always a possibility that the associations in epidemiological studies may be influenceed by chance. Whereas the point estimate provides information on the strength of an association, the precision of the estimates is presented as the width of the confidence interval. The reason point estimates in the present study are presented with confidence intervals instead of P values is that the P value is a mix between strength of the association and its precision (113). In the studies presented, 95 % confidence intervals are used. With no bias and if the underlying statistical model is correct, the confidence interval will contain the true parameter value over unlimited repetitions in 95 % of the time. Following Rothman (112), given these assumptions it is preferable to view the confidence interval as a rough estimate of the uncertainty due to random error. In this dissertation, the studies presented were performed on a large population sample, so the precision is relatively high, and the confidence intervals are quite narrow. The exception is in Paper II, in which the samples of some of the diagnostic groups were small, resulting in less precise estimates and wider confidence intervals. Hence, we cannot rule out the influence of chance variation on some of the results.

Systematic error and validity

Although random errors will be reduced by increasing the number of participants, systematic errors will bias the results of a study regardless of study size. A study can be biased because of how people are selected, or how variables are measured, or because of confounding factors (113). Whereas systematic errors often are referred to as biases, the opposite is referred to as validity, often separated into internal validity and external validity. Internal validity is the degree to which we are successful in eliminating systematic errors within the study, and external validity is the validity of our conclusions as they pertain to those outside of our population.

Self-selection bias

Self-selection bias is a problem that arises when the survey respondents are allowed to decide whether they want to participate in a survey. If respondents' propensity to participate in the study is associated with the topic the researchers are trying to study, self-selection bias might influence results because the respondents who are willing to participate will not be representative for the entire target population. The Nordland Health Study was a population-based study where all inhabitants between 40 and 42 years of age were invited. The study had a high participation rate, and the supplementary results demonstrated that there were only minor differences in disability pension between those who participated, and those who did not participate. Further, there might be differences between those who completed the questionnaire, and those with missing values. However, paper III included analysis of both complete case data and imputed data but did not find substantial differences.

Information bias and misclassification.

Information bias refers to distortion caused by measurement errors when the information on the participants is erroneous. The questions concerning participants' health and health behaviour were based on self-reporting. The study's health questions were not based on formerly validated health scales. However, comprehensive information on the diseases and complaints that are previously recognised as risk factors for disability pension were included. Health behaviour as measured by smoking and alcohol consumption werre measured as self-report. Several studies have revealed that both drinking and smoking are under-reported by participants (114, 115).

During long follow-up periods, measured values at baseline may change. Health, health behaviour and work exposure factors were only reported once, thus we could not examine any possible time-dependent changes in health or work exposures. This means that the health of the participants might have changed between baseline and unemployment, and an ideal design of the study would have been to measure health several times throughout the follow-up period.

Misclassification means assigning people into categories other than the ones they should have been assigned to. Misclassification may happen in two forms: differential and non-differential. Differential misclassification is the result of inaccuracy in how information is obtained when the probability of being misclassified differs across groups of study subjects. The effect of differential misclassification can vary from an overestimation to an underestimation of the true value (116). Non-differential misclassification is the result when all groups have the same error rate or probability of being misclassified for all study subjects. The effect of non-differential misclassification is normally an underestimation of the hypothesised relationship between exposure and outcome. In paper I, the results suggest that health problems can be a common cause for unemployment and disability pension. Since the Norwegian sick leave money is considerably higher than the unemployment benefits, there is a risk that some participants may have left the workplace on a sick-leave, thus were not registered as unemployed prior to disability pension. It can be difficult to separate unemployed and participants on a sick leave after workplace expulsion if health problems are the main cause for both. If the study failed to differentiate between these groups, differential misclassification may have occurred. Thus, additional info about unemployment after workplace closures would be a strength.

The participants were 40 to 42 years old at baseline. In paper III, there is a possibility that exposures at the workplace had already affected the participants' health at baseline. We do not have information on whether the respondents have been in the same job through the follow-up period.

Recall bias

Recall bias is a systematic error caused by difficulties in recalling to memory past events or experiences. The studies presented had a prospective design, and disease could not affect exposure information collected before the disease occurred. Since the studies used first day of

work disability as the disability measure, we excluded the possibility that participants were already in a disability pension process at baseline. Thus, the studies are not likely to have suffeed from recall bias.

Confounding

Confounding is normally defined as a mixing of effects from extraneous factors that are common causes of both the exposure and the outcome (113). In the studies presented we found associations between unemployment and disability pension as well as between work environment exposures and disability pension. If the participants who experienced unemployment or poor work environment had poorer health, a study that did not adjust for health, could have been vulnerable to confounding. In the studies presented, we adjusted for health, health behaviour and education. These are all well-known risk factors for disability pension, although some authors have suggested that adjusting for health when investigating work exposures can be an overcorrection, since poor work environment in some cases can be an intermediate step from poor health to disability pension (87).

Residual confounding occurs when the confounding variable is measured imperfectly or with some error, thus the adjustment using this imperfect measure does not completely remove the effect of the confounding variable (112). In the studies presented, educational level is the only measure of socio-economic position. With additional information on other indicators of socio-economic position – such as income and occupational class – we could have reduced the adjusted estimates even more. There is also a possibility that better health measures such as from diagnostic interviews or validated health measures could have reduced the estimates.

Generalisability/external validity

Generalisability refers to the degree to which the results in these studies can be generalised to people outside the population we studied. Nordland consists of many different municipalities and is diverse in its demography and industry. Many of the municipalities are large in size and sparsely populated with few towns. The distances make it problematic to commute between the municipalities, thus making it more difficult to find jobs outside one's municipality of residence. This may indicate that the risk of unemployment and subsequent disability pension are higher in Nordland than other counties in Norway or Scandinavia. This also means that the differences between the municipalities presented in Paper I and Paper II are unlikely to be greater in other counties.

6.3 Results compared to other studies

Unemployment and disability pension

In paper I, the main objective was to explore the association between unemployment and disability pension in the subsequent year. An association of 1.42 (CI 1.1-1.8) was attenuated considerably to 1.25 (CI 1.0-1.6) after adjusting for baseline health status, lifestyle and education, indicating that these factors may act as common causes for both unemployment and disability pension.

Several studies have demonstrated an increased inflow to disability pension after unemployment. A Norwegian study (43) of the long-term effects of factory closure showed that the cumulative rates of disability pension, granted for medical conditions only, were more than three times higher in the study group than among controls from a second factory in the same company. The excess of disabilities then stayed relatively constant from 5 to 10 years after the shut-down. Another Norwegian study investigating plant downsizing demonstrated that employees of that had downsized by more than 60 % between 1995 and 2000 were 24 % more likely to utilise disability pensions in 2001 than were comparable workers plants that had not been downsized (42). Another study investigating closures because of bankruptcy only showed that job loss more than doubled the risk of disability among men, and showed an increase of 50 % among women (16).

Evidence suggests a strong, positive association between unemployment and several adverse health outcomes. Whether unemployment causes these outcomes is not straightforward. One question that remains unclear is whether unemployment itself leads to poor health and disability, or if people with poorer health are more vulnerable to labour market fluctuations, and are more likely to become unemployed. Some studies have concluded that the direction of causation from unemployment to illness is greater than the converse (47-49), in which illness causes unemployment, whereas others argues for a selection effect, by which those with poor health are more likely to be the first to lose their jobs during financial recessions (51, 52).

A meta-analysis about the possible health effects of reemployment showed improvement in mental health when unemployed persons were reemployed (117). A German study revealed that short-term unemployment only had a negative effect for men, whereas for women short-term unemployment did not have any effect on health satisfaction. Being unemployed for a long period had a negative effect on both men and women, and reemployment had a positive effect on health satisfaction for both men and women independent of the duration of the period of unemployment (118). A recent study from Sweden found that the transition from unstable labour market positions to more permanent employment can be health-promoting, even after controlling for confounders and can also be an indicator of health-related selection (54)

A study from Finland concluded that becoming unemployed did not matter as such for self-assessed health. Instead, the authors argued that persons with poor health are selected for unemployment (51). A European study of four countries demonstrated that poor health or chronic health problems predicted staying or becoming unemployed and that the effects on health were stronger with a lower national unemployment level (52). A study on unemployment rate and work disability in Iceland suggests that people with poor health are forced out of the labour market in times of increasing unemployment (119). The latter studies suggest a selection mechanism, where employees with pre-existing health problems are more likely targets for layoffs than others.

Although our study might suggest that health status, health behaviour and education level might be common causes for unemployment and disability pension, our study only measured the association between becoming unemploymed and disability pension the subsequent year. Studies have shown that the longer the period of unemployment, the worse the consequences to health (117, 118). For individuals who remain involuntarily unemployed, long-term unemployment may have an effect on well-being. First, people face financial difficulties; second, they might lose social contacts and status in a society in where work is important for self-image. Our supplementary analysis after 6 months unemployment gave approximately the same results, indicating in our study, that even long-term unemployment only moderately increases the risk of starting the disability process the following year.

We did not find any support for statistical interactions between unemployment and sex, age or educational level in the risk for disability pension. Previous studies have shown conflicting

results for the health-effects of unemployment on sex and age (117, 120, 121), while people of higher socio-economic or occupational status are less affected by unemployment (120). It should be noted that there might be different effects of long-term unemployment and disability pension for these groups. If job loss has an effect on health behaviour, this suggests that long-term unemployment can have different effects on older people, who experience more health problems, or on people in the lower social classes who might have poorer health behaviour and fewer coping strategies.

A European cross-sectional survey (56) showed that that the negative relationship between unemployment and health was consistent across Europe but that it varied by welfare state regime. This suggests that levels of social protection may have a moderating influence. In public health measures of health equity, it is essential to include people with poor health in the labour market, and several studies have shown that reemployment and the transition from unstable labour market positions into permanent employment could contribute to better public health.

The relationship between unemployment and poor health is complex, and regardless of whether unemployment is a cause or a consequence of poor health, both explanations indicate that growth in disability numbers can be because work disability do not arise from health impairments alone, but that the combination of poor health and poor employment opportunities increases the risk of being disability pensioned.

Geographical differences in disability pension

The multilevel analysis of the association between unemployment and disability pension in paper I indicated a relatively small contribution from geographical differences in the disability pension risk. Approximately 2 % of the underlying propensity of disability pension could be attributed to the municipality level in all three models. With the knowledge of considerable demographic economic and labour market variations between the municipalities in the county studied, and the data from a previous descriptive study that revealed substantial differences in disability pension incidence rates between municipalities (58), it was expected that the risk of receiving a disability pension would be more dependent on municipality of residence. A possible explanation for why there were small differences between the municipalities might

be a population homogenous in age, and perhaps also in health. This could explain why adjusting for compositional differences across municipalities in health and health behaviour had negligible influence on the ICC estimates. When investigating 40 to 42-year-olds only, one might also miss possible differences between other age groups. Older or younger persons might have been more vulnerable to the demographic changes throughout the follow up period. Although the differences between the municipalities were quite small, the results were still statistically significant, suggesting that the municipality differences were greater than what would be expected due to chance alone. Although previous reports have noted municipality differences, prior research has been scarce and has not been performed within a multilevel framework. These previous aggregate studies suffer from a number of limitations, chief among them being the conflation of individual and higher level variance into a rate. Aggregate (i.e. ecological) studies are essentially incapable of distinguishing the contextual – the difference a place makes, from the compositional – what is in a place (122).

Although the municipality might be an important contextual level for factors such as employment opportunities, welfare and health services, municipalities are diverse when considering their size and inhabitants. Some studies suggest that other contextual levels can affect the risk of receiving disability pensions. Recent studies have found peer or network effects to be associated with both disability pension (60) and welfare participation (123), suggesting that people's risk of receiving a disability pension can be affected by the disability pension entry rate of other people in their neighbourhoods.

Differences in length of rehabilitation

As anticipated, the analyses suggested that age was a strong predictor of the length of the rehabilitation period. The rehabilitation period before disability pension was 50 per cent shorter for the participants who were granted disability pension in the last third of the follow-up period compared with those who received disability pension in the first third. Although these models did not differentiate between age-effect and period effect, it seems less likely that the granting of disability pension in general happened more quickly in the later period, and that older people had a shorter rehabilitation time before being granted disability pension. Several other studies have shown that the chances of job return after a rehabilitation period diminish with increasing age (70, 124). Job return seems to be more likely for younger people

who have better overall health and who are more attractive on the labour market. From a socio-economic point of view, younger people who are granted disability pension loses more productive years, and it's likely that the employment and welfare offices are more focused on facilitating job return for younger people, resulting in a longer and more thorough rehabilitation process before granting a disability pension.

The analysis did not indicate that there were any differences between men and women regarding the length of rehabilitation before the granting of the disability pension. Previous research has shown conflicting findings regarding sex differences in the likelihood of returning to work. A review from Sweden (125) showed that although the majority of the studies have indicated that men are more successful in returning to work after a rehabilitation period, others studies have indicated the opposite. There might be differences in how men and women cope with disease and pain, as well as differences in employment opportunities and the treatment they receive from insurance offices. Although this study showed that men and women have approximately the same length of rehabilitation before disability pension, previous studies has suggested that that the field is still unclear and requires more research.

Our study demonstrated that rehabilitation time was approximately the same for groups with different education levels. Most previous studies have concluded that people with higher education are more successful at finding new jobs after rehabilitation (126-128). One reason for the results in the present study might be because the labour market in Nordland County in the follow-up period probably had less employment opportunities for highly educated persons compared to other studies. Another reason might be that the highly educated who apply for disability pension have more disabling conditions than people with less education as suggested by previous research (127). This study did only investigate rehabilitation time only for those who were granted disability pension, and in a study of the success of returning to work after the rehabilitation process the findings may have differed.

Although health is the most important factor for successfully returning to work, characteristics of occupation and workplace can be of importance as well. For people who do manual work, or who have few opportunities to make adjustments at their original workplace, health impairments can make it more difficult to return to work compared with those who have the possibility of adapting to other tasks. This means that area of residence can be of importance for occupational flexibility and opportunities. Simultaneously, the occupational rehabilitation

potential by long lasting educational rehabilitation program is greater among manual workers than among the well educated workers with generally greater job flexibility. If manual work is associated with either short or long rehabilitation periods according to occupational possibilities, this might contribute to the minor differences in mean rehabilitation time across education levels.

The multilevel analysis indicated that 2% of the observed variance could be attributed to the municipality level; however, the variance was substantially higher for participants with psychiatric diagnoses. It should be noted that the number of people with a psychiatric diagnosis was small (n=164), and that the municipality-level variability could, to a large extent, be attributed to the practices of employment and welfare offices in some larger municipalities. It should also be noted that when the respondents who lacked information on health measures were included in the sensitivity analysis, the ICC was reduced from 17% to 1% in the complete case analysis. The persons with missing information on health status (n=97) had considerably shorter rehabilitation periods than those included in the diagnosis specific analysis (mean=752 days vs mean=900 days). A probable explanation is a selection effect, whereby those with missing health information had considerably poorer health, and work ability was easier to assess. By including those whose health impairments were more apparent, the variation between the welfare offices was hence reduced.

Those who experienced unemployment during the follow-up period had longer rehabilitation period before their disability pension were granted. Previous studies have demonstrated that those with a job to return to are more successful returning to work after a rehabilitation period, compared with the unemployed (126, 129). The longer rehabilitation period for people who have been unemployed might reflect difficulties in assessing the major cause of their work incapacity, their health impairments or their unemployment situations.

The analysis indicated that people with psychiatric and musculoskeletal diagnoses have longer rehabilitation periods before they are granted disability pension than do those with other diagnoses. A probable explanation is that participants in these groups of diagnoses have more complex health problems making it difficult to assess the prognosis of the illness and/or to assess the work capacity of these participants. Although a body of research on return to work has focused on musculoskeletal disorders, fever studies have been conducted on mental disorders (130). The results indicated that people with a psychiatric diagnosis were granted a

disability pension sooner in the largest municipalities, especially for less disabling diagnoses. This finding may be attributable to the easier availability of specialised psychiatric care to clarify rehabilitation potential, or to organisational characteristics or other characteristics of some employment and welfare offices in some large municipalities. One interpretation of this finding is that the employment and welfare offices in the smallest municipalities have less experience with people with psychiatric diagnoses, or they have more problems assessing their rehabilitation potential, due to less available specialised care, and they lack the knowledge of suitable rehabilitation programmes for this diagnostic group. Previous research has suggested that both health and workplace factors are important for success in returning to work for people with mental disorders (131).

Self-reported work environment and disability pension.

Work disability is ultimately based on both on a person's health and resources and the requirements posed of the working environment. In Paper III, the focus was on the working environment with the aim of detecting specific and cumulative working conditions, as risk factors contributing to disability pension independent of other working conditions. Although poor work environment was associated with poor health and health related expulsion from the labour market, the relationship between health resources, working environment and disability pension is complex (81). It is difficult to determine the direction of this association, since poor health may be caused by a poor work environment, and conversely, people with poor health may experience and report a more adverse work environment. In this study, we used information on self-rated health and self-reported work environment at baseline. Authors of previous studies have suggested that because poor health might also be caused by work environmental factors, adjusting for baseline health, can lead to over-adjustment (81, 87). The results might indicate that a self-reported poor work environment can act as a mediator on a pathway from poor health to disability pension.

Many of the specific working conditions showed associations with disability retirement, but after adjustments for baseline health and life-style, the associations were attenuated for most variables. Further adjustment for education reduced the estimates even more for most of the physical work factors and for the lack of variation on the psycho-social factors, indicating that low education levels can serve as common causes for both poor work environment and disability pension. Socio-economic differences have been documented in several studies (17,

19, 22), and lower education levels likely means more physically demanding work and thus an increased risk of disability pension, although research has also revealed that low levels of education are associated with more unhealthy lifestyles (132, 133).

The strongest psychosocial risk factors for disability pension in our study were poor colleague fellowship, fear of reorganisation and low work satisfaction. A major finding was that poor colleague fellowship was the only variable that was not attenuated by adjusting for health and education. This result suggests that poor colleague fellowship can be a substantial risk factor for disability pension that is independent of health status or education.

Previous studies have suggested that low social support and interpersonal conflicts in the workplace increase the risk for disability pension among women only (28, 84). A considerable body of evidence has proved that different aspects of interpersonal relationships can have a strong effect on health and well-being (134-136), and previous studies have revealed that interpersonal conflicts at work are associated with high blood pressure (137). Previously, it has been argued that social support is of particular importance for people with emotionally demanding jobs (138). With more women employed in the health care sector, this might be one of the reasons fellowship and social support in the workplace are more important to women.

It is unclear why fear of reorganisation increases the risk of disability pension. One explanation is that perceived uncertainty is higher among those with fewer alternative work opportunities and thus a higher risk of leaving the labour market in the first place. Another explanation is that those who fear reorganisation are the same ones who experience work force cuts. At least one previous study has revealed that job insecurity is associated with disability pension (28).

Low job satisfaction has been shown to be associated with an increased risk for disability pension (78, 87), and work satisfaction has also been found to be associated with better health (77).

In this paper, exposures to vibrations, exhaust and heavy lifting were the strongest physical risk factors for disability pension. Exposure to vibrations has been identified as a cause for

musculoskeletal disorders, and at least two previous studies have revealed that exposure to whole-body-vibrations predicted subsequent disability pension retirement (85, 139). A US review of low back pain revealed that 37% of low back pain was attributable to work factors, particularly vibrations and lifting (140). In a previous study (83), heavy lifting was one of several measures of "physical loading" that predicted disability pension due to musculoskeletal disorders and cardiovascular diseases among Finnish men.

We also found a positive association between noise and climatic changes and disability pension. Noise has previously been found to be a strong predictor of disability among Finnish men (78). Climatic changes at work can affect health negatively. Previous studies have demonstrated an association between hot work environments and accidents (141) and cold work environments and back and neck pain (142). Poor lighting can refer to insufficient light, glare, poorly distributed light or flicker. Previous research has revealed a link between poor lighting and migraine (143), as well as with depression (144).

The cumulative indexes of psychosocial and physical work exposures were both associated with a risk of disability pension. This indicates that an accumulation of several diverse physical and psychosocial exposures might be of importance. The results from previous studies are not conclusive, and the results in the present study build on prior evidence that the accumulation of diverse negative work environment factors may play an important role in health related work exclusion (28, 145).

Previous studies have shown considerable sex differences in the association between various work environmental factors and disability pension (28, 84, 87, 89). This study found no evidence for any statistical interaction between sex and the combination of multiple work exposures on the risk of disability pension. Previous studies have indicated considerable differences between occupational classes (20, 34), and this is likely to be closely connected to education level. Although our study showed that adjusting for educational level reduced the estimates for many of the single work exposures, we found no statistical interaction between educational level and the combination of multiple work exposures on the risk of disability pension

Since the Nordland Health Study was carried out in 1988-89, several major changes have taken place in the structure of the labour market in most industrialised countries. This includes

deindustrialisation and technological innovation, but also downsizing and the privatisation of public services, leading to more flexible, unstable and insecure labour markets (146). As with other social transformations, the changes in the labour market do also have the potential to affect the health of individuals and populations (146). Because of these changes it is likely that the physical work exposures measured, such as vibrations and heavy lifting, are today problems for fewer people, but that the psychosocial work environment that have the strongest association with disability including lack of colleague fellowship and fear of organisation, are more of a problem now.

Although research has revealed several work environmental factors that predicts disability pension, some researchers argues that we know too little about what works in prospective settings (147). Research has yet to reveal feasible ways to decrease the negative influence of work environmental factors (for instance, heavy workload), and increase the positive working conditions (for instance, job control). A major challenge regarding to prevention of disability pension is the ability to create healthy and satisfying work conditions. Work environment need to be modified and improved in such a way that sufficient work ability is maintained and that people can and want to work.

6.4 Conclusions and implications

The aim of this dissertation was to investigate local, contextual risk factors for disability pensioning. Three dimensions were explored, namely, risk of disability after *unemployment*, *differences between municipalities* in the risk of receiving a disability pension as well as in rehabilitation length before disability pension, and the importance of characteristics of the *work environment.*

Unemployment and work opportunities might be important factors in the increase of disability recipients recipients. However, individual health and socioeconomic position might confound this association, since these factors seem to act as common causes for both unemployment and later disability pension. There seem to be small differences between municipalities in disability pension risk. There were considerable individual differences length of rehabilitation before disability pension, but the differences between municipalities waere relatively small. The results indicate that work place factors might be of interest, but also that self-reported work environment may probably be strongly related to individual health and occupation.

Ageing western populations and the increasing societal costs of retirees underscore the importance of finding ways to extend work careers. The political debate focuses on possibilities for increasing the retirement age, but also calls attention to economic incentives and other ways to prevent disability pension. This debate calls for an increased focus on disability pension prevention, as well as facilitating the return to work of people who are excluded from the work market but who still have work capacity. The results from the studies presented suggest that there are theoretical possibilities for municipality level interventions to reduce the risk of workforce expulsion, for example increased focus from the employment offices on those with health problems who have recently become unemployed. It is also possible that attention on work environment and workplace interventions may be a way to reduce disability inflow.

7 References

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Paper I

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Unemployment and disability pension-an 18-year follow-up study of a 40-year-old population in a Norwegian county

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Abstract

Background: This study explored the association of unemployment and an increased risk of receiving disability pension, and the possibility that this risk is attributed to municipality-specific characteristics.

Methods: A cohort of 7,985 40-42 year olds was followed for 18 years in national registers, identifying new episodes of unemployment and cases of disability pension. The association between an unemployment period and disability pension in the subsequent year was estimated using discrete time multilevel logistic regressions and clustering individuals by municipality. The association between unemployment and disability pension was adjusted for age in the follow up-period, sex, baseline health status, health behaviour and education level. A conditional intra-class correlation coefficient (ICC) was estimated as a measure of inter-municipality variance.

Results: In the follow-up period, 2784 (35%) of the participants were granted disability pension. The crude odds ratio for receiving disability pension after unemployment (adjusted for age in follow-up period and sex only) was 1.42 (95% CI 1.1-1.8). Adjusting for baseline health indicators reduced the odds ratio of unemployment to 1.33 (CI 1.1-1.7). A fully adjusted model, including education level, further reduced the odds ratio of unemployment to 1.25 (CI 1.00-1.6). The ICC of the municipality level was approximately 2%.

Conclusions: Becoming unemployed increased the risk of receiving subsequent disability pension. However, adjusting for baseline health status, health behaviour and education attenuated this impact considerably. The multilevel analysis indicated that a minor, yet statistically significant, proportion of the risk of disability pension can be attributed to the municipality of residence.

Keywords: Disability benefit, Disability pension, Unemployment, Work disability, Multilevel modelling

Background

When a person's ability to work is hampered by disease, the medically based disability pension is a cornerstone in the economic compensation for lost income. Occupational life is important for self-identity, health and well-being [1,2], and the association between unemployment and poor health is well documented [3,4]. Furthermore, unemployment and organizational downsizing have been associated with subsequent disability pensions [5-8]. Past experience indicates that economic downturns affect disadvantaged people greater than others and increases the number of unemployed disabled workers [9]. The recent economic recession highlights the need for increased attention to prevent further inflows from unemployment into disability pension.

Although unemployment and poor health status are associated, it remains unclear whether unemployment leads to poor health and disability, or if people with poorer health are more vulnerable to labour market fluctuations, and thus more likely to become unemployed. Some studies suggest that job loss, and the subsequent unemployment period, leads to poor health [10-12]. However, the research is not conclusive [13],

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and other studies suggest that people with poor health have a higher risk of unemployment [14,15]. Regardless of unemployment being a cause or consequence of poor health, both suggest an explanation for the growing number of people receiving disability pensions; work disability does not arise from health impairments alone, but rather it arises from the combination of health impairments and poor employment opportunities [16].

The risk of unemployment is closely connected to local labour market fluctuations. Hence, any study of the association between unemployment and work disability should take into account possible geographical outcome variations. Multilevel analysis with people nested by municipality is a suitable analytical tool to assess this outcome, but the research on geographical differences in disability pensions within a multilevel analytical framework is limited. However, studies on work disability suggest that geographical differences are related to level of urbanization [17,18], municipality and county deprivation [19], as well as variations in praxis of rejecting applicants [20].

By following a cohort of 40- to 42-year-old men and women for a period of 18 years, we have explored the association of unemployment and an increased risk of being granted disability pension and the influence of health, sex, education, age and location of residence on this risk.

Methods

The data were a part of the National Health Screening Service in Norway and were collected in the Nordland County from August 1988 to March 1989. Individual-level information was obtained from a database of national insurance, created by Statistics Norway and the Norway National Insurance Service. Follow-up time was from January 1, 1992 to December 31, 2007. The study was approved by the Regional Committee for Medical Research Ethics (2009/205-4).

Nordland County is one of 19 counties and is situated in the northern part of Norway. In 1990, Nordland County had 45 municipalities and 239,532 inhabitants. In Statistics Norway's categorization, expressed in terms of the relative distribution of industries in relation to the working population residing in the municipalities in 1990, Nordland County had municipalities where the main industries were fishing, agriculture, manufacturing and services. The diverse types of industries in the municipalities were likely affected differently by business fluctuations during the follow-up period.

Disability pension

Disability pension was established to ensure sufficient income for people whose earning ability is permanently impaired by at least 50% due to illness or injury. Although each insurance office can exercise some discretion in their decisions, and thus be more lenient to people who have obvious problems finding new jobs, the law requires a medical diagnosis. In this study, the dependent variable was the first day of work disability, defined as the time when a person's earning ability was permanently reduced. In most cases, this date represents the first day of long-term sickness benefits for persons who were later granted a disability pension. Data on new incidents of disability pensions were available from January 1, 1992, and covered all cases of disability pensions in Norway. No cases were missed in this period as firm and private disability insurance is always supplementary to the national pension.

Unemployment

The impact of unemployment was hypothesized to influence the subsequent risk of disability pension with some induction time. Hence, assessing work disability after unemployment was done as a time-varying covariate with a one-year time lag, meaning the risk of work disability is measured one year after becoming unemployed. Participants were classified as unemployed the year they started an unemployment period. With sensitivity analyses, we also tested models without a time lag of unemployment and with a two-year time lag. Data were obtained from the national insurance register.

Health measures

Baseline information on different aspects of health was used to adjust for health impairment prior to unemployment. A summated index of the number of chronic illnesses included the following conditions: myocardial infarction, angina pectoris, stroke/cerebral infarction, diabetes, high blood pressure, chronic bronchitis, arthritis, Bechterew's disease, cancer, epilepsy, migraine and gastro-intestinal problems. Self-rated health status was assessed by the question, "what is your health condition like?" The question had four answer categories: "Very good", "Good", "Fair" and "Poor". Depression was assessed by the question, "have you been sad or depressed the last 14 days?" The four answer categories ranged from "almost all the time" to "never or rarely". Headache and pains in the neck and shoulders were measured with a four-point scale, ranging from "never/rarely" to "daily". Alcohol use was assessed with a four-point scale, ranging from "non-drinker" to "daily drinker" Smoking was assessed with a three-point scale with the responses of "non-smoker," "former smoker" and "smoker".

Socio-demographic characteristics

The age of the participants was between 40-42 years at baseline. Education level was used as a measure of

socioeconomic status and included the three categories, "primary school", "high school" and "college/university".

Statistics

The association between unemployment and disability pension was estimated with discrete time multilevel logistic regressions with individuals nested by municipality of residence. In a discrete time logistic regression analysis, time is treated as intervals, and the risk of disability pension (event) is measured within each interval, given that the event has not occurred before [21]. We used one-year intervals that corresponded with calendar years. The risk of receiving disability pension is closely related to age [22], and therefore, we used age during follow-up period and age-squared to assess the combination effect of age and follow-up period.

In order to explore the impact of individual municipalities, we estimated a *conditional Intra- class correlation coefficient* (ICC) [21]. For the present study, the ICC provides an estimate of the relative importance of the municipality location on an individual's propensity to receive disability pension.

The association between unemployment and subsequent disability was performed in three models. Model 1 was adjusted only for age (i.e., age and period) and sex. In Model 2, we also included baseline health status, health behaviour (as measured by alcohol and smoking behaviour). In Model 3, education was added to Model 2. The precision of the estimates was represented by 95% confidence intervals (CI). The analyses were limited to the participants with complete information in all study variables (5,834). All analyses were conducted using STATA 11 software (StataCorp LP, Texas, USA).

Effect measure modification analysis

We tested statistical interactions among the variables to investigate the effects of age in follow-up, sex and level of education on the unemployment-disability pension odds ratio.

Results

Descriptive statistics

A total of 4,302 men and 4,310 women attended the screening, an attendance rate of 78% and 86% for women, respectively [23]. Of the 10,497 people eligible for the survey, 990 were excluded because they received disability pension before start of follow-up. A total of 1,522 (16%) of the remaining persons did not answer the questionnaires, leaving 7,985 participants for follow-up. Participants were followed from January 1, 1992, until December 31, 2007. Follow-up was censored at death or emigration. Altogether, 480 died or emigrated during follow-up.

Descriptive statistics are provided in Table 1. A total of 2,784 (34.9%) of the participants were granted disability pension in the follow-up period.

Figure 1 shows the per cent of new unemployment periods and disability pensions per year in the cohort during the follow-up period. Within the cohort, there was a decrease of new unemployment periods from 8% in 1992 to 1.1% in 2007. In this period, there was a decline in national unemployment from 5.4% in 1992 to 1.7% at the end of the follow-up period [24].

Unemployment and disability pension

Table 2 shows the association between unemployment and disability pension within the subsequent year. The odds ratio of unemployment in Model 1 was 1.42 (CI 1.1-1.8). Adjusting for baseline health indicators in Model 2 reduced the estimate to an odds ratio of unemployment to 1.33 (CI 1.1-1.7). Additional adjustment for education further attenuated the odds ratio of unemployment to 1.25 (CI 1.0-1.6) in Model 3.

When the models were tested with a two-year time lag, the odds ratio of unemployment in Model 1 was 1.26 (CI 1.0-1.6) and decreased to 1.17 (CI 0.9-1.5) in Model 2 and to 1.10 (CI 0.9-1.4) in Model 3. When testing for risk of disability the same year as unemployment, the odds ratio was 1.16 (CI 0.9-1.5) in Model 1, 1.08 (CI 0.8-1.4) in Model 2 and 1.02 (CI 0.8-1.3) in Model 3. Having register data on all individuals, Model 1 was also tested including the individuals who did not answer the survey. The odds ratio of unemployment was 1.52 (1.27-1.82). The ICC and the association between sex and age on the risk of disability pension, was the same as in the original model.

There were substantial associations between sex, different measures of poor health, educational level, smoking and alcohol use and disability pension. There was no statistical evidence of effect measure modification between sex and unemployment on disability pension (p-value interaction = 0.55 in the fully adjusted model). The odds ratio of unemployment and disability pension was 1.16 (CI 0.8-1.6) for women and 1.34 (CI 1.0-1.8) for men. There was no evidence of effect measure modification between unemployment and education (p-value = 0.11). The fully adjusted odds ratio of unemployment for people with a low education level was 1.02 (CI 0.7-1.5), compared to 1.54 (CI 1.1-2.1) for people with medium level of education and 0.41 (CI 0.1-3.0) for people with high level of education. There was no support for effect measure modification between unemployment and age in follow-up (p-value = 0.43). The fully adjusted odds ratio (compared to Model 3) of unemployment on receiving disability pension was 1.06 (CI 0.8- 1.5) in the first half of the follow-up period and 1.27 (CI 0.9-1.7) in the last half of the period.

Table 1 Numbers of persons included in descriptive analysis with and without disability pension during follow-up

	N (%)	*Disability p (%)*	*No Disability p (%)*
Total	7,985	2,784 (34.9)	5,201 (65.1)
Men	4,097 (51.3)	1,185 (42.6)	2,912 (56.0)
Women	3,888 (48.7)	1,599 (57.4)	2,289 (44.0)
Been unemployed in follow-up	2,417 (30.3)	935 (33.6)	1,482 (28.5)
Chronic illness			
None	3,833 (48.0)	1,307 (47.0)	2,526 (48.6)
1	1,700 (21.3)	526 (18.9)	1,174 (22.6)
2 or more	2,458 (30.7)	951 (34.1)	1,501 (28.8)
Self rated health			
Fair/poor	781 (11.5)	435 (18.5)	346 (7.8)
Very good/good	6,034 (88.5)	1,921 (81.5)	4.113 (92.2)
Headache			
Never/rarely, once or several times per month	6,129 (91.4)	1,996 (86.8)	4,133 (93.8)
Once or several times per week, daily	577 (8.6)	303 (13.2)	274 (6.2)
Pain in neck or shoulder			
Never/rarely, once or several times per month	5,305 (79.9)	1,616 (70.1)	3,689 (84.5)
Once or several times per week, daily	1,335 (20.1)	663 (29.9)	672 (15.5)
Depression			
Never/rarely	4,149 (61.5)	1,293 (55.3)	2,856 (64.9)
Often/almost all the time	2,593 (38.5)	1,045 (44.7)	1,548 (35.1)
Health behaviour			
Non-smoker	2,264 (28.4)	635 (22.8)	1,629 (31.3)
Former smoker	2,063 (25.8)	660 (23.8)	1,403 (27.0)
Smoker	3,657 (45.8)	1,488 (53.5)	2,169 (41.7)
Non-drinker	2,570 (40.9)	916 (43.0)	1,654 (39.9)
Drinking up to 1-2 times per month	3,439 (54.8)	1109 (52.0)	2,330 (56.2)
Drinking more than once a week/daily	267 (4.3)	106 (5.0)	161 (3.9)
Educational level			
College/university	1,432 (18.1)	296 (10.7)	1,136 (22.2)
High school	4,106 (52.1)	1,392 (50.3)	2,714 (53.0)
Primary school	2,349 (29.8)	1,077 (39.0)	1,272 (24.8)

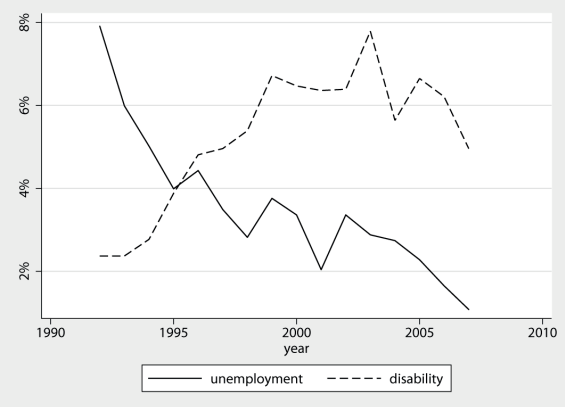

Figure 1 New unemployment periods and disability pensions per year, 1992-2007 in%.

Table 2 The association between unemployment and disability pension.

	Model 1 OR (95% CI)	Model 2 OR (95% CI)	Model 3 OR (95% CI)
Unemployment	1.42 (1.14-1.78)	1.33 (1.06-1.66)	1.25 (1.00-1.56)
Sex (female)	1.58 (1.43-1.74)	1.56 (1.39-1.74)	1.52 (1.36-1.70)
Age in follow-up	1.32 (1.25-1.40)	1.34 (1.26-1.41)	1.34 (1.26-1.41)
Chronic Illness[1]		1.17 (1.11-1.23)	1.17 (1.11-1.23)
Self-rated health: Very good		1.00 (ref)	1.00 (ref)
Good		1.39 (1.21-1.59)	1.35 (1.18-1.54)
Fair		2.08 (1.72-2.50)	2.03 (1.68-2.44)
Poor		3.70 (2.26-6.06)	3.28 (2.00-5.38)
Depressed: Never/rarely		1.00 (ref)	1.00 (ref)
Sometimes		1.10 (0.87-1.39)	1.11 (0.88-1.40)
Often		1.08 (0.85-1.36)	1.08 (0.85-1.37)
Almost all the time		1.14 (0.69-1.87)	1.14 (0.70-1.89)
Headache: Never rarely		1.00 (ref)	1.00 (ref)
Once or several times per month		1.02 (0.91-1.15)	1.03 (0.92-1.16)
Once or several times per week		1.02 (0.85-1.24)	1.02 (0.84-1.23)
Daily		1.35 (0.88-2.06)	1.38 (0.91-2.11)
Pain in neck or shoulder: Never/rarely		1.00 (ref)	1.00 (ref)
Once or several times per month		1.33 (1.18-1.51)	1.31 (1.16-1.48)
Once or several times per week		1.37 (1.16-1.63)	1.32 (1.12-1.58)
Daily		1.90 (1.61-2.24)	1.80 (1.53-2.14)
Smoking: Non-smoker		1.00 (ref)	1.00 (ref)
Former smoker		1.17 (1.01-1.35)	1.11 (0.96-1.20)
Smoker		1.52 (1.34-1.72)	1.38 (1.22-1.98)
Alcohol: Non-drinker		1.00 (ref)	1.00 (ref)
Up to 1-2 times per month		1.09 (0.97-1.22)	1.07 (0.96-1-20)
More than once a week/daily		1.47 (1.15-1.87)	1.55 (1.22-1.98)
Education: High level			1.00 (ref)
Medium level			1.49 (1.27-1.74)
Low Level			2.05 (1.74-2.43)
ICC:	0.02	0.02	0.02
Log likelihood	-7898.4494	-7690.2289	-7649.9913

Discrete time, multilevel regression with one-year time intervals. N = 5,834

[1]A summated index of the number of chronic illnesses described in materials and methods under "health measures"

Differences between municipalities

The multilevel analysis indicates relative small geographical differences in the disability pension risk. The ICC at the municipality level was approximately 2%; however, it was statistically significant, suggesting that the municipality differences were larger than what would be expected due to chance alone.

This result was seen in all the three models. That is, adjusting for compositional differences across municipalities of sex, age, education, health and life style did not influence the ICC estimate.

Discussion

Main findings

The main finding in this study was the association between unemployment and disability pension in the subsequent year. This association was attenuated with adjustments for baseline health status, lifestyle and education, suggesting that these factors may act as common causes for both unemployment and disability pension. We found only weak statistical interactions between unemployment and sex, education and age. A minor but significant risk of disability pension can be attributed to individual municipality characteristics.

Strength and limitations

One of the main strengths of this study was the long follow-up period for the cohort and the high response rate. The study covered a total county population aged 40-42 without disability pension at baseline residing in the same county during the 18-year follow-up period. Although there have been considerable demographical changes in the county, only 6% of the population moved within the county during the follow-up period. Last, the

information in this study was obtained from a highly reliable source established by Statistics Norway and the Norway Social Insurance Service.

The study's questionnaire did not contain information from formerly validated health scales. However, we have included comprehensive information on the diseases and complaints that are recognised as risk factors for disability pension. Furthermore, the single item measure of self-rated health is a common measure both for physical and mental health and is also a strong and independent predictor for disability pension [25-27].

The study did not contain information on the reasons that people became unemployed and only measured new unemployment periods. Thus, it does not grasp the difference between becoming unemployed and being unemployed long-term, where the latter likely has a substantial effect on the risk for disability pension. The analysis conducted may also include persons with regular seasonal employment, which may have attenuated the estimate of the risk of disability pension after unemployment.

The regression models were limited to the participants with complete information for all study variables (5,834). There might be selection effects in the study, meaning that the respondents who chose not to answer questions about their health or health behaviour may have a higher or lower risk of being granted disability pension than the other respondents.

Despite the long follow-up time, the legal framework for receiving disability pension has been stable in this period, and thus it is not likely that changing policies have affected this study. In 2004 there was a major policy change when what was called "time-limited disability pension" were introduced, but this affected mainly younger persons, and not the participants of this study, who were then around 55 years of age.

Unemployment and disability

A recent study from Iceland investigating unemployment and disability pensions from 1992 to 2007 revealed that two large upswings in unemployment had corresponding increases in disability pensions [28]. This suggests that even though health determines the overall incidence of disability pension, marginal fluctuations over time can be related to environmental conditions, like the unemployment rate. When unemployment rates are high, unemployed people with minor health impairments are likely to have more problems finding new jobs, and thus periods of high unemployment rates can lead to more people where work disability arises from the combination of health impairments and poor employment opportunities. The present study's results indicate that the association between unemployment and disability pension could be confounded by health factors. However, it is possible that the association between unemployment and disability pension could be biased according to the presence of time-dependent confounders that are affected by prior unemployment. Hence, further studies are needed that implement longitudinal health measures prior to and after unemployment.

Traditionally, research has suggested that unemployment has stronger negative health effects on men because of gender roles and less financial support from their spouses [29,30]. Two recent meta-analyses summarize the impact of unemployment on physical and psychological well-being reported divergent results. While McKee-Ryan et al. [31] concluded that unemployed women had worse mental health and lower life satisfaction than men, Paul and Moser [29] found that men were substantially more distressed by unemployment than women. A recent study from North Sweden found no support that either gender was more affected by the health consequences of unemployment, and the authors argued that it is less likely to find sex differences in health consequences in Scandinavian countries because of the high female participation in the labour market [30]. In this study, women had a higher risk of receiving disability pension, and although one might assume that women are more often employed in the health services and other public sector professions, which are less influenced by business market fluctuations, this study found weak statistical evidence of gender differences in terms of the likelihood of receiving disability pension after being unemployed.

McKee-Ryan et al. found a u-shaped association where youths and persons older than 50 suffered more from unemployment than middle-aged [31]. Paul and Moser found no clear relationship between age and health outcomes during unemployment [29]. Since we argue that disability pension can be a combination of both health impairments and poor employment opportunities, one might expect that older people, who experience more health problems and possible labour market discrimination, would have a higher risk of receiving disability pensions. Because our study only comprised people from 40 years of age and older, we do not know how our results relate to people of younger age. Despite the association between age and disability pension, we did not find any support that people who became unemployed later in the follow-up period had a higher odds of subsequent disability pension.

Previous research findings suggest that people of high socioeconomic and occupational status have access to better financial and social resources and therefore may be less affected by unemployment. At the same time, these people have lower unemployment rates than people in low-status groups [29]. This study used education

as a measure of socioeconomic status, and despite the association between education and disability pension, the results showed only modest support for the impact of educational level on the association between unemployment and disability pension.

Municipality differences

These findings suggest that the place of residence was of minor importance for the individuals' risk of receiving disability pension. There have been substantial economic and labour market variations between the municipalities in the Nordland County, and a previous descriptive study has shown considerable differences in disability pension incidence rates between the municipalities [32]. With this background, it was expected that the risk of receiving disability pension would be more dependent on municipality residence. However, prior research has not been performed within a multilevel analytic framework, a suitable tool to handle outcomes that are likely to be affected by contextual factors. Nevertheless, the present study's results agree with research on health outcomes that has shown small differences between municipalities using multilevel regression models [33].

Although the municipality is and has been an important contextual level for the local division of government administration (in terms of employment, welfare, health services, etc.), municipalities are diverse when considering their size and inhabitants. Further research should consider other contextual levels, like neighborhoods, economical regions or other levels that may affect the risk of receiving disability pensions. For instance, recent studies have found peer or network effects to be associated with disability pension [34] and welfare participation [35], suggesting that a person's propensity to receive a disability pension can be affected by the disability pension entry rate of similarly-aged workers in his or her neighborhood.

Conclusions

Numerous studies on unemployment and health outcomes have shown divergent findings, especially relating to age and sex. Although there are substantial associations between sex, age and education and disability pension, this study revealed no or only modest effect modification between unemployment and sex, age and education on the odds of subsequent disability pension. This result indicate that becoming unemployed is only a moderate risk-factor itself. However, if job loss has an effect on health behaviour, this suggests that long-term unemployment can have different effects on older people, who experience more health problems, or on people in the lower social class, who might have poorer health behaviors and coping strategies.

In conclusion, becoming unemployed increased the risk of receiving subsequent disability pension. However, adjusting for baseline health status, health behaviour and education attenuated the impact of unemployment considerably. The multilevel analysis indicated that the geographical differences in disability pension risk were only attributable to municipality characteristics to a minor extent; however, this difference was larger than would be expected by chance alone.

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Authors' contributions

MS carried out the data processing, the epidemiological modeling andstatistical analysis and wrote the manuscript. KP, RJ and JHB contributed to the epidemiological modeling, statistical analysis, data interpretation and drafting of the manuscript. NF, ES and BC participated in the design of the study and helped to write the manuscript. All authors read and approved the final manuscript.

Competing interests

The authors declare that they have no competing interests.

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RESEARCH ARTICLE Open Access

Rehabilitation time before disability pension

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Abstract

Background: The decision to grant a disability pension is usually the end of a long process of medical examinations, treatment and rehabilitation attempts. This study investigates to what extent the time spent on rehabilitation time prior to disability pension is associated with characteristics of the individual or the local employment and welfare office, measured as municipality variance.

Methods: A study of 2,533 40 to 42 year olds who received disability pension over a period of 18 years. The logarithm of the rehabilitation time before granting a disability pension was analysed with multilevel regression.

Results: The rehabilitation time before a disability pension was granted ranged from 30 to 5,508 days. Baseline health characteristics were only moderately associated with rehabilitation time. Younger people and people with unemployment periods had longer rehabilitation time before a disability pension was granted. There were only minor differences in rehabilitation time between men and women and between different levels of education. Approximately 2% of the total variance in rehabilitation time could be attributed to the municipality of residence.

Conclusions: There is a higher threshold for granting a disability pension to younger persons and those who are expecting periods of unemployment, which is reflected in the extended rehabilitation requirements for these groups. The longer rehabilitation period for persons with psychiatric disorders might reflect a lack of common knowledge on the working capacity of and the fitted rehabilitation programs for people with psychiatric disorders.

Keywords: Disability benefit, Disability pension, Unemployment, Work environment, Multilevel modelling

Background

Disability benefits are important because they provide economical assurance to people who are marginalised from the labour market due to health impairments. The decision to grant a disability pension is in most cases the end of the line of a long process of medical examinations, treatment and rehabilitation attempts. This process is likely to be a substantial strain on the persons involved [1], and the length of the rehabilitation is likely to reflect the anticipated effect of the process, as well as the attitudes and the capacity of the local employment and welfare office.

Although the health of the participant is an important factor when people struggle returning to work after a rehabilitation process, other demographic factors can be important to whether this ends up in employment or receiving a disability pension. Studies have shown that the likelihood of returning to work after rehabilitation decreases with increasing age [2-4] and that individuals with a higher level of education are more likely to return to work [5-7]. The local labour market could also be a deciding factor with respect to work return. Studies have revealed that subjects living in regions with a low level of unemployment were more likely to return to work [8,9], that low national unemployment rates, increases the probability of returning to work [10], and that people living in rural areas were less likely to return to work [11]. A Swedish review [12] presents a number of other demographic factors that are associated with return to work after vocational rehabilitation including working status [2,6], income [13,14] nationality [5,11] and marital status [5,15]. A Swedish study on outcomes of vocational rehabilitation in six local national insurance offices in the same county also revealed major differences in both sickness allowance, return to work and disability pension [16].

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In Norway, each municipality has an employment and welfare office that organises social welfare decisions (www.nav.no). Furthermore, each municipality has the responsibility to provide primary health care to its citizens. Although the rules and regulations pertaining to rehabilitation and disability pension are uniform and valid throughout Norway, the legislation on vocational rehabilitation functions as a framework law. As a consequence, each employment and welfare office can exercise discretion in their decisions in the rehabilitation process. This discretion may lead to variations in the rehabilitation process between municipalities, where the employment and welfare offices put more effort in finding and providing more opportunities for rehabilitation for people with better prospects in the labour market, and where disability pensions are given sooner when labour market prospects indicates that a return to work is less likely. Another factor that may differ between municipalities is the quality of the healthcare and the medical rehabilitation for people who have temporarily left the labour market because of health problems.

The aim of this study was to investigate whether there were differences in the duration of the rehabilitation period preceding disability pension between local employment and welfare offices, as measured by municipality variance. The duration of the rehabilitation period between men and women, levels of education, age groups, unemployment status, and diagnoses underlying the disability grant were also investigated.

Methods

The data were derived from the National Health Screening Service in Norway. Between August 1988 and March 1989 all residents of Nordland County in Norway aged 40 to 42 years were invited to participate. Data were linked to the national insurance database via a personal identification number, created by Statistics Norway and the Norway National Insurance Service. Follow-up time was from January 1st 1992 to December 31st 2007. The Regional Committee for Medical Research Ethics (2009/205-4) approved this study.

Nordland County is situated in the northern region of Norway. At the time of the health screening, Nordland had 45 municipalities and approximately 240,000 inhabitants. Nordland County has a diversity of industries where some municipalities are dominated by fishing, some by agriculture, some by manufacturing industry and some by services. This diversity in industries suggests that municipalities have been affected differently by business fluctuations during the follow-up period.

Disability pension

Disability pension is granted to people whose earning ability is permanently impaired by at least 50% due to illness, injury or inborn defect. It is also a requirement that the illness or injury is the main reason for the impaired wage earning capacity. Data on new incidents of disability pensions were available from January 1st 1992, and covers all cases of disability pensions in Norway.

Rehabilitation time before disability pension

The dependent variable in this study was the duration of the rehabilitation period before disability pension. The rehabilitation time in days was calculated as the time between the first date of work disability and the date for granting a disability pension. The first date of work disability represents the point in time when a person's earning ability was permanently reduced – in most cases the first day of being sick-listed. The time for granted disability pension is always set to three months ahead of the date of application for disability pension. Both dates are registered at the time disability pension is granted. The rehabilitation period normally includes long-term sick leave, medical rehabilitation and vocational rehabilitation programmes which can deal with vocational assessment, work retraining, education, counselling, work guidance and other forms of preparation for returning to work. [13].

Health measures

In this study, information on different aspects of health and disease were used to adjust for health impairment at baseline. A summarised index of the number of chronic illnesses was constructed including the following conditions: myocardial infarction, angina pectoris, stroke/cerebral infarction, Bechterew's disease, cancer, diabetes, chronic bronchitis, arthritis, epilepsy, migraine and gastro-intestinal problems. Self-rated health was assessed by the question, "What is your health condition like?" with the four answer categories: "very good," "good," "fair" and "poor". Depression was assessed by the question, "Have you been sad or depressed the last 14 days?" with the four answer categories "almost all the time," "frequently," "sometimes" and "never or rarely". Headache and pains in the neck and shoulders were measured with a four-point scale, with answer categories ranging from "never/rarely" to "daily". Smoking was assessed with a three-point scale with three answer categories "non-smoker," "former smoker" and "smoker". Consumption of alcohol was assessed with a four-point scale, with answer categories ranging from "non-drinker" to "daily drinker."

Disability pension diagnosis

Although people can be caused by several diagnoses, the National Work and Welfare Administration codes one major diagnosis after disability pension has been

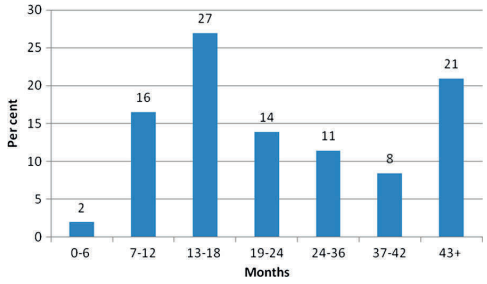

Figure 1 Distribution of rehabilitation time (%). N=2,533.

granted. Musculoskeletal and psychiatric diseases are the most common medical diagnoses for being granted a disability pension in Norway [17], and the rehabilitation process could be different for individuals in these diagnostic categories. The study retrieved diagnosis information from the medical classifications ICD-9 and ICD-10. Diagnoses were split into musculoskeletal disorders, psychiatric disorders and "other diagnosis." To classify individuals in the psychiatric diagnosis group, the ICD-9 mental disorder codes 290–319 and ICD-10 mental disorder codes F00-F99 were used. Individuals with musculoskeletal diagnoses were classified including codes for diseases of the musculoskeletal system and connective tissue 710–739 from ICD-9 and M00-M99 from ICD-10. The diagnosis-specific analysis was restricted to the participants that were registered with a diagnosis at the end of the follow-up (1,346 participants).

Unemployment

With data obtained from the national insurance register, study participants with any periods of unemployment throughout the follow-up period were classified as having been unemployed.

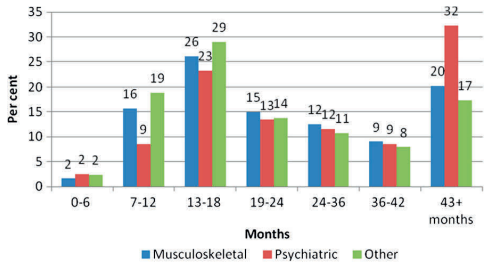

Figure 2 Distribution of rehabilitation time (%). Different diagnostic categories underlying the disability pension decision. Musculosceletal (N=689), psychiatric (N=164) and other diagnoses (N=493).

Table 1 Descriptive statistics. Mean, median and standard deviation of number of days from first day of work disability to day of granted disability pension

	N	Mean	Median	Std.dev
Total	2.533	763	579	556
Unemployed in follow-up period	854	875	669	671
Not Unemployed in follow-up period	1679	706	549	477
Chronic illness: 0	1194	759	579.5	537
1	482	748	548.5	591
2 or more	857	775	608	562
Self-rated health: Fair/poor	375	768	550	617
Very good/good	1777	762	580	545
Depressed: Never/rarely/sometimes	1.189	818	579	639
Often/Almost all the time	945	762	579	555
Headache: Never/rarely/ Once or several times per month	1837	763	579	763
Once or several times per week/Daily	264	761	607	518
Pain neck/shoulder: Never/rarely/ Once or several times per month	1493	748	578	551
Once or several times per week/Daily	589	783	608	562
Smoking: Non-smoker	581	742	578	521
Former smoker	608	744	577	535
Smoker	1343	780	607	579
Alcohol: Non-drinker	838	740	578	533
Up to 1–2 times per month	1012	761	563.5	563
More than once a week/daily	99	856	639	636
Education: Low level	971	773	607	548
Medium level	1287	756	579	563
High level	261	755	577	552
Municipality size: Under 7,500 inhabitants	1055	792	610	592
Between 7,500 and 15,000 inhabitants	615	790	579	590
Over 15,000 inhabitants	863	708	549	477
Musculoskeletal	1002	774	611	518
Psychiatric	261	847	669	577
Diagnosis: "Other"	700	751	563.5	561

*Differences in N due to missing data.

Age and education

The age of the participants ranged between 40–42 years at baseline. To investigate whether the duration of the treatment period was different for different age groups; the participants' ages at the first date of disability was recorded, which ranged from 44 to 61 years. The participants were divided into six age groups. Level of education was measured with the three categories: "primary school", "high school" and "college/university".

Table 2 Multilevel linear regression of the logarithm of days (95% confidence intervals) in rehabilitation time prior to disability pension award

	Model 1		Model 2		Model 3	
	β	95% CI	β	95% CI	β	95% CI
Females vs. Males	0.00	−0.06 to 0.05	0.01	−0.05 to 0.08	0.01	−0.05 to 0.08
Age:						
44-46	Ref		Ref		Ref	
57-59	−0.15	−0.30 to 0.01	−0.17	−0.33 to −0.02	−0.17	−0.33 to −0.02
50-52	−0.28	−0.43 to −0.13	−0.31	−0.47 to −0.16	−0.32	−0.47 to −0.17
53-55	−0.21	−0.36 to −0.06	−0.24	−0.38 to −0.09	−0.26	−0.41 to −0.11
56-58	−0.53	−0.68 to −0.39	−0.56	−0.71 to −0.41	−0.59	−0.75 to −0.44
59-61	−0.80	−0.95 to −0.64	−0.82	−0.98 to −0.67	−0.85	−1.01 to −0.69
Unemployed prior to disability vs. not	0.16	0.10 to 0.22	0.16	0.10 to 0.22	0.16	0.10 to 0.22
Number of reported chronic illnesses			0.03	−0.01 to 0.06	0.03	−0.01 to 0.06
Self-rated health:						
Very good			Ref		Ref	
Good			−0.08	−0.34 to 0.19	−0.07	−0.33 to 0.19
Fair			0.02	−0.23 to 0.28	0.03	−0.23 to 0.29
Poor			0.08	−0.19 to 0.35	0.08	−0.19 to 0.35
Depressed:						
Never/rarely			Ref		Ref	
Sometimes			0.09	−0.15 to 0.34	−0.09	−0.16 to 0.33
Often			0.12	−0.12 to 0.37	0.11	−0.23 to 0.36
Almost all the time			0.14	−0.13 to 0.41	0.13	−0.14 to 0.40
Headache:						
Never/rarely			Ref		Ref	
Once or several times per month			−0.04	−0.10 to 0.03	−0.04	−0.11 to 0.03
Once or several times per week			−0.11	−0.22 to −0.00	−0.11	−0.22 to 0.00
Daily			−0.07	−0.30 to 0.16	−0.07	−0.30 to 0.16
Pain in neck or shoulder:						
Never/rarely			Ref		Ref	
Once or several times per month			0.02	−0.04 to 0.09	0.02	−0.04 to 0.09
Once or several times per week			0.04	−0.06 to 0.14	0.04	−0.06 to 0.14
Daily			0.09	0.00 to 0.18	0.09	0.00 to 0.18
Smoking:						
Non-smoker			Ref		Ref	
Former smoker			−0.00	−0.08 to 0.08	0.00	−0.08 to 0.08
Smoker			−0.02	−0.09 to 0.05	−0.01	−0.09 to 0.06
Alcohol:						
Non-drinker			Ref		Ref	
Up to 1–2 times per month			0.03	−0.03 to 0.10	0.03	−0.03 to 0.10
More than once a week/daily			0.10	−0.03 to 0.24	0.10	−0.03 to 0.24
Education:						
High level					Ref	
Medium level					−0.01	−0.07 to 0.05
Low Level					0.07	−0.03 to 0.16

Table 2 Multilevel linear regression of the logarithm of days (95% confidence intervals) in rehabilitation time prior to disability pension award *(Continued)*

Municipality size:				
Under 7,500 inhabitants			Ref	
7,500 to 15,000 inhabitants			0.02	−0.07 to 0.11
Over 15,000 inhabitants			−0.07	−0.16 to 0.03
Rehabilitation rate in municipality			0.02	−0.01 to 0.05
Random effects:				
Municipality variance	0.0048	0.0046	0.0041	
Years within municipality variance	0.0026	0.0024	0.0023	
Individual variance	0.3329	0.3268	0.3259	
ICC:	0.02	0.02	0.02	

1,757 individuals in 45 municipalities.

Municipality size

A variable was created representing municipality size, reporting whether the respondents were living in a small (less than 7,500 inhabitants), medium (between 7,500 and 15,000 inhabitants) or large municipality (more than 15,000 inhabitants).

Vocational rehabilitation rates in municipalities

Rates of people on vocational rehabilitation for each municipality for every year of the follow-up ranged from 0.24% to 6.43%. The rehabilitation rate was recorded the same year as the first date of work disability.

Statistics

The distribution of the rehabilitation time in days was skewed. Accordingly, a log-transformation was performed to correct the skewed data. A linear multilevel regression analysis was applied to individuals nested by municipality of residence and year of start of rehabilitation. To explore the impact of place of residence, the *Intra- class correlation coefficient* (ICC) was calculated as an estimate of the relative importance of place of residence on the length of the rehabilitation period before receiving a disability pension. The main analyses were performed in a three-level model with individuals nested within years within municipality of residence. The diagnosis-specific analyses had no indication of year differences, and thus were performed as a two-level analysis.

The statistical analysis of the duration of the rehabilitation period was performed in three models. Model 1 was adjusted only for age, sex and unemployment. In model 2, baseline health status and health behaviour (as measured by alcohol and smoking behaviour) were added. In model 3, education, municipality size and rehabilitation rate in the municipality were added to model 2's parameters. The separate analyses for the different diagnoses were done with the same models. The precision of the estimates was presented using 95% confidence intervals (CI). The analyses were limited to the participants with complete information in all study variables (1,757). All analyses were conducted using STATA 11 software (StataCorp LP, Texas, USA).

Results

Descriptive results

Of the 10,497 invited to the health screening, 4,302 men and 4,310 women attended, resulting in an attendance rate of 78% and 86% for men and women, respectively [18]. A total of 2,784 (35%) received a disability pension during the follow-up time. Of these respondents 2,533 persons lived in Nordland County at their first date of disability and also were granted disability pension before the end of the follow-up period. A total of 1,757 of the disability pension recipients had complete information on all study variables.

Rehabilitation time for all participants varied from 30 to 5,785 days with a mean of 805 days (2.2 years) and standard deviation of 608 days. In Figure 1, a categorical distribution of rehabilitation time in months is presented. In Figure 2, the same distribution is presented for the different disability diagnostic categories. Those granted a disability pension within the psychiatric diagnosis group had a mean of 847 days (SD 577) rehabilitation time. Those within the musculoskeletal group had a mean of 774 days (SD 518) rehabilitation time, as compared to 751 days (SD 561) for other diagnosis. Table 1 shows rehabilitation time in days for different groups.

Table 2 shows the results from the multilevel linear regression model where the dependent variable was taken as the logarithm of the days of the rehabilitation period before disability pension was granted. The results indicate that there was only minor sex and education differences in the length of the rehabilitation period before disability pension. In the fully adjusted model, the rehabilitation time was approximately 85% shorter for the oldest group than for the youngest (−0.85, 95% CI −0.69

Table 3 Multilevel linear regression of the logarithm of days (95% confidence intervals) in rehabilitation time prior to disability pension award for subjects with musculoskeletal diagnosis

	Model 1		Model 2		Model 3	
	β	95% CI	β	95% CI	β	95% CI
Females vs. Males	−0.06	−0.15 to 0.03	−0.05	−0.16 to 0.06	−0.05	−0.16 to 0.06
Age:						
44-46	Ref		Ref		Ref	
47-49	−0.24	−0.45 to −0.02	−0.30	−0.52 to −0.08	−0.29	−0.51 to −0.07
50-52	−0.33	−0.54 to −0.12	−0.40	−0.61 to −0.17	−0.40	−0.60 to −0.18
53-55	−0.38	−0.59 to −0.18	−0.45	−0.66 to −0.24	−0.45	−0.69 to −0.27
56-58	−0.70	−0.92 to −0.50	−0.79	−1.00 to −0.57	−0.79	−1.05 to −0.61
59-61	−0.99	−1.28 to −0.69	−1.05	−1.35 to −0.75	−1.05	−1.40 to −0.79
Unemployed prior to disability vs. not	0.13	0.04 to 0.23	0.14	0.05 to 0.24	0.14	0.04 to 0.23
Number of reported chronic illnesses			0.01	−0.04 to 0.06	0.01	−0.04 to 0.06
Self-rated health:						
Very good			Ref		Ref	
Good			−0.09	−0.49 to 0.32	−0.06	−0.46 to 0.34
Fair			0.11	−0.29 to 0.50	0.13	−0.27 to 0.53
Poor			0.23	−0.18 to 0.65	0.25	−0.16 to 0.67
Depressed:						
Never/rarely			Ref		Ref	
Sometimes			−0.09	−0.47 to 0.29	−0.08	−0.46 to 0.30
Often			−0.05	−0.44 to 0.33	−0.05	−0.43 to 0.33
Almost all the time			−0.05	−0.47 to 0.37	−0.05	−0.44 to 0.40
Headache:						
Never/rarely			Ref		Ref	
Once or several times per month			−0.03	−0.13 to 0.07	−0.03	−0.13 to 0.07
Once or several times per week			−0.06	−0.22 to 0.10	−0.06	−0.22 to 0.10
Daily			0.04	−0.33 to 0.40	0.05	−0.31 to 0.42
Pain in neck or shoulder:						
Never/rarely			Ref		Ref	
Once or several times per month			0.01	−0.14 to 0.12	0.00	−0.11 to 0.12
Once or several times per week			0.07	−0.08 to 0.22	0.07	−0.08 to 0.22
Daily			0.13	−0.02 to 0.27	0.12	−0.02 to 0.26
Smoking:						
Non-smoker			Ref		Ref	
Former smoker			−0.03	−0.15 to 0.10	−0.03	−0.16 to 0.10
Smoker			−0.02	−0.14 to 0.09	−0.03	−0.15 to 0.08
Alcohol:						
Non-drinker			Ref		Ref	
Up to 1–2 times per month			0.04	−0.07 to 0.14	0.04	−0.06 to 0.14
More than once a week/daily			0.10	−0.13 to 0.33	0.11	−0.12 to 0.34
Education:						
High level					Ref	
Medium level					−0.03	−0.12 to 0.06
Low Level					0.01	−0.17 to 0.20

Table 3 Multilevel linear regression of the logarithm of days (95% confidence intervals) in rehabilitation time prior to disability pension award for subjects with musculoskeletal diagnosis *(Continued)*

Municipality size:				
Under 7,500 inhabitants			Ref	
7,500 to 15,000 inhabitants			−0.06	−0.19 to 0.08
Over 15,000 inhabitants			−0.09	−0.24 to 0.05
Rehabilitation rate in municipality			0.04	−0.01 to 0.09
Random effects:				
Variance between municipalities	0.0076	0.0072	0.0077	
Variance within municipalities	0.3266	0.3175	0.3153	
ICC:	0.02	0.02	0.02	

689 individuals in 45 municipalities.

to −1.01). Those experiencing unemployment had a 16% (0.l6, 95% CI 0.10 to 0.22) longer rehabilitation period before they were granted disability pension.

The results in model 1 were based on those having complete information on all study variables. A sensitivity analysis (Additional file 1) of all 2,533 persons who received disability pension gave approximately the same results as those presented in Table 3.

Municipality differences in rehabilitation time

The multilevel analysis indicated relatively small differences between the practices of the employment and welfare offices in the length of rehabilitation periods. The ICC at the municipality level was between 1 and 2% in all models in Table 2. However, the ICC was statistically significant (p<.01 in all three models), suggesting that the municipality differences were greater than what would be expected due to chance alone.

Diagnosis specific analyses

Analyses for the different groups of disability diagnosis are presented in Tables 3, 4 and 5. For people with "other" diagnosis and those in the musculoskeletal group, the ICC was between 1 and 2% in all models. For the psychiatric group, model 1 gives an ICC of 17%. Adjusting for health, smoking and alcohol use reduced the ICC to 12% and in model 3 the ICC was reduced to zero. Several models were performed to determine the robustness of the crude high ICC for psychiatric diagnoses. The number of individuals with complete survey information and a psychiatric disability diagnosis was low (n=164). A sensitivity analysis (Additional file 1) of all 261persons who received disability pension with a psychiatric diagnosis gave an ICC of about 1%, suggesting an ICC in line with the other models of our analyses.

Discussion

Main findings

The results from this large population study showed considerable variation in the time before a disability pension are granted, ranging from 30 to 5,508 days. As expected, younger age was associated with a longer rehabilitation time. However, the initial health of the study participants was only marginally associated with the time of the rehabilitation period. Furthermore, those who experienced unemployment periods in the follow up period had longer rehabilitation time before a disability pension was granted than those not being unemployed. There were only minor differences in rehabilitation time before disability pension for men or women, or for different levels of education. Approximately 2% of the total variance could be attributed to the municipality level. The municipality rate of vocational rehabilitation had no substantial influence on rehabilitation time.

Strengths and limitations

The present study was a large population based survey with a high response rate (82%). The information in this study was obtained from a highly reliable source established by Statistics Norway and the Norway Social Insurance Service. Although numerous studies are published on rehabilitation and return to work, this is, to our knowledge, the first study that investigates variations in the duration of the rehabilitation period for a group of participants ultimately becoming disability pension recipients.

The accuracy of the rehabilitation time period is presumably high as the information was obtained from a highly reliable source set up by Statistics Norway and the Norway Social Insurance Service.

The questionnaire in this study did not contain formerly validated health scales. However, the study had comprehensive information on several diseases and complaints that are well known risk factors for disability pension. Furthermore, the study included self-rated health, a common measure for both physical and mental health and also an independent predictor for disability pension [19-21]. The present study had only a crude measure of alcohol consumption, which may have underestimated the impact of alcohol consumption.

Table 4 Multilevel linear regression of the logarithm of days (95% confidence intervals) in rehabilitation time prior to disability pension award for subjects with psychiatric diagnosis

	Model 1		Model 2		Model 3	
	β	95% CI	β	95% CI	β	95% CI
Females vs. Males	0.10	−0.10 to 0.30	0.08	−0.15 to 0.32	0.15	−0.08 to 0.37
Age:						
44-46	Ref		Ref		Ref	
47-49	−0.13	−0.56 to 0.31	−0.05	−0.24 to 0.22	−0.02	−0.44 to 0.41
50-52	−0.10	−0.53 to 0.33	−0.08	−0.69 to −0.05	−0.03	0.46 to 0.39
53-55	0.01	−0.42 to 0.44	0.04	−0.39 to 0.47	0.04	−0.39 to 0.48
56-58	−0.40	−0.85 to 0.06	−0.38	−0.84 to 0.08	−0.32	−0.80 to 0.16
59-61	-	-	-	-	-	-
Unemployed prior to disability vs. not	0.09	−0.14 to 0.31	0.05	−0.18 to 0.27	−0.01	−0.23 to 0.21
Number of reported chronic illnesses			−0.01	−0.12 to 0.10	−0.02	−0.12 to 0.09
Self-rated health:						
Very good			Ref		Ref	
Good			−0.63	−1.63 to 0.37	−0.60	−1.58 to 0.39
Fair			−0.52	−1.51 to 0.46	−0.47	−1.43 to 0.49
Poor			0.47	−1.52 to 0.57	−0.42	−1.45 to 0.61
Depressed:						
Never/rarely			Ref		Ref	
Sometimes			−0.19	−0.79 to 0.41	−0.29	−0.87 to 0.28
Often			−0.20	−0.79 to 0.39	−0.33	−0.90 to 0.23
Almost all the time			−0.28	−0.94 to 0.38	−0.43	−1.06 to 0.21
Headache:						
Never/rarely			Ref		Ref	
Once or several times per month			−0.17	−0.41 to 0.08	−0.17	−0.42 to 0.08
Once or several times per week			−0.58	−0.96 to 0.20	−0.70	−1.07 to 0.34
Daily			−0.54	−1.22 to 0.14	−0.46	−1.13 to 0.22
Pain in neck or shoulder:						
Never/rarely			Ref		Ref	
Once or several times per month			0.09	−0.17 to 0.35	0.14	−0.11 to 0.40
Once or several times per week			0.41	0.02 to 0.80	0.50	0.12 to 0.89
Daily			0.36	0.03 to 0.70	0.45	0.12 to 0.78
Smoking:						
Non-smoker			Ref		Ref	
Former smoker			−0.21	−0.53 to 0.11	−0.18	−0.49 to 0.13
Smoker			−0.15	−0.44 to 0.13	0.08	−0.36 to 0.20
Alcohol:						
Non-drinker			Ref		Ref	
Up to 1–2 times per month			0.12	−0.12 to 0.36	0.18	−0.06 to 0.42
More than once a week/daily			−0.00	−0.41 to 0.40	0.06	−0.34 to 0.45
Education:						
High level					Ref	
Medium level					0.06	−0.16 to 0.29
Low Level					0.40	0.12 to 0.69

Table 4 Multilevel linear regression of the logarithm of days (95% confidence intervals) in rehabilitation time prior to disability pension award for subjects with psychiatric diagnosis *(Continued)*

Municipality size:				
Under 7,500 inhabitants			Ref	
7,500 to 15,000 inhabitants			0.02	−0.23 to 0.28
Over 15,000 inhabitants			−0.35	−0.57 to −0.12
Rehabilitation rate in municipality			−0.05	−0.14 to 0.08
Random effects:				
Variance between municipalities	0.0756	0.0477	0.0000	
Variance within municipalities	0.3706	0.3513	0.3599	
ICC:	0.17	0.12	0.00	

164 individuals in 45 municipalities.

The number of participants was limited to those with complete information for all study variables (1,757) in the regression models. There might be selection effects in the study, meaning that the respondents who chose not to answer questions about their health or health behaviour may have experienced a different rehabilitation pattern and rehabilitation time than those included. The diagnosis-specific analysis was limited to the participants that were registered with a diagnosis at time end of the follow-up (1,346). The diagnosis for disability pension can be delayed for some persons, meaning that our data had missing information about diagnosis for some of the participants that received disability pension the last years of the follow-up.

This study considered rehabilitation time only for those who eventually were granted disability pension, and the results of the rehabilitation process may have differed if we had included those succeeding return to work.

The study did not have full information on disability pension and unemployment from 1990 and 1991. Hence, information from the participants starting their disability process before 1992 was not available.

Rehabilitation time before disability pension

Age was associated with the length of the rehabilitation period. Several other studies has shown that the chances of job return after a rehabilitation period is attenuated with increasing age [3,22]. This attenuation may be because job return seems to be more likely for younger people who have a better overall health and who are more attractive on the labour market. Younger people who are granted a disability pension lose more productive years, and it is likely that the employment and welfare offices are more prone to facilitating job return for younger people, hence a longer and more thorough rehabilitation process before granting a disability pension.

The length of the rehabilitation process was approximately the same for different levels of education. Although a recent Norwegian study [22] concluded that educational level had no substantial influence on the probability of returning to work after rehabilitation, most previous studies have shown that people with higher education are more likely to succeed returning to work after rehabilitation [5-7]. One might expect that highly educated persons have more opportunities in terms of finding new jobs. This study considered rehabilitation time only for those who eventually were granted disability pension, and if we studied the results of the rehabilitation process the findings may have differed. A reason could be that higher educated individuals who apply for a disability pension have more disabling conditions than lower educated individuals. The analysis did not indicate any substantial differences between men and women regarding the length of rehabilitation before the granting of the disability pension. Previous research has shown conflicting findings in terms of sex differences in the likelihood of returning to work. A Swedish review [12] showed that even though a majority of the studies indicate that men are more successful in returning to work after a rehabilitation period, others indicate the opposite. Again, this study could not answer whether there are sex differences in results of a rehabilitation process, only whether there are differences in duration of the rehabilitation process between the sexes.

People who experienced unemployment in the follow-up period had a longer rehabilitation period before disability pension was granted. Previous studies have shown that having a job to return to is associated with returning to work after a rehabilitation period, compared with those without a job to return to [2,6]. A longer rehabilitation period for people who have been unemployed could be caused by difficulties in assessing the major cause of their work incapacity, their health impairments or their unemployment situation.

One would expect poor health to be associated with a shorter rehabilitation period, given that poor health is a premise for being granted a disability pension. However, in this study health measures were only marginally associated with the length of the rehabilitation period. Several studies have shown that people with more severe

Table 5 Multilevel linear regression of the logarithm of days (95% confidence intervals) in rehabilitation time prior to disability pension award for subjects with other diagnoses

	Model 1		Model 2		Model 3	
	β	95% CI	β	95% CI	β	95% CI
Females vs. Males	−0.02	−0.11 to 0.08	0.04	−0.08 to 0.15	0.03	−0.09 to 0.15
Age:						
44-46	Ref		Ref		Ref	
47-49	0.02	−0.25 to 0.30	−0.25	−0.25 to −0.30	0.03	−0.25 to 0.31
50-52	−0.26	−0.52 to 0.01	−0.26	−0.54 to 0.01	−0.26	−0.53 to 0.02
53-55	−0.14	−0.40 to 0.13	−0.12	−0.40 to 0.15	−0.10	−0.39 to 0.17
56-59	−0.52	−0.79 to −0.26	−0.50	−0.78 to −0.23	−0.48	−0.76 to −0.20
60-62	−0.80	−1.17 to −0.44	−0.77	−1.14 to −0.40	−0.74	−1.13 to −0.35
Unemployed prior to disability vs. not	0.15	0.05 to 0.25	0.19	0.08 to 0.29	0.19	0.08 to 0.30
Number of reported chronic illnesses			0.05	−0.00 to 0.10	−0.05	−0.01 to 0.10
Self-rated health:						
Very good			Ref		Ref	
Good			−0.01	−0.43 to 0.42	−0.02	−0.44 to 0.41
Fair			0.11	−0.30 to 0.53	0.11	−0.31 to 0.53
Poor			0.09	−0.35 to 0.53	0.09	−0.36 to 0.53
Depressed:						
Never/rarely			Ref		Ref	
Sometimes			0.01	−0.57 to 0.58	0.00	−0.57 to 0.58
Often			0.04	−0.54 to 0.62	0.04	−0.54 to 0.61
Almost all the time			−0.04	−0.66 to 0.57	−0.05	−0.67 to 0.57
Headache:						
Never/rarely			Ref		Ref	
Once or several times per month			−0.11	−0.24 to 0.01	−0.12	−0.25 to 0.01
Once or several times per week			−0.09	−0.30 to 0.12	−0.10	−0.31 to 0.11
Daily			0.01	−0.42 to 0.44	0.01	−0.42 to 0.44
Pain in neck or shoulder:						
Never/rarely			Ref		Ref	
Once or several times per month			0.09	−0.04 to 0.21	0.09	−0.04 to 0.22
Once or several times per week			0.10	−0.08 to 0.29	0.11	−0.08 to 0.30
Daily			0.13	−0.05 to 0.32	0.14	−0.04 to 0.32
Smoking:						
Non-smoker			Ref		Ref	
Former smoker			−0.04	−0.19 to 0.11	−0.03	−0.19 to 0.12
Smoker			−0.01	−0.14 to 0.12	−0.01	−0.14 to 0.12
Alcohol:						
Non-drinker			Ref		Ref	
Up to 1–2 times per month			0.06	−0.07 to 0.18	0.05	−0.07 to 0.18
More than once a week/daily			0.24	−0.02 to 0.49	0.25	−0.01 to 0.51
Education:						
High level					Ref	
Medium level					0.03	−0.09 to 0.14
Low Level					0.04	−0.13 to 0.21

Table 5 Multilevel linear regression of the logarithm of days (95% confidence intervals) in rehabilitation time prior to disability pension award for subjects with other diagnoses *(Continued)*

Municipality size:				
Under 7,500 inhabitants			Ref	
7,500 to 15000 inhabitants			−0.06	−0.20 to 0.07
Over 15,000 inhabitants			−0.02	−0.14 to 0.10
Rehabilitation rate in municipality			−0.02	−0.07 to 0.03
Random effects:				
Variance between municipalities	0.0038	0.0025	0.0008	
Variance within municipalities	0.3136	0.3048	0.3053	
ICC:	0.01	0.01	0.00	

493 individuals in 45 municipalities.

diseases are less likely to return to work [14,15], and it is important to notice that this study had information on baseline health only; no information was collected on health throughout the follow up period. It is also possible that the sample heterogeneity was reduced, for education and gender differences, because only those that were granted a disability pension were studied.

Municipality differences

The multilevel analysis showed that 2% of the variance could be attributed the municipality level. These results might indicate fairly equal practice between social service offices across municipalities. This is also in line with the results of a previous study based on the same material, assessing the risk of disability pension between the different municipalities where approximately 2% of the variance could be attributed to the municipality level [23].

Previous studies have shown that subjects living in regions with a low level of unemployment were more likely to return to work [8,9], and that people living in the countryside were less likely to return to work [11]. Although health is the most important factor for succeeding returning to work, work place characteristics could also be of importance. For people with manual work, or with few opportunities for adjustments at their original workplace, health impairments can make it more difficult returning to work, compared to those who have the possibility to adapt to other tasks. This means that area of residence can be of more importance for some people, especially for those who have problems returning to their original workplace, and have to search for jobs in areas with high unemployment rates, or in rural areas with less employment opportunities.

The present study's results indicated that people with psychiatric diagnoses were granted a disability pension sooner in the largest municipalities. This finding may be due to organisational characteristics or other characteristics of some employment and welfare offices in some large municipalities. Hence, this finding requires more research attention. One interpretation of this finding is that the employment and welfare offices in the smallest municipalities have less experience with people with psychiatric diagnoses, have more problems assessing their work capacity and has a lack of knowledge on suitable rehabilitation programmes for this diagnostic group.

Conclusions

This study revealed a longer rehabilitation time for younger people and those who have experienced unemployment during the follow-up period. Higher thresholds for granting a disability pension to younger persons and for those having experienced unemployment can reflect a demand for extended rehabilitation measures for these groups. Baseline health characteristics were only moderately associated with rehabilitation time, and no substantial differences in rehabilitation time between men and women, or for different levels of education were found This result may be explained by the fact that the heterogeneity among employees is strongly reduced when we study only those that are granted disability pension. This sample is thus adjusted for all factors that affect the probability of being granted a disability pension (health, gender, education etc.). Place of residence had modest importance for the length of the rehabilitation time. Larger municipalities had a considerably shorter rehabilitation time before the granting of a disability pension. The longer rehabilitation period for persons with psychiatric disorders could reflect difficulties assessing their working capacity and a lack of knowledge on rehabilitation programs for this group.

Additional file

Additional file 1: Appendix: Table 6. Multilevel linear regression of the logarithm of days (95% confidence intervals) in rehabilitation time prior to disability pension award. Complete case.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions
MS carried out the data processing, the epidemiological modeling and statistical analysis and wrote the manuscript. KP, RJ and JHB contributed to the epidemiological modeling, statistical analysis, data interpretation and drafting of the manuscript. NF, ES, SOS and BC participated in the design of the study and helped to write the manuscript. All authors read and approved the final manuscript.

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Paper III

Is not included due to copyright

Appendix

1. The Questionnaire
2. Announcement in Avisa Nordland
3. Tables
4. The Industrial Link

A FAMILIE

Har en eller flere av foreldre eller søsken hatt hjerteinfarkt (sår på hjertet) eller angina pectoris (hjertekrampe)? 12

B EGEN SYKDOM

Har De, eller har De hatt:

Hjerteinfarkt? 13
Angina pectoris(hjertekrampe)? 14
Hjerneslag? 15
Sukkersyke? 16

Hvis De har sukkersyke, i hvilket år ble diagnosen stillet? ..... 17 19 ___

Er De under medikamentell behandling for høyt blodtrykk? 19

C SYMPTOMER

Får De smerter eller ubehag i brystet når De:

Går i bakker, trapper eller fort på flat mark? 20
Går i vanlig takt på flat mark? 21

Dersom De får smerter eller vondt i brystet ved gange, pleier De da å:

Stoppe? 22 1
Saktne farten? 2
Fortsette i samme takt? 3

Dersom De stopper eller saktner farten, forsvinner smertene da:

Etter mindre enn 10 minutter? 23 1
Etter mer enn 10 minutter? 2

Har De vanligvis:

Hoste om morgenen? 24
Oppspytt fra brystet om morgenen? 25

D MOSJON

Bevegelse og kroppslig anstrengelse i Deres fritid. Hvis aktiviteten varierer meget f.eks. mellom sommer og vinter, så ta et gjennomsnitt. Spørsmålet gjelder bare det siste året.

Sett kryss i den ruta hvor «JA» passer best

Leser, ser på fjernsyn eller annen stillesittende beskjeftigelse? 26 1

Spaserer, sykler eller beveger Dem på annen måte minst 4 timer i uka? 2
(Her skal De også regne med gang eller sykling til arbeidsstedet, søndagsturer m.m.)

Driver mosjonsidrett, tyngre hagearbeid e.l.? 3
(Merk at aktiviteten skal være minst 4 timer i uka.)

Trener hardt eller driver konkurranseidrett regelmessig og flere ganger i uka? 4

E SALT/FETT

Hvor ofte bruker De salt kjøtt eller salt fisk til middag?

Sett kryss i den ruta hvor «JA» passer best

Aldri eller sjeldnere enn en gang i måneden 27 1
Opptil en gang i uka 2
Opptil to ganger i uka 3
Mer enn to ganger i uka 4

Hvor ofte pleier De stro ekstra salt på middagsmaten?

Sett kryss i den ruta hvor «JA» passer best

Sjelden eller aldri 28 1
Av og til eller ofte 2
Alltid eller nesten alltid 3

Hva slags margarin eller smør bruker De til vanlig på brød?

Sett kryss i den ruta hvor «JA» passer best

Bruker ikke smør eller margarin på brød 29 1
Smør 2
Hard margarin 3
Myk (Soft) margarin 4
Smør/margarin blanding 5

Hva slags fett blir til vanlig brukt til matlaging i Deres husholdning?

Sett kryss i den ruta hvor «JA» passer best

Smør eller hard margarin 30 1
Myk (soft) margarin eller olje 2

F RØYKING

Røyker De

Sigaretter daglig? ..... 31 JA NEI
(håndrullet eller fabrikkframstilte)
Sigarer eller serutter/sigarillos daglig? 32
Pipe daglig? 33

Hvis De ikke røyker daglig nå, besvar da:

Har De røykt daglig tidligere? 34

Hvis De svarte «JA», hvor lenge er det siden De sluttet?

Mindre enn 1 år? 35 1
Mer enn 1 år? 2

Besvares av dem som røyker nå eller som har røykt tidligere:

Hvor mange år tilsammen har De røykt daglig? ..... 36 Antall år

Hvor mange sigaretter røyker eller røykte De daglig?
Oppgi tallet på sigaretter daglig ..... 38 Antall sigaretter
(håndrullet + fabrikkframstilte)

G KAFFE

Hvor mange kopper kaffe drikker De vanligvis daglig?

Sett kryss i den ruta hvor «JA» passer best

Drikker ikke kaffe, eller mindre enn en kopp 42 1
1 - 4 kopper 2
5 - 8 kopper 3
9 eller flere kopper 4

Hva slags kaffe drikker De vanligvis daglig?

Kokekaffe 43
Filterkaffe 44
Pulverkaffe 45
Koffeinfri kaffe 46
Drikker ikke kaffe 47

H ARBEID

Har De i det siste året hatt:

Sett kryss i den ruta hvor «JA» passer best

For det meste stillesittende arbeid? 48
(f.eks. skrivebordsarbeid, urmakerarbeid, montering)
Arbeid som krever at De går mye? .....
(f.eks. ekspeditorarb., lett industriarb., undervisning)
Arbeid hvor De går og løfter mye? .....
(f.eks. postbud, tyngre industriarb., bygningsarbeid)
Tungt kroppsarbeid? .....
(f.eks. skogsarb., tungt jordbruksarb., tungt bygn.arb.)

Har De i Deres arbeid noen gang vært i kontakt med: JA NEI VET IKKE

Asbeststøv? 49
Kvartsstøv? 50

Har De vanligvis skiftarbeid eller nattarbeid? ..... 51 JA NEI

Er husarbeid i hjemmet hovedyrket Deres? 52
(Svar «NEI» hvis lønnet arbeid utenom husarbeid er 18 timer eller mer pr. uke)

Har De daglig omsorg for syke eller funksjonshemmede i familien? 53

Har De i løpet av de siste 12 måneder hatt arbeidsskadighetsdryst? 54

Er De for tiden sykmeldt, eller har De uføreerklæringspenger? 55

Har De full eller delvis uførepensjon? 56

I ETTERUNDERSØKELSE

Hvis denne helseundersøkelsen viser at De bør undersøkes nærmere:
Hvilken allmenpraktiserende lege/kommunelege ønsker De da å bli henvist til?

Skriv navnet på legen her 57

Legens spesialitet (kode) 58

Tilleggsspørsmål til Helseundersøkelsen i Nordland 1988–1989.

Hovedformålet med den undersøkelsen du idag har gjennomgått er å undersøke risiko for hjerte- karsykdommer. Dette er imidlertid en mangeartet sykdomsgruppe med tildels dårlig kjente årsaksforhold.
For å finne mer ut av årsakene til hjertekarsykdommer og andre hyppige kroniske sykdommer er det nødvendig å få mer kunnskap om bl.a. vaner, helseforholdene generelt og arbeidsmiljøet.

I dette spørreskjemaet ønsker vi derfor å stille deg en rekke spørsmål om forhold som vi tror kan ha betydning for risikoen for å få bl.a. hjertekarsykdom og kreft. Hvis du er i tvil om hva du skal svare, sett kryss i den ruten som passer best.

Ved å delta på denne undersøkelsen bidrar du til å finne mer ut om de forhold som er av betydning for helse og sykdom. Svarene du gir vil bare bli brukt til forskning og blir behandlet strengt fortrolig.

Det utfylte skjema sendes i vedlagte svarkonvolutt.
Portoen er betalt.

På forhånd takk for bidraget!

Med vennlig hilsen

Fylkeslegen i Nordland — Universitetet i Tromsø

Statens helseundersøkelser

PERSONALIA

	Ja	Nei
Er du gift eller samboende?	☐	☐

I hvilket fylke er du født?

.....

Hvor mange års skolegang har du (ta også med folkeskole og ungdomskole)? ..... år

Hvor mange personer bor det i din husstand?

Antall: .....

	Ja	Nei	Vet ikke
Er to eller flere av dine besteforeldre av finsk ætt	☐	☐	☐
Er to eller flere av dine besteforeldre av samisk ætt	☐	☐	☐

HELSE OG SYKDOM

Hvordan er din helsetilstand?

- Dårlig ☐1
- Hverken god eller dårlig ☐2
- Bra ☐3
- Utmerket ☐4

Har du eller har du hatt: Kryss av for hver sykdom.	Ja	Nei
Hudsykdommen psoriasis	☐	☐
Astma	☐	☐
Allergisk eksem	☐	☐
Høysnue	☐	☐
Kronisk bronkitt	☐	☐
Leddgikt (revmatisk artritt)	☐	☐
Bechterews sykdom	☐	☐
Brystkreft	☐	☐
Kreft på livmorhalsen	☐	☐
Annen kreftsykdom	☐	☐
Epilepsi (fallesyke)	☐	☐
Migrene	☐	☐

Hvor mange av dine egne tenner har du igjen? Antall .....

Hvor mange ganger har du hatt vondt i halsen eller influensa med høy feber det siste året? .....

MAGEPLAGER

	Ja	Nei
Har du vært plaget med sure oppstøt, halsbrann eller brystsvie?	☐	☐
Har du vært plaget med sterke smerter eller verk øverst i magen?	☐	☐
Hvis «Ja»: Forandrer smertene seg når du spiser?	☐	☐

Hvis smertene forandrer seg ved spising, blir de:

- mindre plagsomme ☐1
- verre ☐2

	Ja	Nei
Har du søkt lege på grunn av slike plager?	☐	☐

Hvor gammel var du første gang du fikk slike plager? ..... år

	Ja	Nei
Har du eller har du hatt sår på magesekken eller tolvfingertarmen?	☐	☐

Hvis «Ja»: Hva slags sår?

- Sår på magesekk ☐1
- Sår på tolvfingertarmen ☐2
- Vet ikke ☐3

Hvilket år ble diagnosen stillet første gang? 19 .....

	Ja	Nei
Er såret påvist ved røntgenundersøkelse?	☐	☐
Er såret påvist ved gastroskopi (direkte undersøkelse av magen gjennom bøyelig rør)?	☐	☐
Ble du innlagt i sykehus for såret?	☐	☐
Er du operert for såret?	☐	☐

Hvis «Ja»: I hvilket år ble du operert? 19 .....

HOFTEPLAGER

	Ja	Nei
Har du medfødt hoftelidelse?	☐	☐
Hvis «Ja»: Sitter lidelsen i		
Høyre hofte	☐1	
Venstre hofte	☐2	
Begge hofter	☐3	
Hvor gammel var du da hoftelidelsene ble oppdaget?	..... år	
	Ja	Nei
Er du operert i hoften?	☐	☐

	Ja	Nei	Vet ikke
Ble du som spebarn behandlet for hoftefeil med gips eller med pute mellom beina	☐	☐	☐

Kryss av for familiemedlemmer som har eller har hatt hoftefeil:

Farfar ☐1 Farmor ☐2 Søster ☐3 Far ☐4
Morfar ☐5 Mormor ☐6 Bror ☐7 Mor ☐8

PLAGER I HODE, NAKKE OG SKULDRE

Hvor ofte er du plaget av hodepine?
- Sjelden eller aldri ☐1
- En eller flere ganger i måneden ☐2
- En eller flere ganger i uken ☐3
- Daglig ☐4

Hvor ofte er du plaget av smerter i nakke eller skuldre?
- Sjelden eller aldri ☐1
- En eller flere ganger i måneden ☐2
- En eller flere ganger i uken ☐3
- Daglig ☐4

Reduserer plagene i hodet, nakken eller skuldre din arbeidsevne?
- Aldri, eller i ubetydelig grad ☐1
- I noen grad ☐2
- I betydelig grad ☐3
- Klarer ikke vanlig arbeid ☐4

BEVISTLØSHET / HJERTEPLAGER

	Ja	Nei
Har du siste år hatt anfall med plutselig og fullstendig tap av bevissthet?	☐	☐
Hvis «Ja»: Falt du om?	☐	☐
	Antall	
Hvor mange anfall har du hatt siste år?	.....	
	Ja	Nei
Har du hatt anfall med plutselig endring i pulsen eller hjerterytmen siste år?	☐	☐
Hvis «Ja»: Hvordan var hjerteslagene?		
Raskere enn normalt	☐1	
Langsommere enn normalt	☐2	
Uregelmessige	☐3	
	Ja	Nei
Ble du uvel, kvalm e.l. under anfallet?	☐	☐
	Antall	
Hvor mange slike anfall har du hatt siste år?	.....	

SYKDOM HOS FAMILIE

Kryss av for de slektninger som har eller har hatt noen av sykdommene:

	Far	Mor	Bror	Søster
Hjerneslag eller hjerneblødning	☐	☐	☐	☐
Sukkersyke	☐	☐	☐	☐
Hudsykdommen psoriasis	☐	☐	☐	☐
Magesår eller tolvfingertarmsår	☐	☐	☐	☐
Astma	☐	☐	☐	☐
Leddgikt (revmatoid artritt)	☐	☐	☐	☐
Bechterews sykdom	☐	☐	☐	☐
Brystkreft		☐		☐
Annen kreftsykdom	☐	☐	☐	☐
Epilepsi (fallesyke)	☐	☐	☐	☐
Migrene	☐	☐	☐	☐
Ingen av sykdommene ovenfor	☐	☐	☐	☐

KONTAKT MED HELSETJENESTEN

Hvor mange besøk har du hatt siste år på grunn av egen helse eller sykdom? Svar på hvert enkelt spørsmål.	Antall besøk
Hos vanlig lege	.....
Hos spesialist utenfor sykehus	.....
På legevakta	.....
Hos bedriftslege	.....
Hos sykepleier på sykestue	.....
Hos fysioterapeut	.....
Hos kiropraktor	.....
Hos naturmedisiner (homeopat, soneterapeut o.l.)	.....
Hos tannlege	.....
På sykehusets poliklinikk	.....
Antall innleggelser på sykehus siste år	.....
Antall hjemmebesøk av lege til familien siste år	.....

Har du søkt hjelp på grunn av plager fra hode, nakke og skuldre det siste året?	Ja	Nei
Hos vanlig lege	☐	☐
Hos spesialist utenfor sykehus	☐	☐
På legevakta	☐	☐
Hos bedriftslege	☐	☐
Hos kiropraktor	☐	☐
Hos naturmedisiner (homeopat, soneterapeut o.l.)	☐	☐
På sykehusets poliklinikk	☐	☐
	Antall	
Antall innleggelser på sykehus siste år p.g.a. plager fra hode, nakke og skuldre	.....	

Hva gjorde du siste gang du hadde vondt i halsen eller influensa med høy feber?
- Oppsøkte lege for å få behandling ☐1
- Oppsøkte lege for å få sykemelding ☐2
- Ventet til det hele gikk over av seg sjøl ☐3
- Brukte mine egne måter å bli frisk på ☐4

BRUK AV RØNTGEN-UNDERSØKELSE

	Ja	Nei
Har du vært til røntgenundersøkelse de siste 5 år?	☐	☐

Hvis «Ja»:

Hvor mange ganger har du vært til røntgen-undersøkelse av:	Antall ganger
nakken	.....
korsryggen (velkryggen)	.....
magesekk/tolvfingertarm	.....
tykktarm	.....
tenner	.....

TILFREDSHET MED HELSETJENESTEN

Hvor lang tid tar det vanligvis å få time hos vanlig lege i den kommunen der du bor?
- 0-4 dager ☐1
- 5-8 dager ☐2
- 9-14 dager ☐3
- Mer enn 14 dager ☐4
- Vet ikke ☐5

Er det vanskelig eller lett å få lege til sykebesøk i hjemmet når det er behov for det?
- Lett ☐1
- Vanskelig ☐2
- Svært vanskelig ☐3
- Vet ikke ☐4

Er det lettere eller vanskeligere å få lege til sykebesøk enn for 5 år siden?
- Lettere nå ☐1
- Uforandret ☐2
- Vanskeligere nå ☐3
- Vet ikke ☐4

Synes du at almenpraktiserende leger i din kommune tar seg nok tid til å snakke med pasientene?
- Nok tid ☐1
- Dårlig tid ☐2
- Svært dårlig tid ☐3
- Vet ikke ☐4

Er du alt i alt fornøyd eller misfornøyd med almenlege-tjenesten i din bostedskommune?
- Godt fornøyd ☐1
- Fornøyd ☐2
- Misfornøyd ☐3
- Vet ikke ☐4

Tror du almenlegetjenesten alt i alt har blitt bedre eller dårligere i løpet av de siste 5 år i din kommune?
- Bedre nå enn før ☐1
- Bedre for 4-5 år siden ☐2
- Uforandret ☐3
- Vet ikke ☐4

	Ja	Nei
Bor du i gangavstand til et vanlig legekontor?	☐	☐

	Ja	Nei	Ikke aktuelt
Har fylket (Nordland fylkeskommune) nektet deg innleggelse på sykehus utenfor Nordland når din vanlige lege mente det var nødvendig?	☐	☐	☐

Har du siste 5 årsperiode latt være å søke hjelp hos tannlege, lege, sykehuspoliklinikk eller fysioterapeut p.g.a. egenandeler? Kryss av for hvert spørsmål.	Ja	Nei
Tannlege	☐	☐
Vanlig lege	☐	☐
Poliklinikk	☐	☐
Fysioterapeut	☐	☐

KONTAKT I NÆRMILJØET

Hvor mange timer bruker du på lokal foreningsvirksomhet (som idrettlag, politiske lag, religiøse eller andre foreninger) i en vanlig arbeidsuke?	Antall timer .....
Hvor mange familier/husstander i nabolaget kjenner du så godt at dere besøker hverandre av og til?	Antall .....

Har du i løpet av de siste 14 dagene snakket med:	Ja	Nei
noen i familien om gleder og sorger	☐	☐
noen i familien om helsespørsmål	☐	☐
andre utenom familien om gleder og sorger	☐	☐
andre utenom familien om helsespørsmål	☐	☐
Har noen spurt deg om råd når det gjelder sykdom og helse de siste 14 dager?	☐	☐

Hender det ofte at du føler deg ensom?
- Nei ☐1
- Av og til ☐2
- Ofte ☐3

Hvor ofte er du vanligvis sammen med venner i fritiden?
- Daglig/nesten daglig ☐1
- 2-3 ganger pr. uke ☐2
- Ca. 1 gang pr. uke ☐3
- 1-2 ganger pr. måned ☐4
- Sjeldnere enn en gang pr. måned ☐5

KOSTHOLD

Hvor mange brødskiver spiser du vanligvis daglig?
- Mindre enn 2 skiver ☐1
- 2-4 skiver ☐2
- 5-6 skiver ☐3
- 7-12 skiver ☐4
- 13 eller flere skiver ☐5

Hva slags melk drikker du vanligvis?
- Drikker ikke melk ☐1
- Helmelk, søt eller sur ☐2
- Lettmelk, søt eller sur ☐3
- Skummet melk, søt eller sur ☐4

Hvor mange glass/kopper melk drikker du vanligvis daglig?
- Mindre enn ett glass/kopp ☐1
- 1-2 glass/kopper ☐2
- 3-4 glass/kopper ☐3
- 5 eller flere glass/kopper ☐4

Hvor ofte spiser du vanligvis frukt?
- Sjeldnere enn en gang i uken ☐1
- Omtrent en gang i uken ☐2
- 2-3 ganger i uken ☐3
- 4-5 ganger i uken ☐4
- Omtrent daglig ☐5

Hvor ofte spiser du vanligvis grønnsaker til middag eller som egen rett?
- Sjeldnere enn en gang i uken ☐1
- Omtrent en gang i uken ☐2
- 2-3 ganger i uken ☐3
- 4-5 ganger i uken ☐4
- Omtrent daglig ☐5

Hvor ofte spiser du gulrøtter?
- Sjeldnere enn en gang i uken ☐1
- Omtrent en gang i uken ☐2
- 2-3 ganger i uka ☐3
- Mer enn 3 ganger i uka ☐4

Hvor ofte spiser du poteter til middag i løpet av en uke?
- Sjeldnere enn 4 ganger i uken ☐1
- 4-5 ganger i uken ☐2
- 6-7 ganger i uken ☐3

Hvor mange poteter spiser du vanligvis til hvert middagsmåltid?
- Mindre enn en ☐1
- 1-2 ☐2
- 3-4 ☐3
- 5 eller flere ☐4

Hvor ofte bruker du fett (smør, margarin, remulade, majones og lignende) til eller på middagsmaten?
- Sjeldnere enn en gang i uken ☐1
- 1-2 ganger i uken ☐2
- 3-4 ganger i uken ☐3
- 5 eller flere ganger i uken ☐4

Hvor ofte spiser du torsk/sei eller annen mager fisk til middag?
- Sjeldnere enn en gang i uken ☐1
- 1 gang i uken ☐2
- 2 ganger i uken ☐3
- 3 ganger i uken ☐4
- 4 eller flere ganger i uken ☐5

Hvor ofte spiser du feitere fisk slik som uer, kveite, sild, makrell, laks eller ørret til middag?
- Sjeldnere enn en gang i uken ☐1
- 1 gang i uken ☐2
- 2 ganger i uken ☐3
- 3 ganger i uken ☐4
- 4 eller flere ganger i uken ☐5

Hvor mange skiver spiser du der pålegget består av feit fisk (sild, sardiner, makrell, laks o.l.)?
- Mindre enn en skive i uka ☐1
- 1-2 skiver i uka ☐2
- 3-6 skiver i uka ☐3
- 1-2 skiver om dagen ☐4
- 3-4 skiver om dagen ☐5
- 5 eller flere skiver daglig ☐6

	Ja	Nei
Tar du tran, tranpiller eller fiskeoljekapsler for tida?	☐	☐

Hvor mye cola-drikker drikker du i uka?
- Drikker ikke cola-drikker ☐1
- Mindre enn 0.5 liter pr. uke ☐2
- 0.5 - 1.5 liter pr. uke ☐3
- Mer enn 1.5 liter pr. uke ☐4

ALKOHOL

	Ja	Nei
Er du total avholdsmann/kvinne?	☐	☐

Hvis «Nei»:

Hvor ofte pleier du å drikke øl?
- Aldri, eller bare noen få ganger i året ☐1
- 1-2 ganger i måneden ☐2
- Omtrent 1 gang i uken ☐3
- 2-3 ganger i uken ☐4
- Omtrent daglig ☐5

Hvor ofte pleier du å drikke vin?
- Aldri, eller bare noen få ganger i året ☐1
- 1-2 ganger i måneden ☐2
- Omtrent 1 gang i uken ☐3
- 2-3 ganger i uken ☐4
- Omtrent daglig ☐5

Hvor ofte pleier du å drikke brennevin?
- Aldri, eller bare noen få ganger i året ☐1
- 1-2 ganger i måneden ☐2
- Omtrent 1 gang i uken ☐3
- 2-3 ganger i uken ☐4
- Omtrent daglig ☐5

Omtrent hvor ofte har du i løpet av siste år drukket en mengde alkohol tilsvarende minst 5 halvflasker øl, en hel flaske vin eller ¼ flaske brennevin?
- Ikke siste år ☐1
- Noen få ganger ☐2
- 1-2 ganger i måneden ☐3
- 1-2 ganger i uken ☐4
- 3 eller flere ganger i uken ☐5

MOSJON

Hvor ofte utfører du fysisk aktivitet av minst 20 minutters varighet som fører til at du blir svett eller andpusten?
- Sjelden eller aldri ☐1
- Ukentlig ☐2
- Flere ganger i uka ☐3
- Daglig ☐4

Dersom du vanligvis utfører slik aktivitet minst en gang i uka, hvor mye tid bruker du ukentlig til slik aktivitet?
- Mindre enn 30 minutter i uka ☐1
- Mellom 30 minutter og 1 time i uka ☐2
- Mellom 1 og 2 timer i uka ☐3
- Mer enn 2 timer i uka ☐4

Har du endret din fysiske aktivitet i løpet av de siste 5 år?
- Jeg drev mer fysisk aktivitet før ☐1
- Det har ikke vært noen endring ☐2
- Jeg drev mindre fysisk aktivitet før ☐3

REAKSJONER PÅ PROBLEMER

	Ja	Nei
Hvis du får store personlige problemer, regner du da med å få hjelp og støtte fra ektefelle, samboer eller familie?	☐	☐
Har du i lengere tid følt behov for å oppsøke noen på grunn av personlige problem siste år, uten at du har tatt slik kontakt?	☐	☐

Blir du utålmodig eller irritert når du må vente?
- Svært irritert ☐1
- Noe irritert ☐2
- Ikke irritert ☐3

Er du stort sett fornøyd med tilværelsen?
- Meget fornøyd ☐1
- Ganske fornøyd ☐2
- Litt misfornøyd ☐3
- Meget misfornøyd ☐4

Har du i de siste 14 dager følt deg ulykkelig og nedtrykt (deprimert)?
- Aldri eller sjelden ☐1
- Av og til ☐2
- Ofte ☐3
- Nesten hele tida ☐4

Under kommer noen påstander vi ber deg ta stilling til.
For hver påstand skal du sette ett kryss i en rute, alt etter hvor enig du er i påstanden.

	Helt enig	Noe enig	Noe uenig	Helt uenig
Når jeg ikke føler meg bra, bør jeg snakke med lege eller annet helsepersonell	☐	☐	☐	☐
Jeg har stor kontroll over min egen helse	☐	☐	☐	☐
Hvis jeg blir syk, er det for det meste min egen adferd som avgjør hvor raskt jeg blir frisk igjen	☐	☐	☐	☐
Folk flest har problemer nok om en ikke også skal mase om alt som er skadelig for helsa	☐	☐	☐	☐
Jeg kan i stor grad unngå kreft og hjerteinfarkt, hvis jeg tar de riktige forholdsreglene	☐	☐	☐	☐
Jeg kan endre hvilken som helst vane, bare jeg bestemmer meg for det	☐	☐	☐	☐
Folk må ha lov til å skade sin egen helse, så lenge de ikke skader andre	☐	☐	☐	☐

ARBEIDSMILJØ

Hva er ditt nåværende hovedyrke?
- Hjemmeværende husmor ☐1
- Skoleelev/student ☐2
- Industri/verksted/anleggs/bygnings/sprenglings/gruvearbeide ☐3
- Jordbruks/skogbruksarbeide ☐4
- Fisker/sjømann ☐5
- Kontor/handels/hotell/servicearbeide ☐6
- Helsearbeide ☐7
- Lærer/annet undervisningsarbeide ☐8
- Landtransport (sjåfør m.v) ☐9
- Arbeidsledig ☐10
- Under utdanning ☐11
- Uføretrygdet/alderstrygdet/pensjonert ☐12
- Annet ☐13

– Angi evt. yrkesbetegnelse her:

.....

Resten av spørsmålene om ***arbeidsmiljø*** besvares bare av dem som er i lønnet arbeid.

	Ja	Nei
Hvor mange år du har vært på din siste arbeidsplass? ..... år		
Arbeider du i full stilling? (37 timer eller mer pr. uke)	☐	☐
Har du skiftarbeide?	☐	☐

Hvor ofte arbeider du overtid?
- Hver uke ☐1
- Hver måned ☐2
- Sjelden eller aldri ☐3

	Ja	Nei
Er reisetiden til og fra arbeidet samlet over 1 time	☐	☐
Må du i forbindelse med arbeidet overnatte utenfor hjemmet?	☐	☐

Hvis «Ja»: Hvordan overnatter du?
- I ordinær bopel/leilighet ☐1
- På hybel ☐2
- På hotell/pensjonat ☐3
- I anleggsbrakke ☐4
- På annen måte ☐5

	Ja	Nei
Har du vært sykemeldt tilsammen mer enn 4 uker det siste året?	☐	☐

Hvordan trives du med det arbeidet du har nå?
- Meget godt ☐1
- Godt ☐2
- Dårlig ☐3
- Trives ikke ☐4

Er arbeidsoppgavene tilstrekkelig varierte?
- Som oftest ☐1
- Iblant ☐2
- Sjelden ☐3
- Aldri ☐4

Får du vite om du gjør en god jobb?
- Som oftest ☐1
- Iblant ☐2
- Sjelden ☐3
- Aldri ☐4

Er kontakten og samarbeidet med overordnede bra?
- Som oftest ☐1
- Iblant ☐2
- Sjelden ☐3
- Aldri ☐4

Er samarbeide og fellesskap bra på arbeidsplassen?
- Som oftest ☐1
- Iblant ☐2
- Sjelden ☐3
- Aldri ☐4

Får du hjelp og støtte når du har problemer i arbeidet?
- Som oftest ☐1
- Iblant ☐2
- Sjelden ☐3
- Aldri ☐4

Kan du påvirke arbeidsforholdene slik at du får et passende arbeidstempo?
- Som oftest ☐1
- Iblant ☐2
- Sjelden ☐3
- Aldri ☐4

Har du for mye å gjøre i ditt arbeide?
- Som oftest ☐1
- Iblant ☐2
- Sjelden ☐3
- Aldri ☐4

Stiller arbeidet for store krav til deg?
- Som oftest ☐1
- Iblant ☐2
- Sjelden ☐3
- Aldri ☐4

Er du redd for at ditt arbeid skal endres ved omorganisering, nye arbeidsmåter o.l.?
- Som oftest ☐1
- Iblant ☐2
- Sjelden ☐3
- Aldri ☐4

Er du blitt mobbet/trakassert på arbeidsplassen?
- Ofte ☐1
- Iblant ☐2
- Sjelden ☐3
- Aldri ☐4

Er du i ditt nåværende arbeid, eller har du i tidligere arbeid vært, utsatt for:

	Nåværende arbeid				Tidligere arbeid	
	Utsatt for		Medfører ubehag		Utsatt for	
	Ja	Nei	Ja	Nei	Ja	Nei
Støy	☐	☐	☐	☐	☐	☐
Vibrasjoner (utstyr, kjøretøy e.l.)	☐	☐	☐	☐	☐	☐
Dårlig klima (kulde, varme, trekk o.l.)	☐	☐	☐	☐	☐	☐
Stråling (røntgen, glødende metall, o.l.)	☐	☐	☐	☐	☐	☐
Dårlig belysning	☐	☐	☐	☐	☐	☐
Synskrevende arbeide	☐	☐	☐	☐	☐	☐
Tunge løft	☐	☐	☐	☐	☐	☐
Ensformig arbeide	☐	☐	☐	☐	☐	☐
Tobakksrøyk	☐	☐	☐	☐	☐	☐
Røyk (fra sveising, lodding o.l.)	☐	☐	☐	☐	☐	☐
Eksos	☐	☐	☐	☐	☐	☐
Gasser og løsemidler	☐	☐	☐	☐	☐	☐
Andre kjemikalier	☐	☐	☐	☐	☐	☐

RESTEN AV SKJEMAET BESVARES BARE AV KVINNER

Hvor gammel var du da du fikk menstruasjon første gang? ..... år

Antall

Hvor mange barn har du født? .....

Dersom du har født barn, hvor gammel var du første gang du fødte? ..... år

Hvor gammel var du da du fikk ditt siste barn? ..... år

	Ja	Nei
Har du vært plaget av bekkenløsning under ett eller flere av dine svangerskap?	☐	☐

BRYSTUNDERSØKELSE

Hvor ofte undersøker du brystene dine selv?
Sett kryss i den ruten som passer best.
- Aldri ☐1
- 2-3 ganger pr. år ☐2
- 1 gang pr. måned ☐3
- Oftere enn en gang i måneden ☐4

	Ja	Nei
Har du søkt lege for kul i brystet?	☐	☐
Hvis «Ja»:		
Ble det tatt prøve av kulen?	☐	☐
Har du røntgenundersøkt (mammografert) brystene?	☐	☐

PREVENSJON

	Ja	Nei
Bruker du P-Piller nå?	☐	☐
Har du brukt P-Piller tidligere?	☐	☐

Hvis «Ja» på ett av de to spørsmålene over:
- Hvor gammel var du da du begynte med P-Piller? ..... år
- Hvor mange år har du tilsammen brukt P-Piller? ..... år
- Dersom du har født, hvor lenge brukte du P-Piller før første fødsel? ..... år

Hvis du har sluttet å bruke P-Piller:
- Hvor gammel var du da du sluttet ? ..... år

	Ja	Nei
Ble du anbefalt å slutte av medisinske årsaker?	☐	☐

KREFTPRØVE

Antall

Hvor mange ganger har du fått tatt kreftprøve (celleprøve) fra livmorhalsen siste 3 år? .....

Hvor mange år er det siden siste prøve ble tatt? ..... år

Kunngjøring

Til deltakere i Statens helseundersøkelse i Nordland i 1988

NTNU
Det skapende universitet

NTNU, i samarbeid med Universitetet i Tromsø, har fått tillatelse til å studere hvordan samspillet mellom sykdom, arbeidsforhold og endringer i næringsliv og arbeidsmarked påvirker uføretrygding. Utgangspunktet er 40 års undersøkelsen som Statens Helseundersøkelser gjennomførte i Nordland i 1988. Der ble ca 10.000 40-42 åringer invitert hvorav ca 8.000 deltok i undersøkelsen. Informasjon fra denne undersøkelsen er tenkt koblet med informasjon om eventuell senere trygding, utdanning og inntekt på individnivå, og informasjon om næringsliv og arbeidsmarked på gruppenivå. Regional etisk komité Midt-Norge, Helsedirektoratet, Datatilsynet, Arbeids- og Inkluderingsdepartement og Kunnskapsdepartementet har alle gitt tillatelse til koblingene. Koblingene gjennomføres av Statistisk Sentralbyrå. Forskerne får utlevert en avidentifisert fil hvor enkeltpersoner ikke kan identifiseres. Det innebærer at ingen funn kan tilbakeføres til enkeltpersoner eller til grupper av personer som kan identifiseres. Resultatene av studien har selvsagt ingen konsekvenser for de trygdeytelser enkeltpersoner eller for grupper av personer har mottatt.

Studien finansieres av Norges Forskningsråd.

Regional etisk komité, Datatilsynet og Helsedirektoratet har satt som forutsetning for sine tillatelser at det informeres om den planlagte studien slik at de som ikke ønsker å delta, kan trekke sin informasjon fra studien. Dette fordi det på slutten av 80-tallet ikke var noe krav om spesifikt samtykke til bruken av resultatene fra slike studier.

Personer som var 40-42 år i 1988 og som deltok i denne undersøkelsen, som ønsker informasjon om studien eller ønsker å trekke sitt bidrag, kan ta kontakt med
professor Roar Johnsen, tlf 73 59 75 80, roar.johnsen@ntnu.no,
post doc stipendiat Johan Håkon Bjørngaard, tlf 73 59 75 42, Johan.H.Bjorngaard@ntnu.no
doktorgradsstipendiat Morten Støver på 73 59 75 25, morten.stover@ntnu.no.

For de som ikke ønsker at informasjonen de avga i 1988 ikke skal inngå i studien vil Statens Sentralbyrå forestå sletting fra analysefilen.

Appendix 3: Tables

Age	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Total	8,4	8,3	8,3	8,3	8,4	8,6	9,1	9,6	9,9	10,0	10,2	10,4	10,4	10,2	10,0	9,8
<20yrs	0,3	0,3	0,3	0,4	0,4	0,4	0,5	0,5	0,5	0,5	0,5	0,6	0,6	0,6	0,7	0,7
20-24	0,6	0,6	0,6	0,7	0,7	0,8	0,8	0,9	0,9	0,9	0,9	0,9	0,9	0,9	0,9	0,9
25-29	1,3	1,2	1,2	1,3	1,3	1,4	1,5	1,6	1,6	1,6	1,6	1,6	1,6	1,5	1,4	1,3
30-34	2,1	2,1	2,2	2,3	2,3	2,4	2,5	2,7	2,7	2,7	2,6	2,6	2,4	2,3	2,1	2,0
35-39	3,6	3,5	3,6	3,7	3,7	3,9	4,1	4,2	4,3	4,3	4,3	4,3	4,0	3,7	3,4	3,1
40-44	5,5	5,4	5,5	5,6	5,8	6,0	6,3	6,6	6,7	6,6	6,6	6,7	6,3	5,9	5,5	5,2
45-49	8,1	8,1	8,3	8,6	8,7	8,8	9,2	9,6	9,8	9,8	9,8	9,9	9,5	9,1	8,5	8,1
50-54	13,5	12,8	12,5	12,5	12,5	12,9	13,7	14,3	14,7	14,7	14,7	14,7	14,3	13,7	13,1	12,6
55-59	22,4	21,9	21,6	21,3	21,1	21,2	21,3	21,6	21,7	21,7	22,0	22,5	22,5	22,3	21,6	20,8
60-64	34,5	34,3	34,1	33,9	33,7	33,8	34,6	35,3	35,6	35,7	35,6	35,2	34,4	33,7	33,1	32,8
>65yrs	44,4	43,7	43,2	42,8	42,2	42,5	42,7	43,2	43,6	43,3	42,8	43,3	43,7	43,8	43,1	41,8

Prevalence of disability pension by age groups

Age	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Total	8,1	7,7	9,0	9,6	9,4	10,7	12,5	12,8	11,5	9,8	10,3	11,0	8,3	7,6	7,0	7,3
>20yrs	0,9	1,1	1,5	1,7	1,4	1,8	1,2	1,1	2,9	3,3	3,6	3,9	3,7	4,5	4,1	4,4
20-24	0,9	1,0	1,5	1,6	1,6	1,8	2,1	1,9	1,5	1,4	1,5	1,7	1,1	1,3	1,2	1,2
25-29	1,2	1,4	2,1	2,5	2,2	2,6	2,9	2,8	2,2	1,8	2,0	2,2	1,0	0,9	0,9	0,8
30-34	2,0	2,1	3,1	3,5	3,4	3,7	4,3	4,8	3,6	2,6	2,7	3,0	1,4	1,1	1,0	1,0
35-39	3,3	3,4	4,7	5,6	5,3	5,8	6,9	6,8	5,6	4,2	4,6	4,8	2,1	1,6	1,3	1,5
40-44	4,9	5,1	6,6	8,0	7,3	8,5	9,4	10,1	8,0	6,3	6,5	7,5	3,4	2,5	2,1	2,6
45-49	7,3	7,9	10,0	11,4	10,6	11,6	14,2	13,9	12,2	9,5	9,7	11,0	6,0	4,7	4,1	4,7
50-54	13,5	12,3	15,0	15,8	15,1	17,4	21,1	22,0	19,2	16,4	16,8	17,6	11,3	9,7	8,6	9,9
55-59	25,6	22,9	26,9	26,9	28,2	31,2	35,0	34,6	31,1	26,7	28,5	29,8	26,5	24,6	22,4	22,3
60-64	48,0	42,7	43,0	43,5	44,4	49,7	58,0	55,5	50,4	44,2	45,1	44,0	39,7	37,7	33,7	33,6
>65yrs	54,3	47,5	45,0	41,2	38,6	41,7	46,5	41,0	34,8	29,4	26,9	27,3	27,1	26,1	24,1	23,1

Incidence of disability pension by age groups (DP recipients pr 1000 persons without DP)

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Total	8,4	8,3	8,3	8,3	8,4	8,6	9,1	9,6	9,9	10,0	10,2	10,4	10,4	10,2	10,0	9,8
Østfold	11,2	10,9	10,7	10,9	10,9	11,0	11,3	11,9	12,0	12,2	12,1	12,4	12,7	12,7	12,6	12,6
Akershus	5,6	5,6	5,8	5,9	6,0	6,2	6,6	7,1	7,4	7,5	7,7	8,0	8,0	7,8	7,6	7,4
Oslo	7,2	7,0	7,0	7,0	7,1	7,2	7,6	7,9	8,3	8,3	8,2	8,2	7,6	7,2	6,8	6,6
Hedmark	10,6	10,4	10,2	10,2	10,2	10,4	11,2	11,7	12,0	12,3	12,6	13,1	13,6	13,4	13,1	12,8
Oppland	8,9	8,8	8,8	9,0	9,3	9,6	10,3	10,9	11,2	11,5	11,8	12,0	12,0	11,7	11,5	11,2
Buskerud	8,3	8,0	8,0	7,9	7,8	7,9	8,4	8,9	9,1	9,3	9,3	9,4	9,5	9,3	9,0	8,6
Vestfold	10,1	9,8	9,9	10,0	10,1	10,4	11,0	11,6	12,0	12,2	12,2	12,5	12,4	12,3	11,9	11,6
Telemark	10,7	10,6	10,6	10,4	10,4	10,6	11,2	11,9	12,3	12,3	12,3	12,6	12,7	12,7	12,4	12,5
Aust-Agder	9,7	9,7	9,9	10,3	10,6	11,1	11,9	12,7	12,8	12,9	13,0	13,3	13,3	13,0	12,6	12,3
Vest-Agder	9,6	9,6	9,6	9,8	10,0	10,4	11,0	11,8	12,0	12,2	12,6	12,8	12,8	12,4	12,0	11,5
Rogaland	6,5	6,3	6,3	6,3	6,4	6,5	6,8	7,2	7,4	7,6	7,7	7,9	7,9	7,9	7,7	7,4
Hordaland	6,7	6,6	6,6	6,7	6,7	7,0	7,2	7,6	8,0	8,2	8,5	8,7	8,7	8,4	8,0	7,8
Sogn og Fj	6,0	5,9	6,0	6,1	6,3	6,6	7,2	7,8	8,1	8,2	8,5	8,7	8,8	8,7	8,5	8,4
Møre og R	7,9	7,8	7,8	7,8	7,8	7,8	8,4	9,0	9,2	9,4	9,5	9,7	9,5	9,5	9,4	9,1
Sør-Tr	8,3	8,1	8,5	8,4	8,3	8,4	8,9	9,4	9,5	9,5	9,8	10,2	10,3	10,2	9,9	9,7
Nord-Tr	8,8	8,8	8,6	8,6	8,7	9,0	9,6	10,1	10,4	10,7	11,0	11,3	11,2	11,1	11,0	10,8
Nordland	11,0	10,8	10,6	10,6	10,6	10,8	11,5	12,0	12,3	12,4	12,6	12,8	12,8	12,8	12,7	12,7
Troms	10,3	9,9	9,8	9,9	9,9	10,3	10,9	11,5	11,7	11,8	11,9	12,1	12,0	11,9	11,9	11,9
Finnmark	11,3	11,1	10,8	10,8	10,6	10,9	11,5	12,1	12,2	12,3	12,4	12,7	12,6	12,5	12,5	12,6

Prevalence of disability pension by counties

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Total	8,1	7,7	9,0	9,6	9,4	10,7	12,5	12,8	11,5	9,8	10,3	11,0	8,3	7,6	7,0	7,3
Østfold	10,5	8,2	7,7	13,3	10,7	12,6	12,0	14,6	11,3	12,0	10,3	12,8	11,8	11,7	10,6	11,9
Akershus	5,8	6,5	8,8	8,2	8,9	8,2	10,1	11,6	9,9	7,7	8,6	9,6	6,9	6,3	6,4	5,4
Oslo	8,0	6,8	8,6	8,8	9,4	10,3	11,0	11,3	11,0	8,1	7,5	7,5	4,8	4,4	4,4	4,5
Hedmark	11,2	8,8	8,8	10,6	10,5	12,1	15,8	13,4	13,6	12,5	13,0	14,8	11,5	9,5	7,8	8,6
Oppland	7,9	9,0	8,4	10,4	11,0	11,5	13,9	14,0	12,8	11,4	12,0	11,8	7,7	7,9	6,7	8,2
Buskerud	6,7	6,5	9,0	7,9	7,7	8,5	12,2	11,9	11,2	8,9	8,2	9,2	7,1	6,5	5,8	5,6
Vestfold	8,1	7,3	11,6	11,0	11,0	12,5	15,3	15,5	14,3	11,6	11,1	13,5	9,0	9,1	7,5	7,5
Telemark	10,4	9,9	10,6	9,4	11,0	12,0	14,8	15,5	13,7	9,7	10,0	13,0	10,1	10,0	7,9	11,3
Aust-Agder	8,6	9,9	12,4	14,1	12,1	15,2	16,2	16,6	11,9	10,2	11,8	13,0	9,4	7,4	6,6	8,5
Vest-Agder	9,1	10,1	10,3	12,2	12,3	13,0	15,9	16,0	12,5	12,0	15,1	12,9	10,3	6,6	7,0	5,6
Rogaland	6,5	6,3	7,5	8,0	7,1	7,9	9,5	10,0	8,2	8,1	8,6	9,2	6,6	7,1	6,0	5,6
Hordaland	7,3	6,2	7,0	7,9	7,7	9,3	8,9	9,9	11,8	9,1	10,1	9,6	6,8	5,2	3,8	5,3
Sogn og Fj	7,0	6,4	7,0	8,3	8,1	8,6	11,0	11,9	9,8	7,7	10,4	8,5	7,0	5,4	5,1	6,6
Møre og R	9,6	7,8	9,4	8,6	8,5	8,4	13,1	12,5	10,4	8,9	9,9	9,6	6,8	7,8	8,1	6,3
Sør-Tr	7,8	7,8	10,7	8,3	9,1	9,4	13,3	13,0	9,7	8,7	11,5	13,3	10,5	8,4	7,6	8,0
Nord-Tr	9,3	9,7	8,7	9,5	9,2	11,1	12,7	12,5	12,7	12,1	11,7	11,9	7,2	8,1	8,2	9,3
Nordland	10,2	8,9	9,4	11,8	10,2	12,7	14,7	14,4	13,4	11,4	12,5	13,8	11,4	11,1	9,8	11,4
Troms	8,3	7,0	9,1	12,1	10,4	13,8	14,3	15,0	11,9	10,8	11,0	12,8	9,9	10,5	11,3	11,4
Finnmark	6,0	10,0	9,3	10,8	8,4	12,7	14,9	14,5	11,5	10,6	11,9	13,4	10,5	9,2	10,9	10,8

Incidence of disability pension by age counties (DP recipients pr 1000 persons without DP)

Appendix 4 : The Industrial Link

The industrial link 1994	**Code**	**Municipality number**	**Municipality**
Fishing, sealing and whaling	F	1835	Træna
Fishing, sealing, whaling and manufacturing	FI	1818*	Herøy
		1834	Lurøy
		1857	Værøy
Fishing, sealing, whaling and agriculture	FL	1836	Rødøy
Manufacturing, construction	IA	1832	Hemnes
		1837	Meløy
		1845*	Sørfold
Agriculture, construction	LA	1812	Sømna
		1839	Beiarn
Agriculture, fishing, sealing and whaling	LF	1815	Vega
Agriculture, manufacturing	LI	1811	Bindal
		1825	Grane
		1826	Hattfjelldal
		1848	Steigen
Services, construction	TA	1838	Gildeskål
		1841*	Fauske
		1849	Hamarøy
Services, fishing, sealing and whaling	TF	1856	Røst
		1859	Flakstad
		1867*	Bø
		1874	Moskenes
Services, manufacturing	TI	1824*	Vefsn
		1833!	Rana
		1840*	Saltdal
		1850*	Tysfjord
		1854!	Ballangen
		1865	Vågan
		1868*	Øksnes
Services, agriculture	TL	1816	Vevelstad
		1822*	Leirfjord
		1827*	Dønna
		1828	Nesna
		1842(1)	Skjerstad
Services	TT	1804	Bodø
		1805*	Narvik
		1813	Brønnøy
		1820*	Alstahaug
		1851!	Lødingen
		1852*	Tjeldsund
		1853*	Evenes
		1860	Vestvågøy
		1866	Hadsel
		1870	Sortland
		1871!	Andøy

Table X: Nordland County: The industrial link.

(1)Merged with 1804 Bodø January 1st 2005.

! Crisis initiated adaptation programmes

* Preparedness adaptation programmes