

# **Socioeconomic status and disability retirement in Finland**

**Causes, changes over time and mortality**

ANU POLVINEN



FINNISH CENTRE FOR PENSIONS,  
STUDIES



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# **Socioeconomic status and disability retirement in Finland**

## **Causes, changes over time and mortality**

ANU POLVINEN

Academic dissertation

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## SUMMARY

In recent years the longer working lives and the postponing of the retirement age have been topics of extensive discussion in Finland. Disability pensions play an important role in this debate. Working lives will lengthen if the incidence of disability retirement diminishes. Efficient actions can be focused on preventing disability retirement, if the groups at risk of disability retirement are identified. According to earlier studies, there are large socioeconomic inequalities in disability retirement. Manual workers have been found to be at a higher risk of disability retirement compared to upper non-manual employees. However, broader knowledge of socioeconomic differences in disability retirement due to different diseases would be useful in order to lengthen working lives.

This study examined the socioeconomic differences in disability retirement due to different diseases over the period 1988–2009. The study also aimed at finding the contribution of ill-health, health behaviours and working conditions on these differences. Socioeconomic differences in mortality after disability retirement due to different diseases were also studied. The study utilized, longitudinal register data of the Finnish population aged 30 and over and the nationally representative Health 2000 Survey with linked register-based retirement data.

The results indicated that socioeconomic differences in disability retirement vary by cause of disability. Large inequalities were found in disability retirement due to musculoskeletal diseases, psychoactive substance use and cardiovascular diseases. Socioeconomic differences due to depression were small or non-existent, and were larger in younger compared to older age groups. Musculoskeletal diseases contributed most to the overall socioeconomic differences in disability retirement. The incidence of disability retirement has decreased in all socioeconomic classes from the early 1990s on. The decrease has been notable, especially in disability retirement due to musculoskeletal and cardiovascular diseases. Socioeconomic differences due to all causes and musculoskeletal diseases were largely mediated through working conditions and ill-health. In musculoskeletal diseases, the contribution of working conditions was especially clear. Socioeconomic differences in mortality after retirement were smaller than in the general population. Modest socioeconomic differences in mortality after disability retirement due to mental disorders and cardiovascular diseases were found for all causes of death.

Socioeconomic differences in disability retirement due to musculoskeletal diseases have been large during the past decades. Prevention of musculoskeletal

diseases among manual workers may reduce socioeconomic differences in disability retirement. The contribution of mental disorders to overall socioeconomic differences was smaller than the contribution of musculoskeletal diseases. The importance of working conditions should be observed when trying to decrease the number of disability retirements. Smaller socioeconomic differences in mortality after disability retirement may indicate that the disability process can accurately identify chronic health problems regardless of socioeconomic status.



## TIIVISTELMÄ

Viime vuosina työurien pidentäminen ja eläkkeellesiirtymisiän myöhentäminen ovat olleet laajan keskustelun kohteena Suomessa. Tässä työkyvyttömyyseläkkeillä on tärkeä rooli. Vähentämällä työkyvyttömyyseläkkeelle siirtymistä, pidennetään myös työuria. Kun riskiryhmät on löydetty, voidaan eläkkeelle siirtymistä ehkäistä paremmin. Työntekijöillä on ylempiä toimihenkilöitä korkeampi riski siirtyä työkyvyttömyyseläkkeelle. Kuitenkin laajempaa tietoa työkyvyttömyyseläkkeelle siirtymisen riskeistä sairausryhmittäin tarvitaan.

Tämä tutkimus selvittää työkyvyttömyyseläkkeelle siirtymisen sosioekonomisia eroja sairausryhmittäin sekä sosioekonomisia eroja työkyvyttömyyseläkkeelle siirtymisen jälkeisessä kuolleisuudessa. Eroja eläkkeelle siirtymisessä sairausryhmittäin tutkitaan ajanjaksolla 1988–2009. Sairauksien, terveystyökalujen ja työolojen vaikutusta työkyvyttömyyseläkkeelle siirtymisen sosioekonomisiin eroihin myös selvitetään. Tutkimuksessa käytetään pitkittäisaineistoja yli 30-vuotiaasta suomalaisesta väestöstä sekä Terveys 2000 -aineistoa.

Tulokset osoittavat, että sosioekonomiset erot työkyvyttömyyseläkkeelle siirtymisessä vaihtelivat diagnoosin mukaan. Erot olivat suuret niillä, jotka ovat siirtyneet eläkkeelle tuki- ja liikuntaelinten sairauksien, mielenterveysperusteisten alkoholisairauksien tai verenkiertoelinten sairauksien vuoksi. Masennuksen takia eläkkeelle siirtyneillä ei löydetty suuria sosioekonomisia eroja. Erot olivat suuremmat nuoremmassa kuin vanhemmissa ikäryhmissä. Tuki- ja liikuntaelinten sairauksilla oli suurin merkitys eläkkeelle siirtymisen sosioekonomisiin eroihin.

Työkyvyttömyyseläkkeiden alkavuus on laskenut kaikissa sosioekonomisissa ryhmissä 1990-luvun alun jälkeen. Lasku on ollut erityisen suurta tuki- ja liikuntaelinten sairauksien sekä verenkiertoelinten sairauksien vuoksi työkyvyttömyyseläkkeelle siirtyneillä. Työolot ja sairaudet selittävät suuren osan työkyvyttömyyseläkkeelle siirtymisen sosioekonomisista eroista. Fyysisten työolojen yhteys työkyvyttömyyseläkkeelle siirtymisen sosioekonomisiin eroihin nähtiin erityisesti tuki- ja liikuntaelinten sairauksien vuoksi työkyvyttömyyseläkkeelle siirtyneillä. Sen sijaan erot työkyvyttömyyseläkkeelle siirtyneiden kuolleisuudessa olivat pienemmät kuin väestön kuolleisuudessa keskimäärin. Kuitenkin työntekijöiden kuolleisuus oli hiukan suurempi ylempien toimihenkilöiden kuolleisuuden verrattuna niillä, jotka olivat siirtyneet mielenterveys- ja verenkiertoelinten sairauksien vuoksi työkyvyttömyyseläkkeelle.

Tutkimus osoitti, että tuki- ja liikuntaelinten sairauksien osuus työkyvyttömyyseläkkeelle siirtymisen sosioekonomisista eroista on suuri. Mielen terveyden vaikutus oli pienempi kuin tuki- ja liikuntaelinten sairauksien. Työoloilla on suuri merkitys työkyvyttömyyseläkkeelle siirtymisen sosioekonomisten erojen vähentämisessä. Tuki- ja liikuntaelinten sairauksien ehkäiseminen erityisesti työntekijöillä pienentäisi eroja. Sen sijaan vähäiset sosioekonomiset erot kuolleisuudessa työkyvyttömyyseläkkeelle siirtymisen jälkeen viittaavat siihen, että työkyvyttömyyseläkeprosessi erottelee työkyvyttömyyseläkkeelle siirtyvät huolellisesti riippumatta siitä mikä henkilön sosioekonominen asema on.

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## LIST OF ORIGINAL PUBLICATIONS

This thesis is based on the following publications:

Polvinen A, Laaksonen M, Gould R, Lahelma E, Leinonen T, Martikainen P. Socioeconomic differences in disability retirement due to different diseases, 1988–2009. *J Occup Environ Med* [Accepted 25 May 2016].

Polvinen A, Laaksonen M, Gould R, Lahelma E, Martikainen P. The contribution of major diagnostic causes to socioeconomic differences in disability retirement. *Scand J Work Environ Health*, 2014; 40: 353–360.

Polvinen A, Gould R, Lahelma E, Martikainen P. Socioeconomic differences in disability retirement in Finland: The contribution of ill-health, health behaviours and working conditions. *Scand J Public Health*, 2013; 41: 470–478.

Polvinen A, Laaksonen M, Gould R, Lahelma E, Leinonen T, Martikainen P. Socioeconomic inequalities in cause-specific mortality after disability retirement due to different diseases. *Scand J Public Health*, 2015; 43:159–168.

## ABBREVIATIONS

BMI	Body mass index
CI	Confidence interval
CIDI	Composite International Diagnostic Interview
DP	Disability Pension
DR	Disability Retirement
ETK	Finnish Centre for Pensions
HR	Hazard Ratio
ICD	International Classification of Diseases
KELA	The social Insurance Institution of Finland
REF.	Reference group
RR	Risk Ratio
SES	Socioeconomic status

## 1 Introduction

The ageing of the population has given rise to serious economic and social implications for Finland and other countries. The proportion of people over 65 years of age has increased steadily during the past decades. In 1990, the share of people over 65 years was 13.5 per cent whereas in 2010 it was 17.5 per cent, and in 2020 it is forecasted to be 22.6 per cent (SVT 2012). In Finland the average retirement age was 61.2 years in 2014 (Kannisto 2015), and has increased during the past years. At the same time, the time spent in retirement has been extended due to growing life expectancy. Postponing the retirement age and lengthening working careers will be the major aim of the 2017 pension reform.

The health of the Finnish population has improved during the last few decades (Palosuo 2007). Long-term illnesses have decreased since the 1970s among the population of working age, but socioeconomic inequalities in morbidity still exist (Koskinen et al. 2007). The morbidity of certain cardiovascular or musculoskeletal diseases among those aged 30–64 years has diminished significantly during the past decades. However, the incidence of serious mental disorders among the working-age population has remained quite stable during the past decades, and these diseases are more common among people from lower socioeconomic classes (Ostamo et al. 2007).

Disability retirement is a major route to early exit from working life. In 2014 approximately 20,000 people retired due to disability (ETK and Kela 2015). The number of disability retirements has decreased during the past few years. Alongside unemployment insurance, disability pension is the most important social security benefit for the working-age population and concerns large population groups. 1.3 per cent of the Finnish working-age population was retired due to disability in 1990. In 2014 the corresponding figure was 0.7 per cent. The incidence of disability retirement due to all causes, musculoskeletal diseases and mental disorders was a little higher for women than for men, and the incidence of disability retirement due to cardiovascular diseases was higher for men than for women (ETK and Kela 2015).

A disability pension is awarded on the basis of a medically confirmed disease leading to a significant reduction in a person's work ability. The main causes of disability retirement are musculoskeletal diseases and mental disorders. These diseases cover approximately 65 per cent of all new disability pensions (ETK and Kela 2015). Cardiovascular diseases are the reason for a disability pension in 7

per cent of the cases. The risk of disability retirement increases with age. The tendency to retire on a disability pension is highest around the age of 60 or later (ETK and Kela 2015). The mean age of disability retirement varies by cause of disability. For instance, those retiring due to mental disorders are younger than those retiring due to musculoskeletal diseases.

Socioeconomic differences in disability retirement are large and have existed in Finland already in the 1970s and 1980s (Hytti 1988; Notkola et al. 1995). People of lower socioeconomic status run a higher risk of disability retirement than people of upper socioeconomic status. The magnitude of socioeconomic differences vary by the cause of disability (Leinonen et al. 2012). Large socioeconomic differences have been found in disability retirement due to musculoskeletal diseases (Leinonen et al. 2011; Ropponen et al. 2011). Socioeconomic differences in disability retirement due to mental disorders have been divergent. A study among public-sector employees found that socioeconomic differences in long-term psychiatric work disability varied widely between certain mental disorders, being largest for those with disorders of adult personality and behavior, schizophrenia, mental and behavioral disorders to psychoactive substance use (Virtanen et al. 2011).

Ill-health, health behaviours and working conditions are connected to disability retirement. E.g. musculoskeletal diseases, mental disorders and self-rated health (Månsson et al. 2001; Pietiläinen et al. 2011; Pietikäinen et al. 2011), obesity (Karnehed et al. 2007), smoking and alcohol consumption (Månsson et al. 1999; Mäkelä et al. 2008; Salonsalmi et al. 2012; Sidorchuk et al. 2012; Korhonen et al. 2015) are predictors of disability retirement. Working conditions have been found to be strongly associated with disability retirement (Holte et al. 2000; Tüchsen et al. 2008; Christensen et al. 2008; Labriola et al. 2009; Lahelma et al. 2012; Ervasti et al. 2013; Samuelsson et al. 2013). These factors are also connected to socioeconomic differences in disability retirement (Østby et al. 2011; Leinonen et al. 2011; Haukenes et al. 2011). Low socioeconomic status is often related to physically strenuous work and increased risk of ill-health and poor health behaviour (Palosuo et al. 2007; Lahelma et al. 2006; Pulkki-Råback et al. 2012). Manual workers have more health-related problems as well as more problems with drinking and smoking than people from upper socioeconomic classes. Manual workers also have more physically strenuous tasks than upper-non manual workers.

The risk of mortality is higher among disability retirees than among the general population. A Swedish follow-up study from 1971 until 2001 found that the



risk of mortality was two to threefold among disability retirees compared to the general population (Wallman et al. 2006). Higher mortality rates for disability retirees were due to neoplasms, alcohol-related diseases, psychosis or respiratory and neurological diagnoses. However, disability retirees due to musculoskeletal diseases had no elevated risk of mortality compared to the general population (Gjesdal et al. 2009; Gjesdal et al. 2009; Gjesdal et al. 2008; Karlsson et al. 2007). Socioeconomic differences in mortality after disability retirement are less known. A Finnish study (Leinonen et al. 2014) found that socioeconomic differences in excess mortality after disability retirement due to depression and other mental disorders varied by the cause of death.

Disability retirement concerns large population groups and gives rise to notable costs for society every year. The prevention of disability retirement is an important issue for public health and social policy. The main purpose of this study was to examine trends in socioeconomic differences in disability retirement due to different diseases over the time period 1988–2009, and to find out the contribution of different diseases to the overall socioeconomic differences in disability retirement in Finland. A further purpose was to examine how ill-health, health behaviours and working conditions contribute to the socioeconomic differences in disability retirement. This study also examines socioeconomic differences in mortality after disability retirement.

## 2 Concepts used in the study

### 2.1 The Finnish pension system

In Finland the earnings-related pension and the national pension ensure the income of the population in case of old age, incapacity to work or the death of the family provider. Earnings-related pension accrues from employment and self-employment that is insured in the earnings-related pension scheme (ETK 2015).

The statutory earnings-related pension scheme was founded in Finland in 1962 (The Employees Pensions Act, TEL), and in 1956 (The Seafarer's Pensions Act, MEL). It was further expanded in 1964 (The Local Government Pensions Act, KVTEL) and in 1967 (The State Employees' Pensions Act, VEL and the Evangelical-Lutheran Church Pensions Act, Kiel). The Self-Employed Persons' Pensions Act (YEL) and Farmers' Pensions Act (Myel) came effect in 1970 (Hietaniemi & Ritola 2007). Initially, the statutory earnings-related pension scheme included only old-age and disability pensions. Since then, more diversified early retirement benefits have been introduced. The earnings-related scheme was established in cooperation with labour market organizations. These organizations have also taken an active part in the development of the scheme (ETK 2015). The latest and largest reform of the scheme took effect in 2005. Following that reform, retirement on an old-age pension became possible between the ages of 63 and 68 and it was possible to retire on an early old-age pension at the age of 62. In the public sector, people have also had a personal retirement age. In 2005 certain early retirement pensions were abolished. The major purpose of the reform was to postpone the effective retirement age. The next reform will come into force in 2017. In this reform, the old-age retirement age will also be postponed.

The disability pension benefits of the earnings-related pension scheme are disability pension or temporary disability pension (formally: 'cash rehabilitation benefit') and these benefits compensate income for disability lasting for at least one year. Before that, sickness allowance is paid for a maximum of 300 working days. Earnings-related disability pension may be granted to an insured person aged between 18 and 62. The disability pension may be awarded in full or in part. A full disability pension is paid to an employee who has lost at least three-fifths of his/her work ability. A partial disability pension is paid if the work ability is reduced by at least two-fifths (ETK 2015).

When assessing eligibility for a disability pension, medical factors and the ability of the insured to gain an income through such available work that he/

she is capable of will be considered. Previous activity, education, age, place of residence and other factors are also taken into account. For those over the age of 60, the definition of occupational disability is applied (ETK 2015).

The individual early retirement pension, which took effect in the private sector in 1986 and in the public sector in 1989 and was suspended in 2005, was a disability pension designed for elderly employees or self-employed persons who have met a permanent reduction in work capacity but who were not sick enough to qualify for the ordinary disability pension (Gould 2003). The definition of disability for the individual retirement pension put less emphasis on purely medical criteria and more emphasis on the overall capacity to continue working and on the length of the working career (Gould 2003). At first, the minimum age for individual early retirement pension was 55 years. In 1994 it went up to 58 years (Hietaniemi & Ritola 2007).

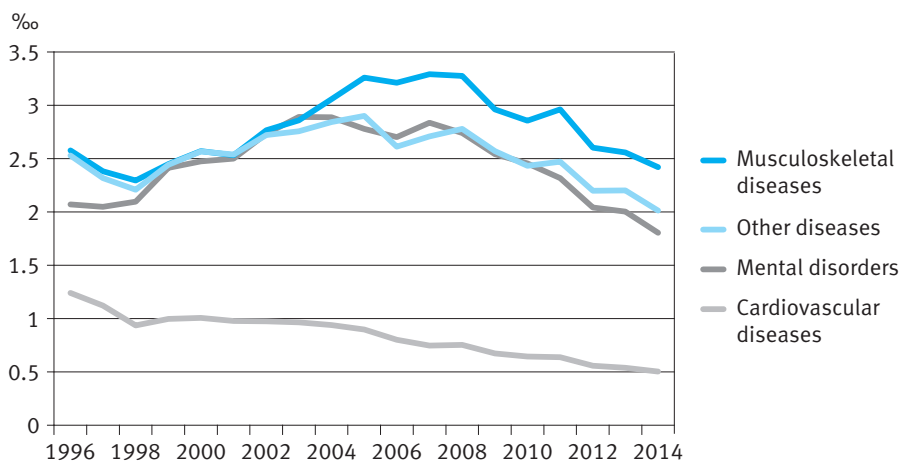
Partial disability pensions are one way of supporting the employment of those with partial work ability. Partial disability pensions are more common in the public sector, among women, the elderly, and those with higher socioeconomic status and musculoskeletal diseases. The incidence of partial disability pensions has increased during the last few decades. The growth has been especially large in the public sector. The growth of the number of partial disability pensions may partly be related to the ending of individual early retirement pension (Gould et al. 2008).

A cash rehabilitation benefit can be granted if it has been assumed that the employee will return back to work following rehabilitation. It is granted for a fixed period of time. The incidence of cash rehabilitation benefits has grown during the past few decades (Saarnio 2015).

The incidence of disability retirement has decreased during past decades. However, in the early 2000s the incidence of disability retirement increased slightly. The growth can partly be explained by the increasing number of disability retirements especially among manual workers, and disability retirement due to mental and musculoskeletal diseases. The incidence of disability retirement due to cardiovascular diseases has decreased steadily during the past decades. After the year 2005, the incidence of disability retirement has diminished in all socioeconomic and most common disease groups (Pensola et al. 2010). Figure 2.1 describes the incidence (‰) of disability retirement due to different diseases over the time period 1996–2014 in the private sector.

**Figure 2.1.**

*Age-adjusted incidence of disability retirement among 25–64-year-olds in 1996–2014, private sector (%).*



Source: Finnish Centre for Pensions, 2015.

## 2.2 Work ability and disability retirement

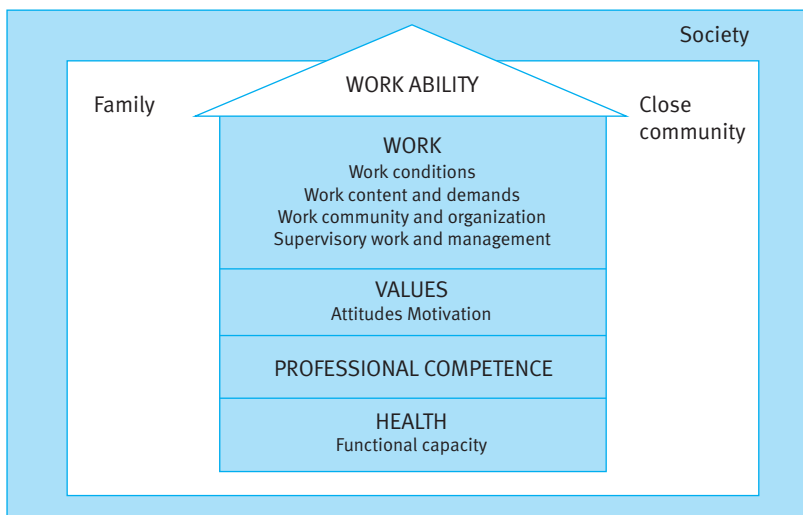
Early exit or early retirement expresses the entry into early retirement before the transition to old-age retirement (Kohli & Rein 1991; Saurama 2004). The models of early exit from work can be divided into the disability pathway, the unemployment pathway or a voluntary early pathway (Guillemard & van Gunsteren 1991; Hytti 1998; Beehr 1986; Hakola 2000a; Hakola 2000b; Hytti 2004; Saurama 2004; Harkonmäki 2007; Järnefelt 2010). Work ability has a major role when it comes to staying in or exiting working life. Disability retirement is connected to a reduced work ability and disability retirement requires a medical verification of the inability to work. It is used when assessing eligibility for a disability pension.

Work ability is a broad concept and has been described in many ways. Many models of work ability have been developed (Mäkitalo et al. 1994; Järvikoski et al. 2001; Ilmarinen 2006; Lederer et al. 2014). Lederer et al. (2013) see work (dis)ability as a relational concept that results from the interaction of multiple dimensions that influence each other through different levels. Ilmarinen (2006) describes work ability as built on the balance between a person's resources and work demands. Health and ability, competence and education, as well as values and attitudes create a person's resources. Work covers the working environment

and the community. Work ability is like a building with several floors. Health and physical, psychological, and social functional capacity constitute the ground floor. If a person's functional capacity or health changes, the change will affect work ability. The second floor of the building represents professional knowledge and competence. They and their continuous development are used to meet the demands of working life. The third floor contains values, attitudes and motivation. This floor is a balance between work and personal resources, and is open to different influences. The fourth floor includes work and its related factors and is multidimensional, including e.g. working conditions, work content and demands, work community and organization and supervisory work and management. Work ability is in close relationship with life outside work. Family and close community as well as society affect a person's work ability in many ways throughout the life (Ilmarinen 2006).

**Figure 2.2.**

*Dimensions of work ability.*



Source: Ilmarinen et al. 2006.

The Job Content Questionnaire (JCQ) (Karasek et al. 1998) measures social and psychological characteristics of jobs. It can be divided into decision latitude, psychological demands and mental workload, social support, physical demands and job insecurity. The model describes how employees are striving for balance between psychological demands and decision latitude. High decision latitude

and high psychological demands mean an active job, so-called good stress. High psychological demands and employees' low decision latitude lead to high job strain. The third dimension, social support, provides an important supplement to the model. The impact of support from coworkers and supervisors play an essential role. Low social support at work increases the risk of high job strain. Social support may consist of socioemotional and instrumental support from coworkers and supervisors (Karasek et al. 1998).

### 2.3 Socioeconomic status as a determinant of disability retirement

Socioeconomic status is a complex and multidimensional theoretical and empirical construct (Lahelma & Rahkonen 2011; Leinonen et al. 2012). It is typically classified hierarchically into higher and lower socioeconomic status. The key dimensions of socioeconomic status are education, occupational social class and income. Education is usually acquired in early adulthood and does not change much over a lifetime. It widely describes people's skills, knowledge and other nonmaterial resources (Lahelma & Rahkonen 2011). Occupational social class describes the position of the employee in the labour market. It can be classified e.g. into upper level employees, lower level employees, manual workers, farmers and other entrepreneurs. Socioeconomic status also reflects material circumstances in paid work, such as working conditions and income (Leinonen et al. 2012).

Socioeconomic differences in health, morbidity, mortality and disability retirement reflect differences between population groups (Saastamoinen et al. 2012; Jensen et al. 2012; Pietiläinen et al. 2011; Alexanderson et al. 2012; Karnehed et al. 2007; Salonsalmi et al. 2012; Sidorchuk et al. 2012; Ropponen et al. 2014; Lahelma et al. 2012; Mäntyniemi et al. 2012; Laine et al. 2009; Koivusilta 2011; Gjesdal et al. 2007). During the last few decades, overall health has improved and life expectancy has grown in Finland, but large socioeconomic inequalities in health still exist. People of lower socioeconomic status more often have poorer health and shorter lives than people of higher socioeconomic status. Health does not directly describe socioeconomic status, but different stages of life have an effect on health inequalities. Factors that contribute to the inequalities in health in adulthood are e.g. lifestyle, structural and psychosocial stress factors, living conditions in childhood, living and working conditions in adulthood, cultural and psychological factors, health in childhood and health problems that occur in adulthood (Mackenbach et al. 1994).

Health and living conditions in adolescence and early adulthood may influence an individual's socioeconomic status. People with good health have better possibilities of acquiring a higher education and socioeconomic status than those with poorer health. (Lahelma et al. 2009). Poor health behaviour is also associated with socioeconomic status. E.g. problem drinking, smoking and obesity expose people to getting ill, and this kind of behaviour is more common among people of lower than higher socioeconomic status.

Socioeconomic status is associated with working conditions. People of lower socioeconomic status are usually in stressful jobs with high physical demands and with low control and decision latitude. Working conditions may also expose them to different diseases. Carrying out heavy physical tasks make people especially vulnerable to musculoskeletal diseases, and stressful jobs may expose people to mental disorders. Heavy physical workloads and low job control are important risk factors for disability retirement (Haukenes et al. 2011; Leinonen et al. 2011; Lahelma et al. 2012).

Socioeconomic status, like several non-medical factors, is associated with early exit from work and disability retirement (Bruusgaard et al. 2010; Albertsen et al. 2007; Krokstad et al. 2002; Borg et al. 2001; Månsson et al. 1998; Krause et al. 1997).

## 2.4 Mortality after disability retirement

In addition to socioeconomic differences in disability retirement, there are also socioeconomic differences in health, hospitalization and mortality after disability retirement, and these differences may vary by cause of disability and death. Mortality after disability retirement may be affected by many factors in addition to health. Health behaviours, living conditions and health care are in a considerable role when we are trying to prevent premature death. Obesity, smoking, heavy alcohol consumption, and lack of physical activity are more common among people of lower socioeconomic status, and these factors increase the risk of mortality especially from cardiovascular diseases (Laaksonen et al. 2008). After disability retirement, work-related factors such as high physical workload, low job control and chemical and physical exposure at work do not exist anymore. However, some work-related diseases may be affecting the risk of mortality long after disability retirement.

## 3 Review of the literature

### 3.1 Socioeconomic differences in disability retirement due to different diseases and change in these associations over time

Socioeconomic differences in disability retirement are large (Nielsen et al. 2012; Bruusgaard et al. 2010; Leinonen et al. 2011; Leinonen et al. 2012; Haukenes et al. 2011; Krokstad et al. 2002). In Finland, they were noticed already in the 1970s and 1980s (Notkola et al. 1995; Hytti 1988). A previous Finnish study based on large register data on Finns (Leinonen et al. 2011) found that the incidence of all-cause disability retirement was especially high in 1990 and has decreased in all socioeconomic groups between the years 1990–2007. At the end of the 1990s, the incidence of disability retirement increased slightly, but since 2001 it has once again decreased. The decrease has been the fastest among manual workers. Even if the incidence of disability retirement has varied during past decades, socioeconomic differences are still evident (Leinonen et al. 2011).

Large socioeconomic differences were found already in the 1970s, 1980s and 2000s also in some Scandinavian studies (Månsson et al. 1998; Krokstad et al. 2002). A Swedish study (Månsson et al. 1998) found that the risk of disability retirement was approximately 3-fold among blue-collar workers compared to higher level white-collar workers. The data included five complete birth year cohorts (born 1926–1930) of middle-aged male residents of Malmö, Sweden. The follow-up began in 1974 and the participants were followed for 11 years (Månsson et al. 1998). A Norwegian study shows that the prevalence of disability retirement has changed based on age and gender between the years 1970–1999. The incidence of disability pension was mainly increasing for both women and men during that period (Gjesdal et al. 2004). Several other studies also show that socioeconomic differences in disability retirement are still large in many countries (Bruusgaard et al. 2010; Haukenes et al. 2011; Johansson et al. 2012; Leinonen et al. 2012; Samuelsson et al. 2012; Falkestet et al. 2014; Sumanen et al. 2015).

Socioeconomic differences in disability retirement vary by cause of retirement. Table 3.1 includes some previous studies about socioeconomic differences in disability retirement due to different diseases.

Large socioeconomic differences in disability retirement due to musculoskeletal diseases have been found (Månsson et al. 1998; Holte et al. 2000; Bruusgaard et al. 2010; Leinonen et al. 2011; Ropponen et al. 2011; Pietikäinen et al. 2011; Nielsen et al. 2012; Claussen et al. 2013).



A Finnish twin cohort study with a follow-up from 1975 to the end of 2004 showed that socioeconomic differences in disability retirement were large (Ropponen et al. 2011). Female and male unskilled workers had approximately a 2.5-fold higher risk of disability retirement due to musculoskeletal diseases than lower white-collar workers. Another Finnish study with a follow-up period from 2000 until the end of 2010 (Leinonen et al. 2011) found that the risk of disability retirement due to musculoskeletal diseases was higher among those in lower than higher social classes. The hazard ratio for disability retirement due to musculoskeletal diseases was almost 15-fold for manual workers compared to managers and professionals. Results from the Finnish Twin Cohort Study, with a record linkage to information on disability pension due to lower back disorders from the official pension registers and a follow-up from 1975 to 2004 (Pietikäinen et al. 2011) showed that years of education decreased the risk of disability pension due to lower back disorders for men and women. Unskilled workers ran a higher risk and upper white-collar workers a lower risk of disability retirement due to lower back disorders than did lower white-collar workers.

A Swedish study (Månsson et al. 1998) with 11 years of follow-up showed that the risk of disability retirement due to musculoskeletal diseases was 6–7 times higher among blue-collar workers than higher level white-collar workers. The excess risk among blue-collar workers was relatively similar among men and women. A Norwegian study (Bruusgaard et al. 2010) found that the risk of receiving disability pension due to musculoskeletal diseases was higher among older than younger individuals. Relative risk was over 350-fold among those aged 60–66 years compared to those aged 18–29 years. The risk of receiving a disability pension was also twofold higher among women than men, and the same was true for those with lower education compared to those with higher education. The relative risk of receiving the disability pension due to musculoskeletal diseases was 23-fold among those with primary education compared to those with university-level education (Bruusgaard et al. 2010). A study among Swedish twins followed from 1993 to 2008 (Ropponen et al. 2013) showed that inequalities in disability retirement due to musculoskeletal diseases were evident by occupational groups: employees in healthcare and social work, agriculture, forestry and fishing, transportation, production and mining and the service and military sectors were two to three times more likely to retire on a disability pension due to musculoskeletal diseases than those in the administration and management sector (Ropponen et al. 2013). In more specific studies, socioeconomic differences in disability retirement due to both complex musculoskeletal diseases as well as well-defined musculoskeletal

diseases have been found. A Norwegian study with demographic information and all social security grants from the National Insurance Administration for 1992–2004 and for all inhabitants of Norway (Claussen et al. 2013) has shown that highly educated people quite rarely retire on a disability pension with myalgia, tenosynovitis or lower back pain. A prospective study with data on all new disability pensioners with osteoarthritis in Norway during the two follow-up periods, 1971–1980 and 1981–1990, showed that manual workers' risk of disability retirement due to osteoarthritis was two to threefold compared to professionals (Holte et al. 2000).

The association between socioeconomic status and disability retirement due to mental disorders has not been consistent and has varied based on the more specific causes of mental disorder. A Finnish study with a follow-up from 2000 until the end of 2010 (Leinonen et al. 2011) found that socioeconomic differences in disability retirement due to all mental disorders are small and follow a non-linear pattern. The hazard ratio was the highest for routine non-manual employees and semiprofessionals. Among Finnish public-sector employees (1997–2005), socioeconomic differences in long-term psychiatric work disability were found for those with depression, anxiety disorders, disorders of adult personality and behaviour, schizophrenia or mental and behavioral disorders owing to psychoactive substance use, showing that manual workers run a higher risk of disability retirement (Virtanen et al. 2011). A recent Finnish study (Sumanen et al. 2015) found that educational differences in disability retirement due to mental disorders were large among all persons aged 25–34 years who were employed permanently or temporarily by the City of Helsinki during 2002–2013.

A Norwegian study including all Norwegians aged 18–66 years and alive at the end of 2003 showed that the relative risk of receiving a disability pension due to psychiatric diagnoses was over tenfold among those with a primary school education compared to those with a university degree (Bruusgaard et al. 2010). A Swedish prospective cohort study of all twins born in 1928–1958 ( $n=52,609$ ) and followed from 1993 to 2008 showed that a low education level predicted a lower risk of disability pension with mental diagnoses, especially depressive or anxiety diagnoses (Samuelsson et al. 2012). Another study with the same twin data (Samuelsson et al. 2013) showed that differences by occupational group in disability retirement due to mental diseases were evident. People working with technology, science, social science and the arts as well as healthcare and social work, transport and production and mining and service and military work ran a higher risk of disability retirement due to mental diagnoses (Samuelsson et al.

2012). A Norwegian study covering all social security benefits from the National Insurance Administration for 1992–2004 and including all inhabitants showed that the risk of disability retirement due to complex psychiatric diagnoses (depression, anxiety) and well-defined psychiatric diagnoses (psychoses, oligophrenia and others) was lower among those with higher education compared to those with lower education (Claussen et al. 2013).

Large socioeconomic differences in disability retirement due to alcohol use diagnoses have also been found (Månsson et al. 1998; Upmark et al. 1999). A Swedish, 11 year-long follow-up study with data from 1971 onwards found that blue-collar workers ran a three times higher risk of disability retirement due to alcohol and mental disorders than higher level white-collar workers (Månsson et al. 1998). A study based on a nationwide survey of 49,285 young Swedish men who were conscripted into military service in 1969/1970 and followed until 1993 showed that a lower social group of origin meant no higher risk of disability retirement with a psychosis diagnosis. However, those in a lower social group of origin ran a higher risk of disability retirement with other psychiatric diagnoses (alcohol and drug-related diagnoses excluded) and alcohol and drug-related disability retirement (Upmark et al. 1999).

Large socioeconomic differences in disability retirement due to cardiovascular diseases have also been found. The risk of disability retirement due to cardiovascular diseases has been approximately two times higher among blue-collar workers compared to higher-level white-collar workers (Månsson et al. 1998).

### **3.2 Ill-health, health behaviours and working conditions as determinants of socioeconomic differences in disability retirement**

Some studies have tried to determine the contribution of ill-health, health behaviours and working conditions to the socioeconomic differences in disability retirement (Haukenes et al. 2011; Leinonen et al. 2011; Østby et al. 2011; Falkestedt et al. 2014). These studies have been put together in Table 3.2.

According to previous studies, work-related factors are most closely associated with the socioeconomic differences in disability retirement (Leinonen et al. 2011; Haukenes et al. 2011; Falkstedt et al. 2014). A Finnish study of middle-aged municipal employees with follow-up from 2000–2002 until the end of 2010 (Leinonen et al. 2011) shows the strong impact of a physical workload and hazardous exposures on the socioeconomic differences in disability retirement. Physical workload and hazardous exposures attenuated the association with 64

per cent and 43 per cent among men, respectively, when job control attenuated the association only slightly. Adjustment of smoking and body mass index slightly attenuated the socioeconomic differences in all-cause retirement for men and women. The association of physical workload, hazardous exposures and job control to the socioeconomic differences in disability retirement was especially seen for those who were retired on a disability pension due to musculoskeletal diseases. In mental disorders the physical workload, job control and hazardous exposures attenuated the hazard ratio for manual workers in particular. Desktop work and job demands widened the social class differences especially for mental disorders. Desktop work and job demands are more common among people in higher social classes (Leinonen et al. 2011). The same study found that the contribution of health behaviours like smoking, alcohol consumption, physical activity and body mass index to the socioeconomic differences in disability retirement was modest. Smoking, body mass index, alcohol consumption and physical activity were added separately to the model and all health behaviours were also modelled. Especially smoking and body mass index somewhat attenuated socioeconomic differences in disability retirement due to all causes and due to musculoskeletal diseases and also socioeconomic differences in disability retirement due to mental disorders, whereas smoking and physical activity had smaller effects.

A Norwegian Hordaland Health Study (HUSK) used a comprehensive national registry on disability pension awards (Østby et al. 2011). Data included 15,067 participants and took place between 1997 and 1999 in Hordaland County. The information on pensions was from 1992 to 2004. The data included a large set of health indicators, and the results showed that health problems account only for a small part of the association between socioeconomic status and disability pension. Among the health indicators were anxiety and depression symptom score, number of somatic diagnosis, number of pharmacologic treatments, somatic symptoms, obesity, self-reported fibromyalgia or lasting pain (Østby et al. 2011). Adjustment of these health-related factors reduced educational inequalities in disability retirement by 16 per cent comparing 12 with more than 12 years of education, and by 11 per cent comparing 9 with more than 12 years of education. Health accounted for less of the association between educational level and disability pension for women than for men (Østby et al. 2011).

The Norwegian Nord-Trøndelag Health Study (HUNT) with follow-up data from 1995 to 2008 showed that the educational inequalities in disability retirement in age groups 25–49 and 50–66 years were somewhat explained by long-standing limiting illnesses, occupational (physically demanding work, attention-demanding

work, low job satisfaction), psychosocial (marital status, few good friends, rare organizational activity, low self-esteem, anxiety and depression symptoms) and behavioural (smoking and physical activity) factors. After adjustment of these factors, considerable inequalities still remained (Nilsen et al. 2012).

A study consisting of 49,321 Swedish men, with follow-up data from 1991–2002, studied the association between the level of education and disability retirement and to what extent the association could be explained by IQ, health-related lifestyle factors, a psychiatric and a musculoskeletal diagnosis, job strain and physical strain at work. The results showed that factors measured in late adolescence, IQ in particular, attenuated the association of education level and disability pension more than work-related factors in adulthood. After adjusting for all these factors, the level of education still remained a significant predictor of disability pension (Johansson et al. 2012). Also another Swedish study of men and women born in 1948 and 1953 and followed from 1986 to 2008, including 22,889 participants (Falkestedt et al. 2014), found the importance of paternal education, ambition to study, and intellectual performance at age 13 to the association of low education and disability pensioning. Working conditions, physical strain at work and job control also partly explained the educational differences in disability pension. Then association of these factors were found for disability retirees due to all causes, musculoskeletal diseases, psychiatric disorders and other diagnoses (Falkestedt et al. 2014). A Dutch 10-year follow-up study during 1999–2008 also studied the effects of health, lifestyle-related factors and work characteristics on the relation between educational level and exit from paid employment to disability benefit (Robroek et al. 2015). Health was measured by self-rated health. Lifestyle-related factors were body mass index, participation in sports, smoking and alcohol intake. Work characteristics were job demands, job control, rewards and physical job demands. The data were based on an annual national survey on living conditions (POLS) and 39,220 persons responded to it. Educational differences in disability benefits were explained for mostly by health (40%), by lifestyle (31%), and by work characteristics (12%) (Robroek et al. 2015).

### 3.3 Socioeconomic differences in mortality after disability retirement

Previous studies have found that disability retirement is associated with a high risk of mortality (Wallman et al. 2006; Karlsson et al. 2007; Gjesdal et al. 2007; Gjesdal et al. 2008; Gjesdal et al. 2009; Leinonen et al. 2013). These studies are

displayed in Table 3.3. However, there are quite a few studies about mortality after disability retirement.

A population-based Norwegian study with 148,942 persons and follow-up time between 1990–1996 found that mortality after disability retirement was 3-fold compared to those with no disability retirement (Gjesdal et al. 2008). The most common diagnostic causes of disability retirement are musculoskeletal and mental disorders. However, these diseases rarely lead to death. Disability retirees due to musculoskeletal diseases had a slightly elevated risk of mortality. Mortality after disability retirement due to musculoskeletal diseases was 1.5–2.0-fold. When due to mental disorders it was over 3-fold, both for men and women, compared to those not in disability retirement. The risk of mortality was also high after disability retirement due to cancer (hazard ratio was 14-fold for women and 10-fold for men) and substance use disorders (hazard ratio was 13-fold for women and 8-fold for men). Adjustment of education and mean income equalized these differences (Gjesdal et al. 2008). A Swedish study with a follow-up from 1985 to 1996 found that mortality after disability retirement was higher among younger than older disability pensioners and among full-time than part-time disability pensioners (Karlsson et al. 2007). The risk of mortality decreased with age (Karlsson et al. 2007). Also a Norwegian study with a 10 per cent random sample of the population aged 30–59 years, with follow-up time from 1990 to 1996, showed that socioeconomic factors such as age and education slightly associated with increased mortality after disability retirement, especially for men. For female disability pensioners, the effect of socioeconomic factors on the mortality risk was much smaller (Gjesdal et al. 2007).

A Finnish study (Leinonen et al. 2014) based on a nationally representative sample of the Finnish population aged 25–64 in 1996, with follow up until the end of 2007, found that the socioeconomic differences in excess mortality after disability retirement due to depression and other mental disorders varied slightly by cause of death. However, socioeconomic differences in disability retirement due to mental disorders seemed to be rather modest. Very little is known about socioeconomic differences in mortality after disability retirement due to reasons other than mental disorders.

### 3.4 Summary of previous studies

Socioeconomic differences in disability retirement are well known, but a summary of past studies shows that there are only a few studies about socioeconomic

differences in disability retirement due to different diseases. Some studies about socioeconomic differences in disability retirement due to musculoskeletal diseases and mental disorders exist, but studies of e.g. socioeconomic differences in disability retirement due to cardiovascular diseases and neoplasms are almost entirely missing. Also, we know that musculoskeletal diseases are the main cause of disability retirement and socioeconomic differences in disability retirement due to musculoskeletal diseases are large, but the importance of the musculoskeletal diseases' contribution to the overall socioeconomic differences in disability retirement is not well known. Cause-specific time-trends about socioeconomic differences in disability retirement due to different diseases are also needed.

New studies are also needed about the contribution of ill-health, health behaviours and working conditions to the socioeconomic differences in disability retirement due to different diseases. It is important to know how all these factors are associated with the socioeconomic differences in disability retirement and what the overall contribution of these factors from socioeconomic differences in disability retirement is.

Past research shows that there are only a few studies about mortality after disability retirement. Studies about socioeconomic differences in mortality after disability retirement are almost completely missing as well. Cause-specific studies about socioeconomic differences in mortality after disability retirement due to different diseases are also needed, as well as studies about socioeconomic differences in mortality from different causes of death.

**Table 3.1.**

*Studies on socioeconomic differences in disability retirement (DR) due to different diseases.*

Authors	Study design	Socioeconomic differences in DR due to different diseases
Månsson et al. 1998	Five complete birth-year cohorts of middle-aged male residents in Malmö were invited to a health survey in 1974–1978. Of 7,697 invited men, 77.1 % participated. Follow-up time was approximately 11 years and nationwide Swedish registers were used. Cox proportional hazard model, logistic regression and chi-square statistics were used.	Blue-collar workers ran a higher risk of disability retirement due to musculoskeletal diseases, mental and alcohol-related diseases and circulatory diseases than lower and higher-level white-collar workers.
Upmark et al. 1999	The study was based on data of 49,285 young Swedish men who were conscripted into military service in 1969/1970. Follow-up time was until 1993. Logistic regression was used.	Low socioeconomic group of origin increases the risk of disability retirement due to psychiatric diagnoses, alcohol-related or drug-related diagnoses.
Holte et al. 2000	Data included all new disability pensioners with osteoarthritis in Norway during the follow-up periods, 1971–1980 and 1981–1990. Logistic regression analysis was used. The study included all subjects living in Norway who were 50–56 years old and were employed either in the 1970 or 1980 census.	Manual workers run a higher risk than professionals of becoming disability pensioners with osteoarthritis. The association was stronger in the 1980s than the 1970s.
Bruusgaard et al. 2010	Data included all inhabitants of Norway aged 18–66 years who were alive on 31 December 2003. Poisson regression was used.	Large educational differences in receiving disability pension due to musculoskeletal diseases and psychiatric diagnoses were found. Lower education predicted higher risk of disability pension. The disparities were stronger for those with musculoskeletal diagnoses.
Leinonen et al. 2011	Data was nationally representative register data. Follow-up of over 260,000 Finns aged 30–63 at the end of 1995 for disability retirement from 1996 to 2004. Cox regression analysis was used.	The risk of disability retirement found to be higher among men and women with a low education, social class and income.
Leinonen et al. 2011	Study used data from the Helsinki Health Study cohort on employees of the City of Helsinki (70% women) from 2000 until the end of 2010. Cox regression analysis was used.	The risk of disability retirement was generally higher among those in lower social classes with a strong socioeconomic gradient for all causes, and for musculoskeletal diseases, and weaker non-linear association for mental disorders.
Ropponen et al. 2011	Finnish Twin Cohort Study included survey data on twin pairs assessed by a mailed questionnaire during the baseline year 1975 and followed up for 30 years. The study sample consisted of 24,043 twin individuals born before 1958. Cox proportional hazard model were used.	Low education and social class were significant risk factors for disability pension due to musculoskeletal diseases and osteoarthritis.
Pietikäinen et al. 2011	Data was Finnish Twin Cohort Study with information on disability pension due to lower back disorders from the official pension registers. Follow-up was from 1975 to 2004. Cox proportional hazard models were used.	Years of education decreased the risk of disability pension due to lower back disorders.
Virtanen et al. 2011	Data was a prospective observational cohort study (1997–2005) including register data on 141,917 public-sector employees in Finland. Cox proportional hazard modes were used to analyze the association between socioeconomic status and outcomes.	Low socioeconomic status was associated with disability in depressive disorders, anxiety disorders, personality disorders, schizophrenia and substance-use disorders. No associations were found between socioeconomic status and disability owing to bipolar disorders or reaction to severe stress and adjustment disorders.



Samuelsson et al. 2012	Data was a prospective cohort study of all twins born in 1928–1958 in Sweden (n=52,609). Follow-up time was 1993–2008. Cox proportional hazard models were used.	Low education predicted higher risk of disability retirement due to all diagnoses and a lower risk of disability retirement due to mental diagnoses.
Ropponen et al. 2013	A sample of 24,543 same-sex Swedish twin individuals was followed from 1993–2008. Nationwide register were used. Cox proportional hazard ratios (HR) were estimated.	Inequalities in disability retirement due to musculoskeletal diseases by occupational groups were found.
Samuelsson et al. 2013	A prospective population-based cohort study included all Swedish twins (N=42715), who were living and working in Sweden and not retired. Twins were followed from 1993 to 2008. Cox proportional hazards regression models were used.	The associations between disability pension with mental diagnoses and occupational group were founded.
Claussen et al. 2013	Data included all social security grants from the National Insurance Administration for 1992–2004 for all inhabitants in Norway. Sample was aged 30–55-years in 1995, being alive, employed and not having a disability pension at the end of 2000. Logistic regressions were used.	Highly educated people quite rarely got disability pension with complex musculoskeletal diseases (myalgia, tenosynovitis, lower back pain) or well-defined musculoskeletal diagnoses (arthritis, osteoarthritis). The risk of disability retirement due to complex psychiatric diagnoses or a well-defined (psychiatric) diagnosis was higher among those of a low education.
Haukenes et al. 2014	The Hordaland Health Study (HUSK) was collected during 1997–1999. The source population included all individuals in Hordaland county born 1953–57. The participation rate was 57% for men and 70% for women. Follow-up was until end of 2004. Cox regression analysis was used.	Large socioeconomic and educational differences in disability retirement were found. People with low education level had higher risk of disability retirement.
Sumanen et al. 2015	Register data of the City of Helsinki for 25–34-year-old employees from the years 2002–2013 were used. Cox regression analysis was used to estimate hazard ratios for disability retirement.	Large educational differences were found for disability retirement due to mental and non-mental causes. People with low education level had higher risk of disability retirement.

**Table 3.2.***Studies on mediating factors of socioeconomic differences in disability retirement.*

Authors	Study design	Mediating factors
Claussen et al. 2009	Data consisted of the Oslo Health Study during 2000–2001. The study consisted of self-reported questionnaires and medical examinations for 40,888 male and female inhabitants of Oslo aged 30, 40, 45, 59–60 and 75–76 years. Information on disability retirement was from 2001 to 2004. Chi-square statistics and logistic regressions were used.	Adjustment for occupation and working conditions reduced the gender differences in disability retirement. Working conditions reduced the occupational differences in disability retirement.
Leinonen et al. 2011	Study used data from the Helsinki Health Study cohort on employees of the City of Helsinki (70% women). Cox regression analysis was used to calculate hazard ratios and 95% confidence intervals.	Socioeconomic differences in disability retirement were largely mediated through physical workload among both women and men and hazardous exposures particularly among men. In mental disorders, job control also mediated the association. The contribution of health behaviour to the socioeconomic differences was modest.
Østby et al. 2011	15,067 participants in the Hordaland Health Study were linked to a comprehensive national registry on disability pension awards. Logistic regression were used to examine the association between socioeconomic status and rates of disability pension awarded, before and after adjusting for a wide range of somatic and mental health factors.	Ill-health explained only a small part of the association between socioeconomic status and disability pension.
Haukenes et al. 2011	The Hordaland Health Study was conducted during the period 1997–1999. The study population included all individuals living in Hordaland County born during the period 1953–1957, aged 40–45 years at the time of the health study. Cox regression analysis was used.	Study found a strong gradient in disability pension by occupational class. In the gender and health-adjusted model, work-related factors mediated the impact of occupational class on subsequent disability pension by 24% in the unskilled manual class.
Johansson et al. 2012	Data on 49,321 Swedish men was obtained from the 1969 conscription cohort. Data was collected when subjects were 18–20 years of age. Information about DP was between 1991 and 2002. Information about IQ, health-related lifestyle factors, psychiatric and musculoskeletal diagnoses was obtained. Cox proportional hazards models were used.	Adjustment for factors in late adolescence (IQ, health-related lifestyle factors, psychiatric and musculoskeletal diagnosis) attenuated the association between level of education and DP by 33–63%. Adjustment for work characteristics in adulthood (job control and physical strain at work) attenuated the association between level of education and DP by 22–47%.
Nilsen et al. 2012	The data included 32,948 participants in the HUNT Study (1995–1997), 25–66 years old, without disability pension and in paid work. Information on the occurrence of disability pension was obtained from the National Insurance Administration database up to 2008. Cox regression analysis was used.	Illness and occupational psychosocial and behavioural factors explained some of the educational inequalities in disability retirement.
Falkstedt et al. 2014	Two nationally representative samples of men and women born in 1948 and 1953 in Sweden (N=22,889) were linked to information from social insurance records on cause and date of disability pensions. Follow-up was from 1986 until 2008. Cox proportional hazards regression was used.	High physical strain at work and low job control both contributed to explain the association between low education and disability pensions.
Robroek et al. 2015	Annual national survey “Permanent Survey on Living Conditions” POLS was used, where 14,708 Dutch employees participated in the follow-up study from 1999 to 2008. Competing risks regression analysis was used.	Educational differences were explained by health (40%), by lifestyle (31%) and by work characteristics (12%).

**Table 3.3.**  
*Studies on mortality after disability retirement.*

Authors	Study design	Risk factors for mortality after disability retirement
Wallman et al. 2006	Data included 6,887 Swedish men and women less than 65 years old at baseline. Information on disability pension, hospital admission, and mortality from 1971–2001 were linked to the data. Poisson regression and Cox's regression were used.	Disability retirees had a higher mortality rate than the non-retired. The risk was also highest among individuals granted a disability pension at a young age.
Karlsson et al. 2007	Data included the population of the Swedish county of Östergötland aged 16–64 years in December 1984 (n=245,704). Follow-up time was 1985–1996. Cox proportional hazards model were used.	Mortality was higher for DP recipients than for individuals without DP. Mortality was highest among the youngest DP recipients, and it was especially high the first year of DP, and among full-time DP recipients.
Gjesdal et al. 2007	Data was a 10% random sample of the Norwegian population aged 30–59 years. Follow-up time was 1990–96. Cox regression analysis were used.	The findings indicated the important role of socioeconomic factors related to disability pension status and mortality. Low level of education increased risk of mortality.
Gjesdal et al. 2008	Data included 148,942 persons followed between 1990–1996 in Norway. There were 6,285 women and 4,113 men on a disability pension at baseline. A Cox proportional hazard analysis was carried out for women and men to analyze all-cause mortality.	The disability retirees had a strongly increased risk of mortality especially for disability retirement due to alcohol and cancer. After adjustment of education and income levels, the hazard ratios decreased significantly for the men.
Gjesdal et al. 2009	Data was 9-year prospective cohort study in Hordaland County, Norway. Study included 1,417 women and 1,075 men aged 16–62 years with a spell of LTSA ≥ 8 weeks, and with a musculoskeletal or mental diagnosis. The endpoint of follow-up was death. Cox proportional hazards analysis was used.	Among the men, 5.6% of DP recipients died. 7.2% (men) with mental diagnoses and 4.4% (men) with musculoskeletal sick-leave diagnoses died. Increasing age, male gender and low income increased the mortality risk significantly.
Leinonen et al. 2013	Data included members of the Finnish population aged 25–64 in 1996 with no prior disability retirement due to mental disorders (N=392,985). Cox regression analysis were used. Mortality was the outcome variable between 1997–2007 and disability retirement due to mental disorders as a time-varying covariate.	Excess suicide mortality was particularly large after disability retirement due to mental disorders, particularly depression. Largest excess mortality was found among younger age groups, non-manual classes, and those living with a partner and children.

## **4 Aims of the study**

The specific aims of the study were to

1. examine trends in socioeconomic differences in cause-specific disability retirement in Finland, 1988–2009 (Substudy I)
2. examine socioeconomic differences in disability retirement due to different diseases and to find out the contribution of different diseases to the overall socioeconomic differences in disability retirement (Substudy II)
3. examine the contribution of ill-health, health behaviours and working conditions to socioeconomic differences in disability retirement due to all causes and musculoskeletal diseases (Substudy III)
4. examine socioeconomic differences in cause-specific mortality after disability retirement due to different diseases (Substudy IV).

## 5 Material and methods

### 5.1 Data sources

#### *Register data from Statistics Finland (Substudies I and IV)*

We used administrative register data from various sources linked together by Statistics Finland. The data were a 11 per cent sample of Finns. The data also included an 80 per cent oversample of the deceased during the follow-up. Analysis weights were used to account for the different inclusion probabilities among the deceased and the living. The follow-up time was 1987–2009 in substudy I and 1987–2007 in substudy IV. Substudy I included men and women aged 30–62 years residing in Finland during the follow-up period 1988–2009. Substudy IV included men and women aged 30–62 years residing in Finland at baseline and those who turned 30 during the follow-up period 1988–2007. In substudy IV, 58,937 men and 52,289 women retired on a disability pension during the follow-up. Among the disability retirees, 24 per cent of men and 13 per cent of women died during the follow-up period.

#### *Register data from Statistics Finland (Substudy II)*

Substudy II used longitudinal register-based data from Statistics Finland, a 10 per cent sample of Finns. It included 258,428 participants aged 35–64 years during the follow-up period 1997–2010. The participants were employed or unemployed prior to the follow-up. 14,303 men and 13,188 women retired on a disability pension during the follow-up.

#### *Health 2000 survey (Substudy III)*

The data of Health 2000 included 8,082 persons aged 30 years and over, living in Finland (Heistaro 2008). Health examinations and face-to-face interviews were carried out between August 2000 and May 2001. Register-based retirement data were derived from the Finnish Centre for Pensions, the Social Insurance Institution of Finland and Statistics Finland. Follow-up register data included information on retirement and two diagnoses of disability between years 2000–2009. The data included 3,674 persons aged 30–62 years, who were employed full-time or part-time at baseline or had been in a paid job during the last 12 months. The outcome

variables were disability retirement due to any cause, due to musculoskeletal diseases and mental disorders. 363 persons ended up in disability retirement due to any cause, 163 due to musculoskeletal diseases and 95 persons retired due to mental disorders between the years 2000–2009. Disability retirement due to mental disorders was not modelled due to the small number retirements.

## 5.2 Study variables

### *Socioeconomic status*

Socioeconomic status (SES) was categorized according to the classification of Statistics Finland (1989). We used the most recent information on socioeconomic status, available in 5-year intervals between 1970 and 2005. Earlier information on socioeconomic status was used if information on socioeconomic status was missing from a more recent year. Socioeconomic status was based on a person's main type of activity, occupation, occupational status (self-employed/employee) and branch of industry. Socioeconomic status was divided into upper non-manual employees, lower non-manual employees, manual workers and self-employed. The self-employed included farmers and small/other employers, entrepreneurs, own-account employees, and other self-employed persons (Statistics Finland 2013). In substudies I and IV, we excluded the self-employed from our analysis.

### *Disability retirement due to different diseases*

Disability retirement during follow-up periods included full and partial disability retirement and those who received temporary disability pension or individual early retirement pension.

The retirement diagnoses were categorized according to the International Classification of diseases (ICD-10) into the following groups: Musculoskeletal diseases (M00–M99), mental and behavioural disorders (F10–F99), cardiovascular diseases (I00–I99), diseases of the nervous system (G00–G99) and neoplasms (C00–D48). In substudy II, mental and behavioural disorders were further classified into subgroups of psychoactive substance use (F10–F19), schizophrenia (F20–F29) and depressive episodes (F32–F33) and other mental disorders. In substudy II, musculoskeletal diseases were divided into back diagnoses (M40–M54), arthrosis (M15–M19) and other musculoskeletal diagnoses.

### *Age groups*

Different age groups were used in different substudies. In substudy II, we divided those aged 35–64 into five age groups: 35–44, 45–49, 50–54, 55–59 and 60–64 years, and in cause-specific examinations we divided participants into 35–54-year-old and 55–64-year-old participants. Substudy III analyzed the contribution of health, health behaviour and working conditions to socioeconomic differences in disability retirement due to all causes in two age groups: 30–49 years at the baseline and 50–62 years at the baseline. In substudies I and IV age was treated as a continuous variable.

### *Gender*

Whenever possible, analyses were made separately for men and women. In some analyses men and women were pooled together due to the small number of disability retirements.

### *Ill-health (Substudy III)*

In the Health 2000 study, the concept of ill-health was based on clinical medical examinations. Diagnosed somatic diseases were classified into four groups: musculoskeletal diseases, circulatory diseases, respiratory diseases and other somatic diseases. Mental disorders were classified according to the Composite International Diagnostic Interview (CIDI): disorders of depression, anxiety and alcohol use. Self-rated health was measured with a question: “Is your present state of health: good, rather good, moderate, rather poor or poor?” It was classified into good (good and rather good), average (moderate) and poor (rather poor, poor) health. Medically certified sick leave days were derived from the register of the Social Insurance Institution of Finland for the years 1998–1999. The sick leave benefit requires a waiting period of 10 working days before sickness allowance is paid, and the register covered only those days that meet these requirements. The data included only sick leaves longer than 10 days.

### *Health behaviours (Substudy III)*

Four health behaviours (Substudy III) were measured: physical exercise, smoking, risk use of alcohol and obesity. Physical exercise describes the respondents’ leisure-time exercising: how often they exercise during their leisure time to the extent

that they are at least somewhat out of breath and sweating. Adequate physical exercise was at least one time per week for no less than 30 minutes. Risk use of alcohol was calculated as two portions per day for men and one portion per day for women. Obesity was defined by body mass index (BMI). Values over 35 kg/m<sup>2</sup> were classified as severe obesity. Smoking was divided into non-smokers, ex-smokers, current smokers and current heavy smokers.

### *Working conditions (Substudy III)*

In substudy III, Karasek's job control and job demands (Karasek et al. 1998) were used as measures of psychosocial working conditions. Job control was based on the amount of work and skills needed for the work: 'I can make a lot of independent decisions in my job', 'My job demands creativity', 'My job demands that I learn many new things', 'My job comprises many repetitive similar tasks', 'I have much say in my job and tasks', 'My job demands highly developed skills', 'I can do many different tasks in my job' and 'I can improve my special skills'. Job demands included statements about the pace of work: 'I need to be fast in my job', 'My job demands extremely hard labour', 'An unreasonable amount of work is expected from me', 'I have enough time to get my work completed', 'The pace in my job is extremely fast'. Social support at work was based on items concerning support and appreciation at work: 'When needed, my closest superior supports me', 'When needed, my fellow workers support me', 'In my work unit we discuss together tasks, aims and how to reach them', 'I am happy with the appreciation my superior shows towards my work'. Alternatives for answers in all questions were: 'I fully agree', 'I agree to some extent', 'I do not agree nor disagree', 'I disagree to some extent' and 'I fully disagree' (National Institute for Health and Welfare 2016).

Physically demanding work was measured by physical working conditions and chemical and physical hazards at work. The score for physical working conditions was the sum of items that included daily work: lifting, carrying, bad working postures, working with hands above shoulder plane, working on knees or squatting, strenuous work using hands or repetitive hand movements. Alternatives for answers were: 'Not at all', 'Occasionally', 'Under half of the time', 'Over half of the time'. Chemical and physical hazards at work consisted of the following irritants at work: noise, dust, shaking or vibration, chemicals, gases, cigarette smoke, coldness, heat, air draught or insufficient lighting. Alternatives



for answers were: ‘Not present or no harm’, ‘Troubles to some extent’, ‘Troubles quite much’, ‘Troubles a lot’ (National Institute for Health and Welfare 2016).

### *Causes of death (Substudy IV)*

Causes of death were classified into natural causes of death: neoplasm (C00–D48), cardiovascular diseases (I00–I425, I427–I99), other natural causes (A00–R99) excluding (I00–I99, C00–D48, F10, G312, G4051, G621, G721, K292, K70, K860, O354) and unnatural causes of death: alcohol-related diseases and accidental poisoning by alcohol (F10, G312, G4051, G621, G721, I426, K292, K70, K860, O354, P043, X45), and suicides and other unnatural causes (X60–X84, Y870, V01–X44, X46–X59, X85–Y86, Y871–Y89) (Statistics Finland 2012).

## 5.3 Statistical methods

Cox proportional hazard models were used to estimate hazard ratios (HR) and their 95 per cent confidence intervals (95% CI) for disability retirement due to different diseases (Substudies II, III) and mortality after disability retirement due to different diseases (Substudy IV). In substudy III the contribution of diseases, self-rated health, health behaviours and working conditions to socioeconomic differences in disability retirement were examined. The percentual change in socioeconomic differences in disability retirement due to all causes and musculoskeletal diseases was calculated as:  $(HR(\text{base model}) - HR(\text{base model} + \text{added variables})) / (HR(\text{base model}) - 1) * 100$ .

Age-adjusted all-cause and cause-specific disability retirement incidence rates (per 1,000 person years) by socioeconomic status for men and women were calculated in substudies I, II and IV. In substudy IV, mortality rates after disability retirement due to different diseases (per 1,000 person years) and for those with no disability retirement (per 1,000 person years) were also calculated. In substudies I and II, the excess disability retirement in different socioeconomic groups were calculated using the formula:  $\text{excess disability retirement}_{ij} = [\text{number of disability retirement}_{ij}] - [\text{number of disability retirement}_{ij} / RR_{ij}]$ , where  $RR_{ij}$  = age-adjusted risk ratio for disability retirement in socioeconomic group *i* and disease group *j*. Similar formula have been used e.g. when excess mortality due to unemployment has been calculated (Martikainen 1989).

## 6 Results

### 6.1 Socioeconomic differences in cause-specific disability retirement (Substudies I and II)

Table 6.1 shows the age-adjusted disability retirement rates due to all causes, musculoskeletal diseases, mental disorders and cardiovascular diseases in 1990, 1995, 2000, 2005 and 2009 by socioeconomic status. Incidence of disability retirement due to all causes, musculoskeletal diseases and cardiovascular diseases decreased rapidly in the early 1990s but the decrease flattened out in the late 1990s. Changes in the incidence of disability retirement due to mental disorders were small during the follow-up period.

**Table 6.1.**

*Incidence of disability retirement (DR) due to any cause, musculoskeletal diseases, mental disorders and cardiovascular diseases by socioeconomic status in 1990, 1995, 2000, 2005 and 2009 (DR/1,000 person years).*

	Year	Men			Women		
		Upper non-manual	Lower non-manual	Manual workers	Upper non-manual	Lower non-manual	Manual workers
All causes	1990	14.5	18.3	26.9	10.6	16.9	30.0
	1995	7.8	9.6	16.7	6.8	11.2	17.8
	2000	5.3	8.2	12.6	6.3	7.7	14.4
	2005	4.5	7.2	13.5	5.2	8.0	15.2
	2009	3.8	5.9	10.4	3.3	7.2	10.4
Musculoskeletal diseases	1990	1.4	5.5	11.7	3.5	7.7	15.5
	1995	1.2	2.2	5.8	1.9	4.1	7.9
	2000	0.5	2.5	4.1	1.2	2.6	5.5
	2005	0.5	1.5	4.4	1.2	3.0	6.5
	2009	0.6	1.3	3.6	0.7	2.6	4.7
Mental disorders	1990	3.3	3.2	3.7	3.1	4.0	5.1
	1995	2.5	3.3	3.3	2.6	3.4	4.1
	2000	2.6	2.2	3.0	3.1	2.8	4.1
	2005	2.0	2.6	3.4	2.4	2.8	4.3
	2009	1.9	2.3	2.5	1.5	2.7	2.6
Cardiovascular diseases	1990	3.1	4.7	5.1	1.4	1.6	3.3
	1995	1.3	1.6	2.7	0.6	0.7	1.7
	2000	0.5	1.4	1.8	0.6	0.4	1.1
	2005	0.6	0.7	1.6	0.2	0.3	0.8
	2009	0.3	0.5	1.0	0.2	0.3	0.6

In 1990, the incidence of disability retirement due to all causes was high: per 1,000 person years, 26.9 male manual workers and 30.0 female manual workers and 14.5 male upper-non manual employees and 10.6 female upper-non manual employees retired due to disability. Between the years 1990–2009 the incidence of disability retirement due to all causes diminished in all socioeconomic groups, but most among manual workers. Among lower non-manual employees, the incidence of disability retirement due to all causes was higher than among upper non-manual but smaller than among manual workers.

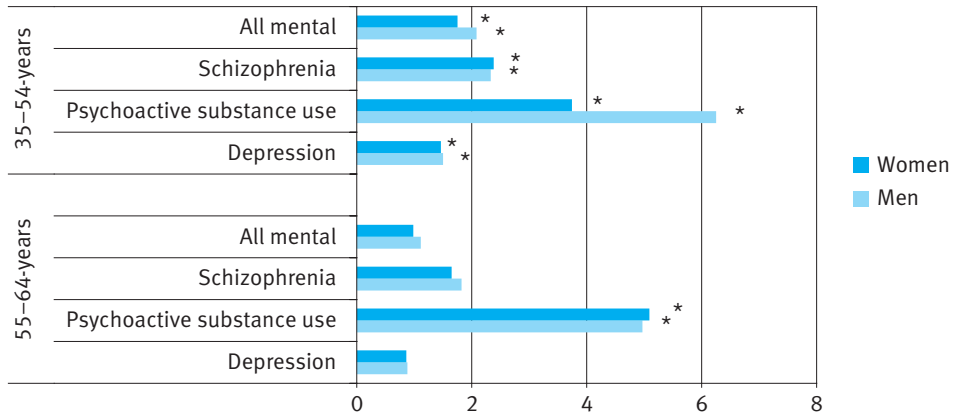
Socioeconomic differences were large in disability retirement due to musculoskeletal diseases. In 1990 the incidence of disability retirement due to musculoskeletal diseases was especially high for manual workers. The incidence of disability retirement due to musculoskeletal diseases diminished during the follow-up in all socioeconomic groups, but socioeconomic differences in disability retirement still remained large.

Socioeconomic differences in disability retirement due to mental disorders were modest in the beginning of the follow-up, but they expanded somewhat in the late 1990s. The incidence of disability retirement due to mental disorders diminished in all socioeconomic groups. More specific examinations of socioeconomic differences in disability retirement due to depression, psychoactive substance use and schizophrenia (Substudy II) shows that differences vary by specific cause of mental disorder (Figure 6.1). Socioeconomic inequalities in disability retirement were largest in retirement due to psychoactive substance use or schizophrenia. The hazard ratio for disability retirement due to psychoactive substance use for 35–54-year-old male manual workers was 6.3 times (95% CI 4.0–10.5) compared to upper-class non-manual employees. The hazard ratio for 55–64-year-old male manual workers for disability retirement due to psychoactive substance use was 5.0 (95% CI 3.0–8.6). Socioeconomic differences in disability retirement due to depression were inconsistent: small socioeconomic differences in disability retirement due to depression for 35–54-year-old men and women were found. However, the association was inverse for those retired on a disability pension due to depression between ages 55–64, showing that manual workers ran a lower risk of disability retirement due to depression than upper non-manual employees (Figure 6.1).

Socioeconomic differences in disability retirement due to cardiovascular diseases were seen over the whole study period, even if a considerable decrease in the incidence in all socioeconomic groups was evident during the follow-up (Table 6.1).

**Figure 6.1.**

*Socioeconomic differences in disability retirement due to different mental disorders. Age-adjusted hazard ratios (HR) for manual workers (ref.=upper non-manual employees).*



\* = Statistically significant HR ( $p < 0.05$ ).

The socioeconomic inequalities in disability retirement were larger in younger than older age groups. E.g. for 35–54-year-old male manual workers, the hazard ratio for disability retirement due to all causes was 3.2 (95% CI 3.0–3.5) and for 55–64-year-old male manual workers the risk of disability retirement was 2.8 (95% CI 2.6–3.0) compared with upper non-manual employees. However, socioeconomic inequalities in disability retirement due to musculoskeletal diseases were notably high in both age groups, 35 to 54 years and 55 to 64 years. For both 35–54-year-old and 55–64-year-old male manual workers, the risk of disability retirement due to musculoskeletal diseases was almost sevenfold compared with upper non-manual employees (Substudy II).

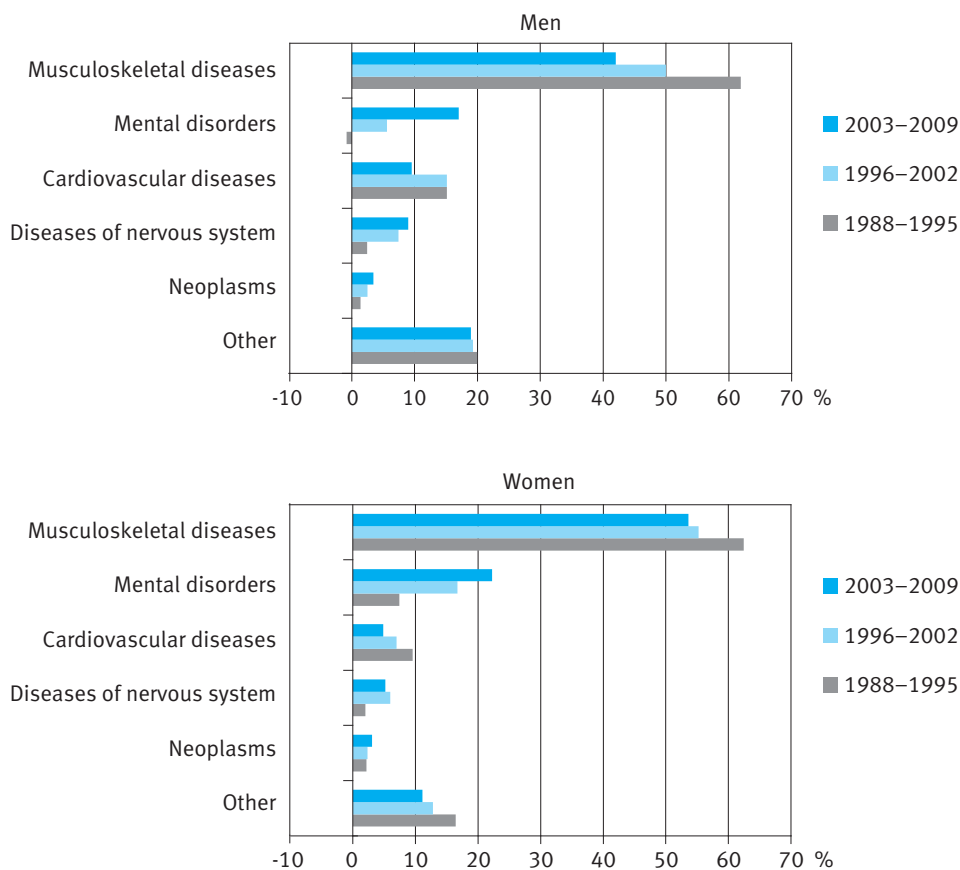
## 6.2 The contribution of different diseases to the socioeconomic differences in disability retirement (Substudies I and II)

We calculated the proportion (%) of different diseases contributing to the overall socioeconomic differences in disability retirement in 1988–1995, 1996–2002, 2003–2009 for manual workers using upper non-manual employees as a reference group (Figure 6.2). Musculoskeletal diseases made the largest contribution to the overall socioeconomic differences in disability retirement in all three time periods. In period 1988–1995, the contribution of musculoskeletal disease was

62 per cent for men. However, its contribution was a little smaller in later periods than earlier. The contribution of mental disorders seemed to grow for both men and women, as did that of the diseases of the nervous system and neoplasms. In period 2003–2009, the contribution of mental disorders was 17 per cent for men. The contribution of cardiovascular diseases decreased during time period, and for men its contribution to the overall socioeconomic differences was small (approximately 10%). However, the contribution of cardiovascular diseases to the overall socioeconomic differences in disability retirement was higher for men than for women. The contribution of other diseases seemed to stay quite stable during the different time periods, especially for men.

**Figure 6.2.**

*Contribution of diseases (%) to the overall socioeconomic differences in disability retirement for men and women (manual workers versus upper non-manual employees).*



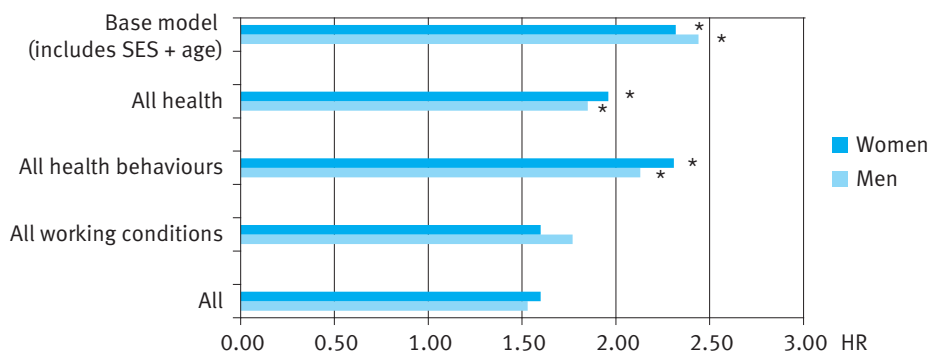
### 6.3 The contribution of ill-health, health behaviours and working conditions to socioeconomic differences in disability retirement (Substudy III)

Substudy III examined associations of ill-health, health behaviours and working conditions to socioeconomic differences in disability retirement (Figure 6.3). Adjustment for all somatic diseases (circulatory, respiratory, musculoskeletal and other diseases) slightly attenuated the socioeconomic differences in disability retirement (for men 21%; for women 14%). Mental disorders (alcohol use, depressive and anxiety disorders) had no effect or slightly increased socioeconomic differences in disability retirement. Sick leave days and self-rated health also attenuated the socioeconomic differences slightly for both genders. Adjustment for all health measured attenuated the socioeconomic differences in disability retirement at 41 per cent for men and 27 per cent for women. The contribution of health behaviours (exercise, smoking, alcohol use and obesity) to the socioeconomic differences in disability retirement due to all causes was modest, especially for women (22% for men and 0% for women). Adjustment for all health measured attenuated the socioeconomic differences in disability retirement at 41 per cent for men and 27 per cent for women. The contribution of health behaviours (exercise, smoking, alcohol use and obesity) to the socioeconomic differences in disability retirement due to all causes was modest, especially for women (22% for men and 0% for women).

The socioeconomic inequalities in disability retirement were somewhat explained through working conditions. Job control, job demands and social support attenuated the socioeconomic differences most for men. Social support at work and job demands slightly widened the socioeconomic inequalities for women. Physical working conditions attenuated the socioeconomic inequalities (49% for men and 55% for women).

**Figure 6.3.**

*The contribution of ill-health, health behaviours and working conditions to socioeconomic differences in disability retirement due to all causes. Age-adjusted hazard ratios (HR) for manual workers (ref.=upper non-manual employees).*

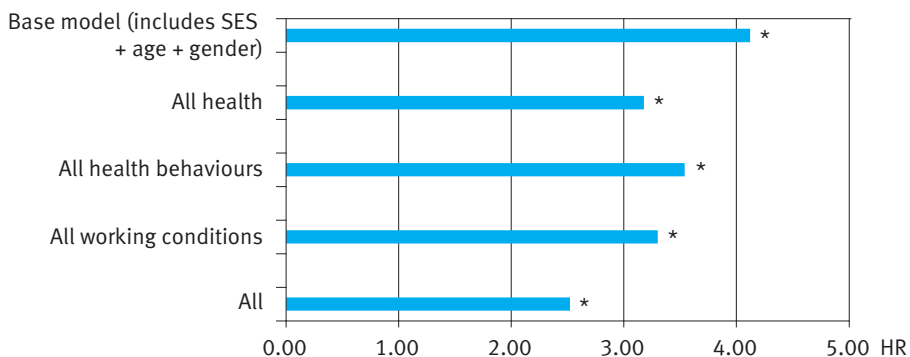


\* = Statistically significant HR ( $p < 0.05$ ).

Socioeconomic inequalities in disability retirement due to musculoskeletal diseases were large. All somatic diseases slightly attenuated the socioeconomic differences in disability retirement due to musculoskeletal diseases (15%) (Substudy III). Mental disorders had hardly any effect at all, or even widened socioeconomic differences in disability retirement due to musculoskeletal disorders (-3%). Among health behaviours, obesity attenuated the socioeconomic differences in disability retirement the most. Adjustment of job control, job demands and social support widened the socioeconomic differences in disability retirement due to musculoskeletal diseases. The association of physical working conditions (65%) as well as chemical and physical risks (38%) at work contributed the most to socioeconomic differences in disability retirement due to musculoskeletal diseases. All working conditions attenuated the socioeconomic differences in disability retirement due to musculoskeletal diseases by 26 per cent (Figure 6.4).

**Figure 6.4.**

*The contribution of ill-health, health behaviours and working conditions to the socioeconomic differences in disability retirement due to musculoskeletal diseases. Age and gender-adjusted hazard ratios (HR) for manual workers (ref.=upper non-manual employees).*



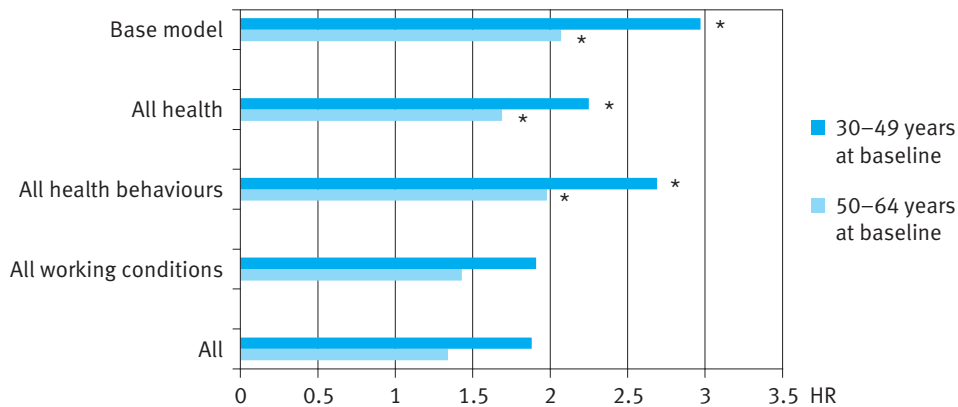
\* = Statistically significant HR ( $p < 0.05$ ).

The association between socioeconomic status and disability retirement was somewhat stronger for younger (30–49 years) than older (50–62 years) disability retirees (Figure 6.5). Somatic diseases attenuated the socioeconomic inequalities somewhat more among younger (24%) than older participants (15%). The association of mental disorders to socioeconomic differences in disability retirement among both younger and older participants was modest. Adjustment for self-rated

health attenuated the differences among older participants in particular (31%). All health attenuated the socioeconomic differences nearly as much in both age groups (37% for those aged 30–49 years; 36% for those aged 50–62 years). The association of health behaviours was modest (14% for those aged 30–49 years; 8% for those aged 50–62 years). Regarding working conditions, job control, job demands and physical working conditions slightly attenuated the inequalities among the younger participants (31% for those aged 30–49 years). The strongest attenuation was due to physical working conditions (73% for those aged 50–62 years) and chemical and physical hazards (44% for those aged 50–62 years) among the older participants.

**Figure 6.5.**

*The contribution of ill-health, health behaviours and working conditions to the socioeconomic differences in disability retirement due to all causes for those 30–49 years and 50–64 years at baseline. Age and gender-adjusted hazard ratios (HR) for manual workers (ref.=upper non-manual employees).*



\* = Statistically significant HR ( $p < 0.05$ ).

#### 6.4 Socioeconomic differences in cause-specific mortality after disability retirement (Substudy IV)

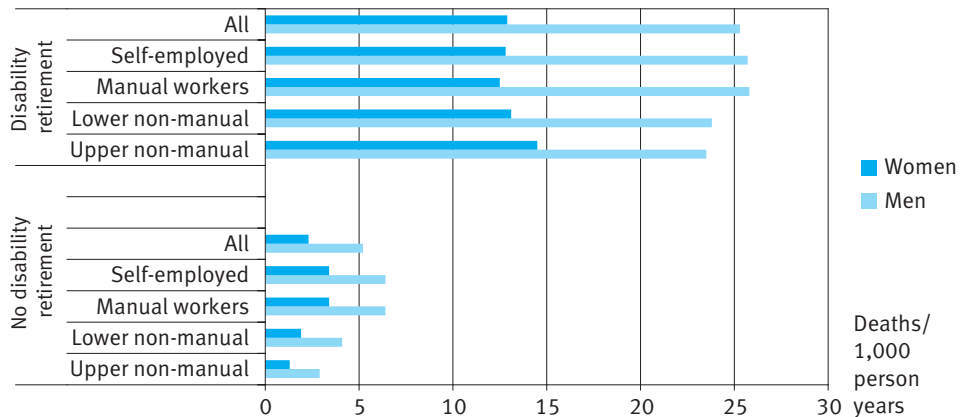
58,937 men and 52,289 women retired due to disability during the follow-up period 1988–2007 (Substudy IV). Among the disability retirees, 24 per cent of men and 13 per cent of women died during the follow-up. Disability retirees ran a higher risk of death than non-disability retirees. This applied to both men and women in all socioeconomic classes. For non-disability retired people, a



socioeconomic gradient in mortality was seen. Socioeconomic differences in mortality after disability retirement were modest.

**Figure 6.6.**

*Deaths per 1,000 person years for disability retirees and non-disability retirees by socioeconomic status, 1988–2007.*



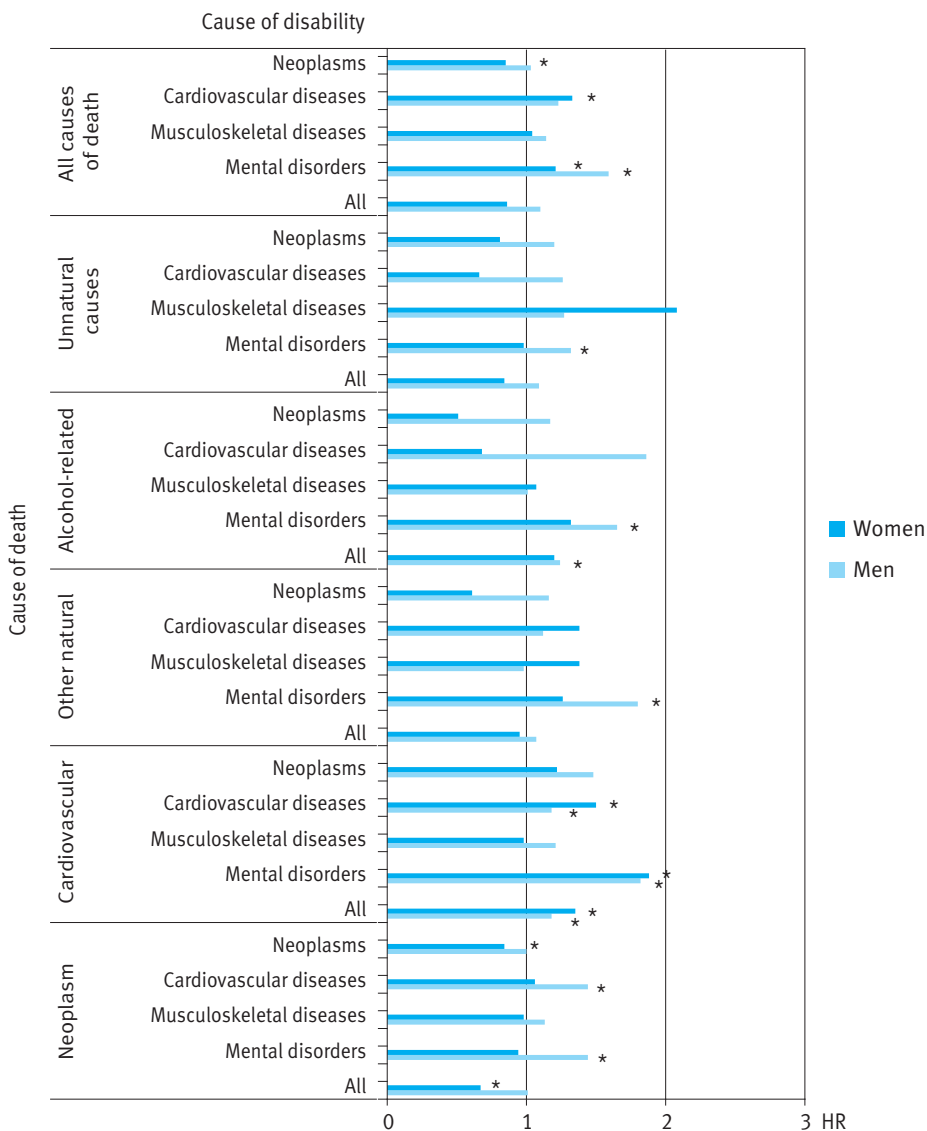
Small socioeconomic differences in mortality after disability retirement due to different diseases were found. A slightly higher risk of mortality was found for those male manual workers who retired due to depression (HR=1.3; 95% CI=1.1–1.7), any mental disorders (HR=1.6; 95% CI=1.4–1.8), cardiovascular diseases (HR=1.2; 95% CI=1.1–1.4) or diseases of the nervous system (HR=1.3; 95% CI=1.1–1.7). For female manual workers, the risk of mortality after disability retirement due to mental disorders (HR=1.2; 95% CI=1.0–1.8) was slightly higher than for upper non-manual employees (Substudy IV).

Among male disability retirees due to all causes, socioeconomic differences were found in mortality from cardiovascular diseases and alcohol-related causes. The hazard ratio for male manual workers' risk of mortality from cardiovascular diseases was 1.2 (95% CI=1.1–1.3) and from alcohol-related causes of death 1.2 (95% CI=1.0–1.5). For women, manual workers ran a lower risk of mortality from neoplasms (HR=0.7; 95% CI=0.6–0.8) and a higher risk of mortality from cardiovascular diseases (HR=1.4; 95% CI=1.0–1.7) after disability retirement due to all causes than upper non-manual employees. Large socioeconomic differences were found for all causes of death among non-disability retirees. A slightly increased risk among female non-disability retired manual workers (HR=1.1;

95% CI=1.0–2.3) was observed even for mortality from neoplasms, which was opposite to the gradient found among female disability retirees (Substudy IV).

**Figure 6.7.**

*Hazard ratios (HR) for mortality from different causes of death after disability retirement due to different diseases among male and female manual workers compared to upper non-manual employees.*



\* = Statistically significant HR (p<0.05).

Among men, socioeconomic inequalities in mortality from all of the observed causes of death were found after disability retirement due to mental disorders (Figure 6.7). Socioeconomic differences were also found for mortality from neoplasms (HR=1.4; 95% CI=1.1–2.0 for manual workers) and cardiovascular diseases (HR=1.2; 95% CI=1.0–1.4 for manual workers) after disability retirement due to cardiovascular diseases. Cardiovascular mortality among disability retirees was smaller than among those with no disability retirement. Socioeconomic differences in mortality from any cause of death after disability retirement due to musculoskeletal diseases or neoplasms were not found.

Among women, only few socioeconomic differences in cause-specific mortality among disability retirees due to any cause were found. Increased mortality from cardiovascular diseases was nevertheless found for manual workers after disability retirement due to mental disorders (HR=1.9; 95% CI=1.2–3.1) and cardiovascular diseases (HR=1.5; 95% CI=1.0–2.4). Socioeconomic inequalities in mortality after disability retirement due to different diseases were smaller compared to non-disability retirees. A weak reverse socioeconomic gradient (HR=0.8; 95% CI=0.7–1.0) in mortality from neoplasms after disability retirement due to neoplasms for women was found.

## 7 Discussion

### 7.1 Main findings

This study confirmed large socioeconomic differences in disability retirement among men and women in the Finnish population of working age. The study also examined socioeconomic differences in mortality after disability retirement in the time period 1988–2007. The results can be summarized into four main points:

First, socioeconomic differences in disability retirement were observed during 1988–2009. The incidence of disability retirement due to all causes, musculoskeletal and cardiovascular causes decreased during the follow-up period in all socioeconomic groups, but most in manual groups. Musculoskeletal diseases contributed the most to socioeconomic differences in disability retirement during the whole period of review. For men, its contribution to the overall socioeconomic differences in disability retirement was over 60 per cent in 1988–1995 and over 40 per cent in 2003–2009, and for women over 60 per cent in 1988–1995 and over 50 per cent in 2003–2009.

Second, socioeconomic differences in disability retirement varied by cause of disability. Large socioeconomic differences in disability retirement due to musculoskeletal and cardiovascular diseases were seen. Manual workers' risks of disability retirement due to musculoskeletal diseases were over fivefold, and due to cardiovascular diseases between two and threefold compared to upper non-manual employees. Socioeconomic differences in disability retirement due to mental disorders were more inconsistent. Clear socioeconomic differences were seen for disability retirement due to psychoactive substance use and schizophrenia. Male manual workers' risk of disability retirement due to psychoactive substance use was over fivefold and, due to schizophrenia, twofold compared to the upper-class non-manual employees.

Third, working conditions attenuated the socioeconomic differences in disability retirement the most. Physical working conditions contributed the most to socioeconomic differences in disability retirement. The contribution was especially high (65%) for disability retirement due to musculoskeletal diseases and in the age group 50–62 years (73%). Adjustment for health and health behaviours slightly attenuated the socioeconomic differences in disability retirement.

Fourth, socioeconomic differences in mortality after disability retirement due to different diseases were small or non-existent. Small socioeconomic differences in mortality after disability retirement due to mental disorders and cardiovascular

diseases were found. Socioeconomic differences were also evident in mortality from cardiovascular diseases, alcohol-related causes and neoplasms after disability retirement. Manual workers' risk of mortality after disability retirement due to these diseases and causes of death were approximately 1.2–1.5-fold compared to upper-level non-manual employees.

## 7.2 Socioeconomic status and disability retirement due to musculoskeletal diseases

The results concerning socioeconomic differences in disability retirement due to musculoskeletal diseases are similar to previous studies concerning socioeconomic differences in disability retirement (Leinonen et al. 2011; Bruusgaard et al. 2011; Ropponen et al. 2011). Manual workers have been shown to run a higher risk of disability retirement due to musculoskeletal diseases than upper non-manual employees (Leinonen et al. 2011; Ropponen et al. 2011). In this study, manual workers' risk of disability retirement due to musculoskeletal diseases was approximately sixfold compared with upper non-manual employees.

Working conditions are important determinants of socioeconomic differences in disability retirement (Leinonen et al. 2011; Haukenes et al. 2011; Falkstedt et al. 2014). The association was extremely strong among older disability retirees and due to musculoskeletal diseases. The results show that physical working conditions are strongly associated with socioeconomic differences in disability retirement, which may be a result from manual workers having more physically demanding work than upper non-manual employees. These inequalities are for the most part likely due to a high physical workload, low job control and chemical and physical exposures at work (Haukenes et al. 2011; Leinonen et al. 2011; Kärkkäinen et al. 2013; Falkstedt et al. 2014). These kinds of exposures more often accumulate for people of lower socioeconomic status and may expose them to musculoskeletal or other diseases. Long exposures to poor working conditions may also expose manual workers to a higher risk of disability retirement.

Manual workers have health problems, poor health behaviour, diseases and physically demanding work at a higher rate than upper non-manual workers. Health problems and physically strenuous work increases the risk of disability retirement, especially due to musculoskeletal diseases and among older manual workers. Staying employed may depend on many factors like health status, health behaviours and working conditions.

This study found that the contribution of ill-health and health behaviours to the socioeconomic differences in disability retirement was smaller than the contribution of working conditions. However, we can assume that many factors in adolescence and at different ages are associated with later disability retirement. The influence of these factors may vary over longer time periods. Socioeconomic status and living conditions in adolescence as well as early working conditions may later influence the risk of disability retirement.

### 7.3 Socioeconomic status and disability retirement due to mental disorders

The results showed that socioeconomic differences in disability retirement due to mental disorders are inconsistent. They varied by specific cause of mental illness and by age. Socioeconomic differences in disability retirement due to depression were smaller than due to other mental disorders like schizophrenia or psychoactive substance use. A previous study (Samuelsson et al. 2012) found that low education predicts a lower risk of disability retirement due to mood, neurotic, stress-related and somatoform disorders. The association between symptoms of common mental disorders and socioeconomic status has been less consistent. A previous Finnish study (Virtanen et al. 2011) of public-sector employees indicated that socioeconomic differences in long-term psychiatric work disability varied widely between certain mental disorders, being largest for disability retirement due to schizophrenia and psychoactive substance use.

Mental disorders in adolescence are associated with lower education (Virtanen et al. 2011). Also, diagnosed, severe mental disorders are more common among lower socioeconomic groups (Aromaa et al. 1999; Ostamo et al. 2007). The median age of onset appears to be early for specific anxiety disorders, bipolar disorders, substance use disorders and schizophrenia. (Bauer et al. 2005; Kessler et al. 1995; Kessler et al. 2005). Previous knowledge concerning severe mental disorders is in line with this study about socioeconomic differences in disability retirement due to schizophrenia. Findings showed that especially younger manual workers ran a higher risk of disability retirement due to schizophrenia than upper non-manual employees.

The association of depression and socioeconomic status is divergent, and clear associations have not been found. People of higher socioeconomic status may even run a higher risk of depression than people from lower socioeconomic classes (Ostamo et al. 2007). The median age of onset of depression tends to be

later than for severe mental disorders (Bauer et al. 2005; Kessler et al. 1995; Kessler et al. 2005). Disability retirees retiring due to depression also appear to be fairly highly educated and have often had long working careers (Gould et al. 2007). The incidence of disability retirement due to depression seems to be relatively common in all age groups. The results showed small socioeconomic differences in disability retirement due to depression in age group 35–54, but among those aged over 55 years differences were not evident. This means that both manual workers and upper-non manual employees retire on disability due to depression almost as often. Psychosocial working conditions like job control or job demands, which are the risk factors of disability retirement due to mental disorders, may thus affect disability retirement due to depression similarly in all socioeconomic groups.

Manual workers' higher risk of disability retirement due to psychoactive substance use may partly be explained by health behaviours. Earlier studies have shown that drinking that leads to severe problems tends to be more common among lower socioeconomic classes (Richter et al. 2013; Mejean et al. 2013; Mäkelä et al. 2010; Claessen et al. 2010; Mäkelä et al. 2008; Hemmingsson et al. 2008). Many factors, like problem use of alcohol, contact with the police, unemployment and other factors associated with low socioeconomic status are predictors of disability retirement due to psychoactive substance use (Uppmark et al. 2001). Manual workers also run a higher risk of hospitalization and alcohol-related death than people of higher socioeconomic status (Mäkelä et al. 2008).

A further reason for smaller socioeconomic differences in disability retirement due to mental disorders may be that among upper socioeconomic groups, work is less physically strenuous and musculoskeletal problems are the main reason for disability retirement less often, leaving more space for mental disorders as the most important cause of disability retirement.

#### **7.4 Socioeconomic status and disability retirement due to cardiovascular diseases**

We found large socioeconomic differences in disability retirement due to cardiovascular diseases. Mediating factors of socioeconomic differences in disability retirement due to cardiovascular diseases are less known. According to previous studies (Mejean et al. 2013; Kamphuis et al. 2012; Huisman et al. 2005; Stringhini et al. 2010) a large number of biological, behavioural, psychological and social factors constitute mediating factors of socioeconomic differences in

cardiovascular morbidity and mortality. E.g diet, alcohol consumption, physical activity, depression, hopelessness, and marital status as well as cholesterol, hemoglobin, and body mass index have contributed to socioeconomic differences in cardiovascular diseases (Mejan et al. 2013; Lynch et al. 1996). Adulthood risk factors have played a major role in the explanation of socioeconomic inequalities in mortality from cardiovascular diseases compared to childhood socioeconomic circumstances (Kamphuis et al. 2012). All these factors may also be associated with socioeconomic differences in disability retirement due to cardiovascular diseases as well, as they explain socioeconomic differences in cardiovascular mortality. Cardiovascular diseases among 30–64-year-olds have substantially diminished in all socioeconomic groups during the past decades (Palosuo et al. 2007).

## 7.5 The changing incidence of disability retirement due to different diseases

The incidence of disability retirement due to any causes and particularly due to musculoskeletal diseases has diminished rapidly during the past decades, especially among manual workers. This may be partly explained by labour market changes. Early retirement has been more common during times of economic growth than during recessions (Hytti 1998). The high incidence of disability retirement in the early 1990s may slightly be due to the individual early retirement pension. It was a disability pension with less stringent medical criteria, designed for elderly employees (Gould et al. 2003). In 1990, 39 per cent of all new disability pensions were individual early retirement pensions. In the public sector, the use of individual early retirement pensions was more popular than in the private sector. In 1996 the share of individual early retirement pensions in all new disability pensions was 19 per cent (ETK 2016). The high number of disability retirement cases diminished during the mass unemployment that characterized the first half of the 1990s, as those who received unemployment benefits were not steered towards disability pension and unemployment especially involved people from the lower socioeconomic classes. The diminishing incidence of disability retirement at the end of 1990s can slightly be explained by better health and rising age limits for individual early retirement pension (Rantala 2008). The slightly increasing trend in the incidence of disability retirement in the early 2000s may also be partly linked to economic growth during that time.

The incidence of disability retirement may also be associated with the share of rejected applications. The number of rejected applications has increased



in the 2000s. It has been large among e.g. young people, those suffering from musculoskeletal diseases, those with low education, those in the private sector and those in unemployment (Gould & Nyman 2012).

During the past decades the occupational class and educational structures have changed and many occupations have disappeared. Table 7.1 describes the change in the structure of educational levels. The proportion of those with primary education only has diminished rapidly between the years 1990–2013. At the same time, the proportion of people with lower and higher tertiary level education has increased.

**Table 7.1.**

*The structure of educational levels among the Finnish population aged 25–64 in 1990, 2000, 2010, 2013, per cent.*

Level of education	Year			
	1990	2000	2010	2013
Primary education	35	22	14	12
Secondary	37	41	43	44
Tertiary, lower	21	27	29	29
Tertiary, higher	7	10	14	15
	100	100	100	100

Source: Statistics Finland/StatFin.

Globalization and new technology have changed work tasks and working communities and the occupational structure has therefore become more diverse. Nowadays many duties require more education and specialization than previously, even if many manual occupations with strenuous tasks still exist.

The incidence of disability retirement has diminished, but socioeconomic differences in disability retirement have remained. This is in line with general socioeconomic differences in health. Various indicators have shown that the health of the Finnish population has improved, but socioeconomic health inequalities have generally remained or even expanded (Palosuo et al. 2007). In the 2000s, musculoskeletal diseases were common among manual workers aged 30–64 years compared to upper non-manual employees, and this was the case already in the 1970s or 1980s (Palosuo et al. 2007). Even nowadays, musculoskeletal diseases are the main cause of disability retirement in most of the cases, and socioeconomic differences in disability retirement due especially to musculoskeletal diseases are large.

Our study shows that musculoskeletal diseases constitute the largest contribution to the overall socioeconomic differences in disability retirement during follow-up. Even if the number of disability retirement cases due to musculoskeletal diseases has decreased, the contribution of musculoskeletal diseases to the overall socioeconomic differences is still considerable. This means that even today, many manual workers suffer from musculoskeletal diseases and many manual workers are still in physically strenuous occupations. This may put them at higher risk of disability retirement.

## 7.6 Socioeconomic differences in cause-specific mortality after disability retirement due to different diseases

During the past few decades, large occupational (Pensola et al. 2004; Pensola et al. 2012) and educational (Tarkiainen et al. 2013; Elo et al. 2006) inequalities in mortality have been observed in Finland. Even if socioeconomic differences in disability retirement are large, it seems socioeconomic differences in mortality after disability retirement due to certain diseases and causes of death are small or nonexistent. However, disability retirees run a higher risk of mortality than non-disability retirees. The risk of mortality was especially high after retirement due to neoplasms, psychoactive substance use, cardiovascular diseases, and diseases of the nervous system (Gjesdal et al. 2008).

Socioeconomic differences in disability retirement due to any mental disorders have been found to be small, and they vary by specific cause of mental disorder. However, small socioeconomic differences in mortality after disability retirement due to mental disorders were found in this study, especially for men. A Finnish study (Leinonen et al 2014) found socioeconomic differences in excess mortality after disability retirement due to depression and other mental disorders, which varied by cause of death. Association between socioeconomic status and mortality after disability retirement due to mental disorders may be explained partly by same factors as socioeconomic inequalities in mortality in general. Biological, behavioural, psychological and social factors are associated with socioeconomic status and mortality (van Oort et al. 2005; Laaksonen et al. 2008; Elo et al. 2014; Mäkelä and Paljärvi 2008).

Small socioeconomic differences in mortality after disability retirement due to cardiovascular diseases were also found. The association between socioeconomic status and mortality after disability retirement from cardiovascular diseases can partly be explained by factors associated with cardiovascular mortality in general.

Diet, smoking, alcohol use, physical activity, body mass index and cholesterol have found to be risk factors for cardiovascular mortality in general (Laaksonen et al. 2008; Kamphuis et al. 2012). These factors may partly explain the small socioeconomic differences in mortality after disability retirement.

Socioeconomic differences in mortality after disability retirement due to musculoskeletal diseases were non-existent. The results of this study support the previous ones on mortality after disability retirement. People on disability retirement due to musculoskeletal diseases only run a somewhat elevated risk of mortality (Gjesdal et al. 2008; Gjesdal et al. 2009; Gjesdal et al. 2009). In this study, working conditions were mediating factors for socioeconomic differences in disability retirement due to musculoskeletal diseases. Work-related factors such as a high physical workload, low job control and chemical and physical exposures at work contributed the most to the socioeconomic differences in disability retirement due to musculoskeletal diseases (Leinonen et al. 2011). This may result from the fact that in the absence of work-related exposures, socioeconomic differences in mortality after disability retirement due to musculoskeletal diseases are diminishing.

Work-related exposures diminish after disability retirement, but ill-health can be presumed to be rather stable. However, previous studies of antidepressant use before and after retirement show that retirement-related changes in antidepressant use depend on the reason for retirement. Among disability retirees there is a rising trend in antidepressant use prior to retirement and a decrease following retirement due to depression (Leinonen et al. 2013). Therefore, results based on recorded purchases of antidepressant medication support the assumption that retirement can be beneficial especially for mental health (Laaksonen et al. 2012; Oksanen et al. 2011). A Norwegian study (Øverland et al. 2008) about health status before, during and after disability retirement shows that there was an increase in symptoms (depression, anxiety, somatic symptoms, pain and sleep problems) around the time of disability retirement, with a subsequent return to pre-retirement levels. The follow-up time was 3–7 years before and after retirement.

## 7.7 Methodological considerations

Population-based studies have several strengths. The data are representative of the Finnish population and information on disability retirement, mortality and a broad range of diagnoses are derived from reliable national registers with little missing data. The data used in Substudies I and IV include an 11 per cent sample

of the Finnish population and 80 per cent of all the deceased during the follow-up period. Analysis weights were used to account for the different inclusion probabilities among the deceased and the living. The study had extensive enough follow-up data in Substudy IV, concerning socioeconomic differences in mortality after disability retirement, and in Substudy I, concerning the socioeconomic differences in the time period 1988–2009. The data used in Substudy II were also comprehensive. It was a 10 per cent sample of the Finnish population. In Substudy II, disability retirements due to eight different groups of disease could be studied among men and women, also in two different age groups.

Information on social status was available in 5-year intervals and was treated as time-varying, using the most recent information of socioeconomic status during the follow-ups. Socioeconomic status could be determined also for the retired persons, even if they were outside the labour force prior to disability retirement.

Health 2000 data included a large number of variables that measured individual health. The information in these variables was based on health examinations and interviews. The data for the survey were collected in interviews with almost 10,000 participants. Comprehensive health examinations were carried out for 8,000 people. The population target of Health 2000 includes individuals aged 18 or over and living in Finland. The National Public Health Institute of Finland (KTL) co-ordinated the Health 2000 Study. The sampling design was carefully made. The basic design was a stratified two-stage cluster sampling design. The study provided a large set of information on major public health problems in Finland, their causes and treatment, as well as the functional capacity and work ability of the Finnish population in the early 2000s. The Health 2000 study was carried out with special care. Earlier domestic national population studies were consulted and the conceptualization, design and methods of the research were developed and refined in several stages.

A large number of variables also enabled us to comprehensively study associations of health behaviours and working conditions to socioeconomic differences in disability retirement. Overall, the Health 2000 study included some loss of information. Of persons aged 30, 89 per cent participated in the home interviews and 85 per cent in the health examinations. However, the research material is high in quality and represents the whole population rather well. In Substudy III, self-reported information on working conditions and health behaviours were used and these variables may be subject to reporting bias.

Register data in the Health 2000 Study (Substudy III) were collected from various registers to complement the data collected in the field examinations. Register data enables the follow-up e.g. of causes of death, illnesses and retirement.

The Health 2000 Study is representative of the Finnish population. However, the number of disability retirements was rather small and this restricted the analysis concerning disability retirement due to certain diseases. Analyses concerning disability retirement due to musculoskeletal diseases were made pooling men and women together. The Health 2000 Study (Substudy III) only included 363 disability retirements during the follow-up period. It was not possible to carry out an analysis concerning disability retirement due to other than musculoskeletal diseases. Therefore, we only examined factors that were associated with socioeconomic differences in disability due to all causes and musculoskeletal diseases. More detailed analyses of the association of ill-health, health behaviours and working conditions to socioeconomic differences in disability retirement due to different mental disorders, cardiovascular diseases, neoplasms or the nervous system were left for later studies. Also due to the small number of disability retirements, we were not able to carry out an analysis by gender.

However, there are quite a few studies concerning cause-specific differences in disability retirement. The existing studies concentrate on specific countries or a more restricted population. We need more detailed studies of socioeconomic differences in disability retirement due to different diseases, or socioeconomic differences in mortality from different causes of death.

## 7.8 An overall view of socioeconomic differences in disability retirement

The results of this study show that socioeconomic differences in disability retirement are evident, and vary by cause of disability and age. Previous studies have found socioeconomic differences in disability retirement due to musculoskeletal diseases and different mental disorders (Månsson et al. 1989; Bruusgaard et al. 2010; Leinonen et al. 2011; Mäntyniemi 2012; Kärkkäinen et al. 2013), but evidence of these diseases' contribution to the overall socioeconomic differences in disability retirement is missing. Also, little is known about socioeconomic differences in disability retirement due to other than musculoskeletal diseases or mental disorders. E.g. studies on socioeconomic differences in disability retirement due to cardiovascular diseases or neoplasms are rare or missing entirely.

This thesis shows that musculoskeletal diseases have been the main cause of socioeconomic differences in disability retirement during the past decades. A large number of manual workers have retired on a disability pension due to musculoskeletal diseases. Disability retirement due to musculoskeletal diseases is also concentrated to the older age groups. Therefore prevention of musculoskeletal diseases should focus on older manual workers. This study and previous studies have found that physical working conditions are strongly associated with socioeconomic differences in disability retirement. By improving manual workers' physically strenuous working conditions, the number of disability retirements would be decreasing in all socioeconomic groups and especially among manual workers.

The contribution of musculoskeletal diseases to the overall socioeconomic differences in disability retirement was large already in 1990. Even if the contribution of musculoskeletal diseases has been reduced over the past 20 years, its contribution to the overall socioeconomic differences is still considerably large. Many work-related factors such as the contents of work, work environments as well as job requirements have changed during the past few decades. Working conditions may have improved in many workplaces, but many physically strenuous occupations still exist, especially among manual workers. Therefore, adverse working conditions is still a notable risk factor for disability retirement, especially for manual workers.

The contribution of mental diseases to the overall socioeconomic differences in disability retirement has increased slightly during the past decades. However, socioeconomic differences in disability retirement due to mental disorders are still pretty low. This thesis and previous studies showed (Virtanen et al. 2011; Leinonen et al. 2011; Samuelsson et al. 2012; Samuelsson et al. 2012) that socioeconomic differences in disability retirement due to mental disorders varied a lot by more specific cause of mental disorder and by age. Altogether, socioeconomic differences in disability retirement due to mental disorders are complex and need to be studied more so that the right actions can be allocated into workplaces and into the right occupations, in order to prevent disability retirement due to mental disorders. Measures decreasing work-related stress or improving employees' job control would help prevent disability retirement due to mental disorders. Thus register-based studies with long enough follow-up and information on disability retirement due to specific mental disorders would give valuable information on socioeconomic inequalities in disability retirement due to different mental disorders. More specific studies with information on work

ability (Ilmarinen 2006), e.g professional competence, attitudes, motivation and also close community and family members, would also provide new information on how these factors are associated with socioeconomic differences in disability retirement due to different diseases.

In many workplaces, well-being at work has received more attention during the last few years. Many aspects of work, such as work satisfaction, burnout, attitudes, atmosphere and working conditions affect well-being at work. These factors also constitute dimensions of work ability (Ilmarinen et al. 2006). Employees who work with energy and dedication are more productive and open to new information. Positive well-being at work may partly lead to longer working careers and diminish the number of disability retirements. From this point of view, employers should focus more on older manual workers' working conditions, especially the physical working conditions. Positive well-being at work may benefit both companies and society, if the number of work absences and disability retirements diminish.

This thesis additionally showed that socioeconomic differences in mortality after disability retirement due to musculoskeletal diseases are small. This may partly result from work-related factors disappearing after disability retirement and no longer affecting a person's health. Small socioeconomic differences in mortality after disability retirement due to mental disorders are more difficult to explain. We can assume that socioeconomic differences in mortality after disability retirement due to mental disorders to some degree follow socioeconomic differences in mortality from mental causes. In general, small socioeconomic differences in mortality after disability retirement tell us that the disability retirement system quite accurately identifies chronic health problems regardless of socioeconomic status. This may indicate that disability retirees are a select group displaying lowered work ability and health. Also mortality before disability retirement may have affected so that those people with poorest health have met the premature death and therefore they have never ended up to disability retirement. Thus disability retirees' risk of mortality may be relatively similar regardless of their socioeconomic status.

## 8 Conclusions

Disability retirement is a major reason for an early exit from the labour market. Every year approximately 20,000 people retire on a disability pension. The major aim of the 2017 earning-related pension reform is to postpone the age of retirement and lengthen working careers (ETK 2016). Disability pensions have an important role in this aim. The diminishing incidence of disability retirement would help the aim of postponing the age of retirement and lengthening working careers, as well as diminish the costs caused by disability. Knowledge of how different factors like health, health behaviours and working conditions are associated with the socioeconomic differences in disability retirement gives us valuable information on subgroups of employees who run an elevated risk of disability retirement. Broader and more specific information on factors associated with socioeconomic differences in disability retirement is also needed. Such factors include e.g. dimensions of peoples' work ability.

Working conditions are an important mediating factor of socioeconomic differences in disability retirement. Therefore, more attention should be paid to working conditions and their effect on disability retirement, especially among manual workers. By improving working conditions, especially physical working conditions, the number of disability retirees would partly be reduced, especially among those with manual occupations. Investment in well-being at work can partly lengthen working careers as well.

More attention should be focused also on ageing employees, who often have chronic illnesses and a weaker working ability, and are therefore at higher risk of disability retirement especially in physically adverse occupations. One way of preventing disability retirement would be relieving such employees of their duties or transferring them to other jobs when their working capacity or health is lowered and current tasks become difficult to handle. Employees' resources and survival at work should be regularly observed, especially in older age groups and in physically strenuous tasks.

Socioeconomic inequalities in disability retirement due to mental disorders are inconsistent and complex. However, the contribution of mental disorders to the overall socioeconomic differences in disability retirement has grown, even if socioeconomic inequalities in disability retirement due to different mental disorders are divergent. Severe mental disorders seem to be more common among manual workers and also among the young. Therefore the risk of morbidity in



these diseases should be taken into consideration already at the early stages of health care, and especially the health care of younger people should be better advanced so that mental disorders could be identified at an early stage. Disability retirement due to psychoactive substance use is more common in the lower socioeconomic classes. Prevention of alcohol-related diseases would also have a large influence on the number of disability retirement cases. In Finland, the influence of alcohol use on people's health and behaviours as well as society in general is relatively well known, and actions to prevent diseases and mortality caused by alcohol use have been carried out by e.g. raising the tax on alcohol. Disability retirement due to depression seems to be almost as common among lower and upper socioeconomic classes. Many non-work-related and work-related factors have been found to be associated with individuals' mental health (Virtanen et al. 2008). Adverse life events, financial hardship and psychosocial life stress, in addition to work-related factors, are factors associated with people's mental health (Virtanen et al. 2008). The result of this thesis implicates that individuals' mental wellbeing should be investigated in workplaces as well as in life outside work, in all socioeconomic and age groups.

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# Socioeconomic status and disability retirement in Finland

## Causes, changes over time and mortality

This study examines socioeconomic differences in disability retirement in the period 1988–2009. It also outlines the contribution of different diseases, health behaviours and working conditions to these differences and portrays the socioeconomic differences in mortality after disability retirement.

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