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OCCUPATIONAL CLASS DIFFERENCES IN SICKNESS ABSENCE

CHANGES OVER TIME AND DIAGNOSTIC CAUSES

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ACADEMIC DISSERTATION

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ABSTRACT

Sickness absence marks temporal work disability, reflecting ill-health in working-age populations. It gives rise to notable costs, for instance, due to shortened working careers. Previous studies have shown that those in lower occupational classes have more sickness absence compared to those in higher classes, and the class differences have been particularly pronounced in sickness absence related to musculoskeletal diseases and injuries. Due to ageing workforce and weakening economic dependency ratio, extending working careers, for instance by reducing sickness absence, has been a target at the national level in Finland as well as in many Western countries. However, there is lack of studies on occupational class differences in sickness absence over time and across diagnostic causes in nationwide populations.

The aim of this study was to examine occupational class differences in long-term sickness absence and underlying diagnostic causes of the class differences over time among women and men in the Finnish employed population.

The study was based on data obtained from national registers. A 70% random sample of working-age Finnish residents was linked to data on medically certified sickness absence of over 10 working days based on paid sickness allowances retrieved from the Social Insurance Institution of Finland. Data on occupational class obtained from Statistics Finland were linked to the data. The study focused on upper non-manual employees, lower non-manual employees and manual workers. The study covered the years from 1996 to 2014, the diagnosis-specific examination spanning from 2005 to 2014. For example in 2014, the study population consisted of 675,363 women and 604,715 men. Statistical methods included a direct age-standardisation method, the Slope Index of Inequality (SII), the Relative Index of Inequality (RII) and a negative binomial hurdle model.

The results showed that lower occupational class was consistently associated with higher sickness absence due to any diagnostic cause across the occupational class hierarchy, both in absolute and relative terms, with men having larger differences than women. Despite modest annual variations, the class differences in all-cause sickness absence persisted among both genders over time. Among the study population, the most common diagnostic causes of long-term sickness absence were musculoskeletal diseases, mental disorder and home and leisure injuries. Throughout the study period, by far the largest class differences were detected in sickness absence due to musculoskeletal diseases, with men having very large relative differences. With regard to specific musculoskeletal diagnoses, the class differences in the occurrence of absence were most pronounced in shoulder disorders and back pain, whereas chronic musculoskeletal diseases, namely rheumatoid arthritis, disc disorders and, among men, also hip osteoarthritis, caused the largest class differences in

the length of absence. In addition to musculoskeletal diseases, large occupational class differences were detected in sickness absence due to home and leisure injuries, particularly among men. In contrast, modest occupational class differences were found in sickness absence due to mental disorders among both genders during the study period. Among the Finnish female employed population, a divergent pattern, in turn, was found in the class differences in sickness absence due to breast cancer, the most common cancer type among women: across the occupational classes, the higher the class, the greater the cumulative incidence but the shorter the duration of absence throughout.

Occupational class differences in long-term sickness absence have remained prominent during the past two decades in the Finnish employed population. The results of the study indicate that occupational class and diagnoses should be taken into account in planning of preventive measures aimed at reducing sickness absence at the national level. Specifically, actions should be targeted at employees in lower occupational classes and at manual workers in particular to reduce sickness absence and narrow the impact of occupational class differences on sickness absence effectively. This study further highlights the importance of musculoskeletal diseases, particularly back and shoulder disorders, and home and leisure injuries as the major diagnostic causes for persisting occupational class differences in long-term sickness absence in the Finnish nationwide employed population.

TIIVISTELMÄ

Sairauspoissaolot ilmentävät työssäkäyvän väestön sairauksia ja työkyvyn rajoitteita. Sairauspoissaoloista aiheutuu huomattavia kustannuksia muun muassa menetettyjen työpanosten ja siten lyhentyneiden työurien vuoksi. Aiemmat tutkimukset ovat osoittaneet, että alemmissa ammattiasemissa työskentelevillä on enemmän sairauspoissaoloja kuin ylemmissä ammattiasemissa toimivilla henkilöillä. Sairausryhmittäin tarkasteltuna ammattiasemien välisten erojen on todettu olevan erityisen suuria tuki- ja liikuntaelinten sairauksista ja vammoista johtuvissa sairauspoissaoloissa. Väestön ikääntymisestä ja taloudellisen huoltosuhteen heikentymisestä johtuen työurien pidentäminen on ollut kansallisena tavoitteena Suomessa, kuten useissa muissa länsimaissa. Koko työssäkäyvän väestön kattavaa tutkimustietoa ammattiasemien välisistä eroista sairauspoissaoloissa ja niiden taustalla olevista sairauksista pitkällä aikavälillä ei kuitenkaan ole saatavana.

Tämän tutkimuksen tavoitteena oli tarkastella pitkien sairauspoissaolojen ammattiasemien välisten erojen suuruutta ja niissä tapahtuneita muutoksia sekä taustalla olevia sairauksia pitkällä aikavälillä työssäkäyvässä suomalaisessa väestössä.

Tutkimus perustui kansallisista rekistereistä saatuun aineistoon. Ammattiasemien välisiä eroja sairauspoissaoloissa tutkittiin vuosittain ajanjaksolla 1996–2014, sairausryhmittäisen tarkastelun käsittäessä vuodet 2005–2014. Kansaneläkelaitoksen (Kela) rekisteristä poimittiin 70 prosentin satunnaisotos Suomessa asuvista työikäisistä naisista ja miehistä. Aineisto oli edustava satunnaisotos työikäisistä suomalaisista kunkin vuoden lopussa. Tiedot sairauspoissaoloista saatiin Kelan ylläpitämästä rekisteristä, joka kattaa korvatut sairauspäivärahajaksot. Sairauspäivärahaa maksetaan yli 10 työpäivää kestävistä sairauspoissaoloista ja sen myöntäminen edellyttää lääkärintodistusta. Ammattiasemaa koskevat tiedot saatiin Tilastokeskuksesta. Tämä tutkimus rajattiin koskemaan ylempiä toimihenkilöitä, alempia toimihenkilöitä ja työntekijöitä. Esimerkiksi vuonna 2014 tutkimusaineistossa oli 675 363 naista ja 604 715 miestä. Analyysimenetelminä käytettiin suoraa ikävakiointimenetelmää, absoluuttista eriarvoisuusindeksiä (SII), suhteellista eriarvoisuusindeksiä (RII) ja hurdle-regressiomallia.

Tulokset osoittavat, että suomalaisessa työssäkäyvässä väestössä ammattiasemien välillä on huomattavat erot sekä absoluuttisesti että suhteellisesti tarkasteltuina. Sekä naisilla että miehillä alemmissa ammattiasemissa havaittiin enemmän sairauspoissaoloja kuin ylemmissä ammattiasemissa työskentelevillä henkilöillä. Ammattiasemien väliset erot pitkissä sairauspoissaoloissa olivat miehillä suuremmat kuin naisilla. Maltillisesta vuosittaisesta vaihtelusta huolimatta nämä erot säilyivät

merkittävinä koko kaksi vuosikymmentä kattaneen tutkimusjakson ajan. Yleisimmät pitkiä sairauspoissaoloja aiheuttaneet sairauspääryhmät olivat tuki- ja liikuntaelinten sairaudet, mielenterveyden häiriöt sekä koti- ja vapaa-ajan tapaturmista aiheutuneet vammat ja myrkytykset. Sairauspääryhmittäin tarkasteluna suurimmat ammattiasemien väliset erot havaittiin tuki- ja liikuntaelinten sairauksista johtuvissa sairauspoissaoloissa, joissa erityisesti miehillä ammattiasemien väliset suhteelliset erot olivat suuret. Eri tuki- ja liikuntaelinten sairauksien vuoksi alkaneissa sairauspoissaoloissa merkittävimmät ammattiasemien väliset erot todettiin hartiaseudun sairauksissa ja selkäsäryssä, kun taas sairauspoissaolojen pituudessa ammattiasemien väliset erot olivat suurimmat nivelreumassa, nikamavälilevysairauksissa ja miehillä myös lonkan nivelrikossa.

Sairauspääryhmittäin tarkasteluna suuret ammattiasemien väliset erot havaittiin myös koti- ja vapaa-ajan tapaturmista aiheutuneista vammoista johtuvissa pitkissä sairauspoissaoloissa. Suomessa vapaa-ajan tapaturmat ovat työikäisen väestön yleisin tapaturmatyyppi. Ammattiasemien väliset erot olivat merkittävät etenkin miehillä. Sen sijaan mielenterveyden häiriöistä johtuvissa pitkissä sairauspoissaoloissa ammattiasemien väliset erot olivat pienet koko tutkimusjakson ajan sekä naisilla että miehillä. Naisten yleisimmästä syövästä eli rintasyövästä johtuvissa pitkissä sairauspoissaoloissa havaittiin puolestaan edellä kuvatusta poikkeavat ammattiasemien väliset erot. Ylemmissä ammattiasemissa työskentelevillä naisilla rintasyövästä johtuvien sairauspoissaolojen alkavuus oli korkeampi mutta sairauspoissaolojen pituus lyhyempi kuin alemmissa ammattiasemissa toimivilla naisilla.

Tutkimuksen tulokset osoittavat, että ammattiasemien väliset erot pitkissä sairauspoissaoloissa ovat säilyneet merkittävinä kahden vuosikymmenen aikana suomalaisessa työssäkäyvässä väestössä. Tulokset heijastelevat yleisemmin terveyden sosioekonomisia eroja. Tulokset painottavat, että ammattiasema ja työstä poissaoloon johtavat sairaudet tulisi ottaa huomioon sairauspoissaolojen ehkäisyyn ja ammattiasemien välisten erojen kaventamiseen tähtäävien toimenpiteiden suunnittelussa. Tulokset viittaavat siihen, että toimenpiteitä tulisi kohdentaa erityisesti tuki- ja liikuntaelinten sairauksiin, kuten selkä- ja hartiaseudun sairauksiin, sekä koti- ja vapaa-ajan tapaturmista aiheutuviin vammoihin alemmissa ammattiasemissa työskentelevillä henkilöillä, jotta pitkiä sairauspoissaoloja ja niiden eroja ammattiasemien välillä voidaan vähentää tehokkaasti.

CONTENTS

LIST OF ORIGINAL PUBLICATIONS

This thesis is based on the following publications:

I Pekkala J, Blomgren J, Pietiläinen O, Lahelma E, Rahkonen O. Occupational class differences in long sickness absence: a register-based study of 2.1 million Finnish women and men in 1996–2013. BMJ Open 2017;7:e014325. doi: 10.1136/bmjopen-2016-014325

II Pekkala J, Blomgren J, Pietiläinen O, Lahelma E, Rahkonen O. Occupational class differences in diagnostic-specific sickness absence: a register-based study in the Finnish population, 2005–2014. BMC Public Health 2017;17:670. doi: 10.1186/s12889-017-4674-0

III Pekkala J, Rahkonen O, Pietiläinen O, Lahelma E, Blomgren J. Sickness absence due to different musculoskeletal diagnoses by occupational class: a register-based study among 1.2 million Finnish employees. Occupational and Environmental Medicine 2018;75:296–302. doi: 10.1136/oemed-2017-104571

IV Suur-Uski J*, Pekkala J*, Blomgren J, Pietiläinen O, Rahkonen O, Mänty M. Long-term sickness absence due to breast cancer among Finnish women: a population-based study on occupational class differences during 2005–2013. Submitted.

*Equal contribution

The publications are referred to in the text by their roman numerals.

ABBREVIATIONS

CABG	Coronary artery bypass grafting
CI	Confidence interval
GEE	Generalised estimating equations
ICD-10	International Classification of Diseases 10th Revision
IRR	Incidence rate ratio
Kela	The Social Insurance Institution of Finland
OECD	Organisation for Economic Co-operation and Development
PCI	Percutaneous coronary intervention
RII	The Relative Index of Inequality
RR	Relative risk
SII	The Slope Index of Inequality
TENK	Finnish Advisory Board on Research Integrity

1 INTRODUCTION

Sickness absence is a marker of temporal work disability (Prins, 2013), indicating ill-health and poor functioning among working populations (Marmot et al. 1995; Laaksonen et al., 2011). It is unevenly distributed among working populations. Occupational class, a key indicator of socioeconomic position (Lynch & Kaplan, 2000; Lahelma et al., 2004; Galobardes et al., 2006; Lahelma & Rahkonen, 2017), is a divider: in general, the lower the class, the more the sickness absence (Allebeck & Mastekaasa, 2004). Overall, the phenomenon is uniform with regard to the socioeconomic differences in health in general (Mackenbach et al., 2008). In Finland, the reduction of socioeconomic health differences has been an objective in several health policy programs over the years (Sihto & Karvonen, 2016). Even so, socioeconomic differences in health have remained significant in Finland as well as in many other European countries (Hu et al., 2016). However, less is known about changes in occupational class differences in sickness absence over the course of time.

A variety of changes in the factors potentially affecting employees' sickness absence and the class differences have taken place in Finland over the years. For instance, the occupational structure has altered markedly during the past three decades: the share of manufacturing work has declined and the proportion of social welfare, health care and commercial work has increased (Sutela & Lehto, 2014). Consequently, the proportion of manual workers has declined and the proportion of non-manual workers increased (Sutela & Lehto, 2014). Since the late 1990s, the majority of Finnish wage and salary earners have been women (Sutela & Lehto, 2014); they take full-time jobs nearly as often as male wage and salary earners in Finland (Statistics Finland, 2016). Moreover, physical work demands have alleviated, and awareness of occupational health and safety regulations has grown among Finnish employees (Sutela & Lehto, 2014). Unemployment rate, in turn, declined in Finland after the deep recession of the early 1990s until 2008, after which the trend turned due to a global economic downturn (Statistics Finland, 2017a; Statistics Finland, 2017b). In the early 2010s, several amendments were made to Finnish legislation in order to prevent work disability and to promote chances to work despite limitations in work ability (Sauni et al., 2015). Nationwide evidence on occupational class differences in sickness absence over time helps to detect the class differences in sickness absence across the whole spectrum of the employed population, to distinguish population groups at risk in terms of work disability and to target preventive measures at the national level in order to reduce sickness absence. Further evidence could also help detect factors for the potential changes over time in these employee groups.

Sickness absence is regarded as a complex multifactorial phenomenon affected by different factors at the individual, workplace and societal levels (Alexanderson, 1998). A disease leading to work disability is a prerequisite for sickness absence and related benefits (Alexanderson & Norlund, 2004). In Finland, a medical certificate based on a disease diagnosed by a doctor is required, for instance, in order to receive sickness allowance as a compensation for loss of income due to inability to work from the 11th working day onwards. The three most common diagnostic causes of these long-term sickness absence episodes are musculoskeletal diseases, mental disorders and injuries (The Social Insurance Institution of Finland, 2016a).

Previous studies examining diagnosis-specific sickness absence have demonstrated hierarchical occupational class differences in sickness absence also in a variety of different diagnostic causes. The few studies examining occupational class differences simultaneously across several different diagnostic causes (Chevalier et al., 1987; Feeney et al., 1998; Vahtera et al., 1999; Melchior et al., 2005) have demonstrated particularly large class differences in sickness absence due to musculoskeletal diseases and injuries. However, less consistent occupational class gradients have emerged in mental disorders (Stansfeld et al., 1995; Feeney et al., 1998; Melchior et al., 2005). Overall, there is a lack of studies examining occupational class differences in diagnosis-specific sickness absence across a wide spectrum of diagnostic causes and changes over time in these differences in nationally representative samples. More detailed diagnosis-specific evidence on the class differences could facilitate the identification of employees at risk of work disability and planning preventive actions in the future.

All in all, sickness absence is a major health and working life problem with considerable financial consequences. It shortens working lives and increases the risk of an employee's permanent exit from the labour market (Kivimäki et al., 2004). A marked economic burden is incurred on individuals, companies and the society due to lost working days as a consequence of inability to work attributable to ill-health (Liiketaloustieteellinen tutkimuslaitos, 1993). Due to ageing workforce and weakening economic dependency ratio (European Commission, 2014), the Finnish Government and labour market organisations, in line with several other member countries of Organisation for Economic Co-operation and Development (OECD), attempt to extend working lives, for example, by reducing sickness absence (Työelämätyöryhmä, 2010; OECD, 2010). The current Finnish government also seek to foster health and wellbeing and to reduce inequalities in the population (Prime Minister's Office, 2015). The existing health differences set a challenge to egalitarian health policies (Lahelma & Rahkonen, 2017).

The purpose of this study is to examine occupational class differences in long-term sickness absence in a nationally representative Finnish employed population and to give insight into underlying diagnostic causes of the class differences and changes over time in these differences. Occupational class differences in sickness absence are assessed by means of both absolute and

relative measures to give an overall picture of the health problem. The study covers the period from 1996 to 2014.

2 CONCEPTUAL FRAMEWORK

The key concepts of the study are presented as follows. First, the concept of occupational class will be introduced. Then, the concepts of work disability, sickness absence and sickness allowance will be presented. Last, potential explanations for occupational class differences in sickness absence and concepts related to the measurement of the class differences will be covered.

2.1 OCCUPATIONAL CLASS

Occupational class is a key socioeconomic division in the population and among employees (Lynch & Kaplan 2000; Galobardes et al., 2006; Lahelma & Rahkonen, 2017). Socioeconomic position refers to social and economic resources determining an individual's position within the hierarchical structure of a society (Lynch & Kaplan 2000; Galobardes et al., 2006). However, it cannot be measured directly. The key indicators are education, occupational class and income (Lynch & Kaplan 2000; Galobardes et al., 2006; Lahelma et al., 2004; Lahelma & Rahkonen, 2017). Education reflects non-material resources, such as knowledge and skills, and provides formal qualifications to paid employment, thus promoting the achievement of occupational class positions. Income relates to material circumstances and derives usually from paid work. Work-based occupational class is an important structure linking education and income. Occupational class pins individuals to society's fundamental structures defined through paid work. It marks status, power and resources, and reflects physical and psychosocial circumstances at work. Consequently, occupational class as an indicator of socioeconomic position excludes population groups outside employment, such as unemployed individuals, students and retirees (Galobardes et al., 2006).

2.2 WORK DISABILITY AND SICKNESS ABSENCE

Work disability

The concept of work disability, as work ability as its positive counterpart, comprises a diversity of meanings, having evolved over time along with research evidence and developments in society (Mäkitalo, 2006; Ilmarinen et al., 2008). At first, work disability was seen as a pure consequence of a medical condition causing individual's inability to perform one's tasks at work (Mäkitalo, 2006). Thereafter, the concept was broadened and work disability was seen as a result of an imbalance between a person's individual functioning capacity and the demands at one's work (Mäkitalo, 2006; Ilmarinen et al.,

2008). Later on, the concept of work disability was expanded to comprise also a broader work environment, i.e. work conditions, work community and management, family-related and close community factors as well as structures at a societal level (Ilmarinen et al., 2008). The viewpoint with regard to the concept of work disability depends on a purpose for which it is being used, and no consensus of a single universal definition of work disability exists (Ilmarinen et al., 2008). The balance model, for instance, dominates the concept of work disability in the social security system in Finland (Ilmarinen et al., 2008).

Sickness absence

Sickness absence can be regarded as a manifestation of temporal work disability (Prins, 2013). It means absence from work as a consequence of inability to conduct one's tasks at work transiently due to ill-health or an injury (Alexanderson & Norlund, 2004; Prins, 2013). Among working populations, sickness absence is an integrated measure of ill-health and poor health-related functioning (Marmot et al., 1995; Laaksonen et al., 2011). This phenomenon can be measured in several ways. In general, sickness absence is examined by means of episode-, time- and person-based measurements, such as frequency of absence, length of absence and cumulative incidence of absence, respectively (Hensing et al., 1998). To obtain a comprehensive picture of an underlying health problem, however, both person- and time-based measurements are recommended when examining sickness absence (Hensing, 2009). Cumulative incidence of absence, for example, indicates the proportion of individuals having at least one new sickness absence episode during a study period (Hensing, 2009). Prevalence of absence is obtained when also ongoing absence episodes are taken into account (Hensing, 2009). Length of absence, in turn, is usually defined as number of days absent from work (Hensing, 2009).

Sickness absence episodes are commonly divided into short and long episodes of absence, but no uniform definition exists regarding the cut-off point. Short sickness absence is usually self-certified, i.e. being based on the absentee's own assessment of one's health condition and need of absence. The underlying diagnoses for short sickness absence episodes comprise usually minor diseases, such as gastroenteritis, respiratory infections and headache (Feeney et al., 1998). Long sickness absence episodes are usually medically certified, thus indicating diseases diagnosed by a doctor and impaired work ability in relation to the demands of one's work. The underlying diagnoses of long-term sickness absence are usually more severe diseases compared to those leading to short episodes. The major diagnostic causes of prolonged sickness absence are musculoskeletal diseases and mental disorders (Feeney et al., 1998; Henderson et al., 2005).

Sickness absence may have several deleterious consequences. Particularly longer sickness absence episodes have been shown to increase the risk of

adverse health and social consequences among working populations. For instance, they have been found to increase the risk of subsequent unemployment (Hultin et al., 2012). Moreover, prolonged sickness absence predicts future permanent work disability, i.e. disability pension (Kivimäki et al., 2004; Kivimäki et al., 2007; Alexanderson et al., 2012; Hultin et al., 2012). The association with regard to disability pension is particularly strong for long-term sickness absence due to mental disorders, musculoskeletal diseases and circulatory diagnoses (Kivimäki et al., 2007; Alexanderson et al., 2012; Hultin et al., 2012). Overall, long-term sickness absence has been shown to increase the risk of financial difficulties (Bryngelson, 2009).

The underlying causes of sickness absence are complex and multifactorial (Alexanderson, 1998; Allebeck & Mastekaasa, 2004; Beemsterboer et al., 2009). A disease or an injury leading to a deterioration of work ability in relation to the demands of work constitute a prerequisite for sickness absence (Alexanderson & Norlund, 2004). Some major diseases, such as myocardial infarction and stroke, and severe injuries nearly always compel individuals to withdraw from work; in that case the risk factors of the diseases or injuries parallel the risk factors causing absence from work (Alexanderson & Norlund, 2004). Factors affecting sickness absence can be classified into different structural, i.e. individual, workplace/community and national levels (Alexanderson, 1998; Piha, 2013). Sickness absence, particularly long-term absence, is generally more common among older employees than among those in younger age groups (Marmot et al., 1995; Allebeck & Mastekaasa, 2004; Beemsterboer et al., 2009). However, the oldest, over 60-year-old employees tend to be less absent from work (Laaksonen et al., 2010a), which may result from health-related selection of those employees still working at this age (Piha, 2013). Women have more sickness absence than men (Bekker et al., 2009). The gender differences are marked in short absences but tend to diminish by prolongation of absence (Laaksonen et al., 2008; Laaksonen et al., 2010a). Health behaviours, such as smoking (Weng et al., 2012), alcohol consumption (Salonsalmi et al., 2009; Kaila-Kangas et al., 2018) and obesity (Neovius et al., 2009) have been shown to associate with sickness absence. Physical activity tend to be inversely related to sickness absence (Amlani & Munir, 2014). Employee's attitude and motivation, both outside and at work, affect sickness absence (Alexanderson, 1998; Beemsterboer et al., 2009). A variety of factors at the workplace level, such as physical work exposures and psychosocial working environment, are major determinants of sickness absence (Alexanderson, 1998; Allebeck & Mastekaasa, 2004; Beemsterboer et al., 2009). Moreover, sickness absence has a tendency to emulate business cycles, i.e. sickness absence rate tends to increase in concordance with economic boom and declining unemployment, and vice versa (Pichler, 2015). Features of the sickness insurance system also contribute to sickness absence at the national level (Alexanderson, 1998; Allebeck & Mastekaasa, 2004).

Sickness allowance

In Finland, all medically certified absence episodes of over 10 working days, i.e. long-term sickness absence, can be followed up at the national level through paid sickness allowances obtained from the registers of sickness insurance administered by Kela. Under the Finnish system (The Social Insurance Institution of Finland, 2016b), all 16–67-year-old Finnish residents (until 2004, the upper age limit was 64 years) are eligible to receive sickness allowance as a compensation for loss of income due to work disability, if they are not on pensions. The principles of sickness allowance in its current form and extent date back to 1964, when the first Sickness Insurance Act was implemented in Finland (Niemelä, 2014). Sickness allowance is paid by Kela as a compensation for work disability caused by an illness or by a home and leisure injury for at most one year, and a medical certification is required in order to receive the benefit. Work-related and traffic injuries, however, are compensated by insurance companies in Finland. Receipt of sickness allowance begins after a waiting period, comprising the first day of work disability and the following nine working days. The waiting period consists of calendar days, however, excluding Sundays and midweek holidays. The waiting period is 55 calendar days if annual earned income does not exceed a defined minimum level, or if a person has not been employed or engaged in any other gainful activity, such as being a student, three months before the occurrence of work disability (the latter prerequisite expired at the end of 2015). During the waiting period, employers must pay full salary to employees, despite them being unable to work, according to the Employment Contracts Act. Based on the collective agreements, however, employers pay full salary usually longer than this minimum time in Finland (Toivonen, 2012).

Changes over time and diagnostic causes of sickness absence based on paid sickness allowances

Various changes in sickness absence based on paid sickness allowances have taken place over time (Blomgren, 2016). Between the years 1996 and 2015, the proportion of 16–64-year-old Finns receiving sickness allowance of the non-retired population, i.e. the prevalence of long-term sickness absence, increased from the mid-1990s until 2006. After the mid-2000s, the prevalence turned into a decrease. It reached the level of mid-1990s by 2015, being 10.8% and 7.5% for women and men, respectively.

In Finland, the most common diagnostic cause of long-term sickness absence on the basis of paid sickness allowances comprise musculoskeletal diseases among both genders. Consequently, the trend over time in the prevalence of long-term sickness absence due to musculoskeletal diseases has emulated the abovementioned changes in the sickness absence prevalence due to any diagnostic cause between the years 1996 and 2015. The changes over time in the other common diagnostic causes of these longer-term sickness

absence episodes, namely mental disorders and injuries, differ from the overall trend. Sickness absence prevalence due to mental disorders increased sharply, especially among women, from the mid-1990s until the mid-2000s after which it declined modestly and levelled off by 2010. With regard to injuries, the prevalence of long-term sickness absence has remained broadly stable among men and increased slightly among women during the 20-year time period. The prevalences in the next largest diagnostic causes for the receipt of sickness allowance, i.e. respiratory diseases, digestive diseases, diseases of the nervous system, neoplasms, cardiorespiratory diseases among men and diseases and complications related to pregnancy, childbirth and the puerperium among women, have stayed at a relatively low level in Finland over the 20-year time period. (Blomgren, 2016)

2.3 OCCUPATIONAL CLASS AS A DETERMINANT OF SICKNESS ABSENCE

Occupation-based socioeconomic position has been previously shown to constitute a significant determinant of medically certified sickness absence: the lower the class, the more the sickness absence across the occupational class hierarchy (Melchior et al., 2005; Laaksonen et al., 2010b; Piha et al., 2010). Occupational class could be linked to sickness absence in various ways and consequently result in differences in sickness absence between employees in different positions in the occupational class hierarchy. Working conditions may impair health as a consequence of exposure to different harmful substances or physically strenuous job tasks (Lynch & Kaplan, 2000; Galobardes et al., 2006). Work tends to be physically demanding in manual occupations (Lehto & Sutela, 2009). Uncomfortable work postures and work requiring heavy weight loading, for instance, have been shown to increase risk of long-term sickness absence (Lund et al., 2006). Moreover, employees in higher occupational classes may have more flexibilities to adapt their job tasks in relation to ability to work compared to those in lower classes (Doeglas et al., 1995). Studies seeking to explain occupational class differences in sickness absence have shown that different work-related factors, in particular detrimental physical working conditions, are major explanatory factors for occupational class differences in sickness absence (Christensen et al., 2008; Laaksonen et al., 2010b; Löve et al., 2013). The results regarding psychosocial working conditions have appeared heterogeneous (Melchior et al., 2005; Christensen et al., 2008; Laaksonen et al., 2010b).

Higher occupational class usually relates to better income and hence provides better access to material resources affecting health, such as access to health care, housing, good quality food and physical activities (Lynch & Kaplan, 2000; Galobardes et al., 2006). Previously, occupational class differences in sickness absence have been found to relate to health behaviours, e.g. smoking, alcohol consumption, weight and physical activity (Christensen

et al., 2008; Laaksonen et al., 2010b) and also to poor health (Löve et al., 2013). Ill-health may also result in poorer education and hence prevent achievement of an occupational position (Galobardes et al., 2006). Selection to occupational classes due to poor health may also influence to the development of occupational class differences in sickness absence (Melchior et al., 2005).

Occupational class is used as an indicator of socioeconomic position in this study as it is well suited to reflect the hierarchical social structure of an employed population. To illustrate, occupation-based socioeconomic position is a significant determinant of health overall: the lower the position, the poorer the health (Mackenbach et al., 2008), though there exist diverging socioeconomic differences in certain diseases. In breast cancer, for instance, the disease incidence is greater among women in higher socioeconomic positions than among those in lower socioeconomic positions (Lundqvist et al., 2016).

Socioeconomic differences in health can be measured both in absolute and relative term. As measures of inequality, absolute and relative differences examine the respective differences in health status by exposure categories, such as occupational class groups (Shaw et al., 2007). To illustrate, absolute differences can be expressed as the difference between, for instance, the proportion of workers having sickness absence during a year in each occupational class and the reference class, such as the highest occupational class (Regidor, 2004; Shaw et al., 2007; Mackenbach, 2015). Relative differences, in turn, imply the ratio between, for example, the proportion of a health event in each occupational class and the reference class (Regidor, 2004; Shaw et al., 2007; Mackenbach, 2015).

When monitoring the socioeconomic differences, there exist widely acknowledged consensus to assess both absolute and relative differences between groups at different levels of the hierarchy (Mackenbach & Kunst, 1997; Regidor, 2004; Moonesinghe & Beckles, 2015). However, this is rarely done in previous studies (King et al., 2012). The assessment of the differences both in absolute and relative terms is important since the magnitude of and changes over time in socioeconomic differences in health may diverge between absolute and relative measures (King et al., 2012). For instance, the absolute difference may vary even when the relative difference remains constant since the former depends on the prevalence of a health outcome as opposed to the latter (Shaw et al., 2007). To illustrate, if the risk of a health status decreases from 100 per 1,000 to 50 per 1,000 in the lowest class and from 50 per 1,000 to 25 per 1,000 in the highest class, the absolute difference declines from 50 per 1,000 to 25 per 1,000 whereas the relative difference remains constant, i.e. the relative risk is 2 (Shaw et al., 2007). Furthermore, absolute differences point out the public health significance of socioeconomic differences since health policies usually aim at reducing the number of cases of health problems (Regidor, 2004; Shaw et al., 2007). Relative differences, in turn, indicate better causal effects or disease aetiology (Shaw et al., 2007) but can be also

used to measure the effectiveness of a policy measure on a target outcome (Regidor, 2004).

3 REVIEW OF THE LITERATURE

The review of the literature summarises research evidence on occupational class differences in sickness absence. Both longitudinal and cross-sectional studies conducted mainly in the Nordic and other European countries are included in the review. In chapter 3.1, the focus is on studies examining occupational class differences in all-cause sickness absence and changes in these differences over time. Chapter 3.2 covers studies on occupational class differences in diagnosis-specific sickness absence. Chapter 3.3 pulls together the results of the presented studies and highlights the gaps in the current knowledge in the context of the present study.

3.1 OCCUPATIONAL CLASS DIFFERENCES IN ALL-CAUSE SICKNESS ABSENCE

There is ample evidence on occupational class differences in sickness absence accumulated in various countries over the last decades. Previous studies have examined the class differences in all-cause sickness absence both in cross-sectional and longitudinal settings. Despite the differences in the definitions of sickness absence (e.g. with regard to the length or being self-certified versus medically certified episodes) and occupational class, the results are consistent: the lower the occupational class, the higher the sickness absence due to any diagnostic cause.

There exists an abundant research evidence on occupational class differences in sickness absence in the Nordic countries, where data on sickness absence are mainly gathered through official registers. In Finland, the evidence is mainly based on two different cohorts of public sectors employees. A Finnish study (Vahtera et al., 1999) examining a cohort of local government employees in three cities (altogether 918 men and 1,875 women) showed hierarchical occupational class differences in over three-days-long sickness absence episodes but found minor and less consistent gradients in short (1–3 days) sickness absence. Several studies on the class differences in sickness absence have been conducted among Finnish municipal employees working for the City of Helsinki (The Helsinki Health Study) (Piha et al., 2007, Laaksonen et al., 2010b, Piha et al., 2010, Sumanen et al., 2015a, Sumanen et al., 2017). In the Helsinki Health Study cohort, the target population is the staff of the municipality of the City of Helsinki (80% are women), i.e. the largest single employer in Finland (Lahelma et al., 2007); the municipality operates in healthcare, social welfare services, education and culture, public transport and technical services. Among both genders, clear hierarchical occupational class differences have been found, with medically certified sickness absence of four days or more being approximately two to three times

more common among employees in the lowest occupational class compared to those in the highest class (Piha et al., 2007; Laaksonen et al., 2010b; Piha et al., 2010). These results parallel the finding regarding the magnitude of occupational class differences in sickness absence days per year in employment among 18–34 and 35–59-year-old Finnish municipal employees (n=~37,500 per year), among whom the differences tend to be more pronounced among older age groups compared to younger employees (Sumanen et al., 2017). Sumanen et al. (2015a) examined short (1–3 days) sickness absence episodes among young, 18–34-year-old female employees of the City of Helsinki from 2002 (n=8,582) to 2013 (n=9,468). The study found hierarchical occupational class differences and, in line with the findings of Sumanen et al. (2017) regarding younger employees, the highest amount of sickness absence was found among routine non-manuals, the second lowest occupational class in the study.

A similar finding was reported by a Danish study (Kristensen et al., 2010) examining 2,331 hospital employees; the study found that nursing assistants, i.e. the second lowest occupational class in the study, had higher risk estimates for short (1–3 days) sickness absence compared to cleaners and porters, possibly due to an increasing proportion of medium (4–14 days) long episodes with decreasing occupational class position. The occupational class gradient was indeed evident in medium long sickness absence but did not appear in long, over 14 days long absences, though the number of individuals in the latter case was low. Another Danish study (Christensen et al., 2008) examined a cohort of employees (n=5,221) drawn from a random population sample and found that lower occupational class was consistently associated with higher risk of over eight-weeks-long sickness absence based on sick leave data drawn from a national register of social payment transfers.

A Swedish study (Löve et al., 2013) examining a random sample of an employed population (n=2,763) and a sample of newly sick-listed (over 14 days) employees (n=3,044) based on the information of the Swedish Social Insurance Agency, showed clear hierarchical class differences in sickness absence across the occupational classes; compared to higher non-manuals, female unskilled workers, for instance, had almost two-fold and male unskilled workers over three-fold risk of long-term sickness absence after age-adjustment. A similar gradient was demonstrated in a cross-sectional Norwegian study (Hansen & Ingebrigtsen, 2008) examining over 14-days-long sickness absence in an employed population drawn from nationally representative samples (altogether 3,298 men and 3,187 women).

In the early 1990s, a British study (North et al., 1993) examined civil servants, i.e. 6,900 men and 3,414 women, in London offices of 20 Whitehall departments (the Whitehall II Study) in 1985–1988. The participants of the Whitehall II study include civil servants from clerical and office support grades, middle-ranking executive grades and senior administrative grades (Marmot & Brunner, 2005). The study showed hierarchical occupational class differences both in self-certified short (1–7 days) and medically certified long

(over 7 days) sickness absence. After adjustment for age, male employees in the lowest grades had over five and over seven times higher rate ratios for short and long sickness absence, respectively, compared to male employees in the highest grades. Among women, the corresponding figures were almost three and over three times higher for short and long absences, respectively. After all adjustments (age, health behaviours, ethnic group, work factors and adverse social factors outside work), the differences attenuated somewhat but remained statistically significant.

A Spanish study (Moncada et al., 2002) examining retrospectively a cohort of employees working a Barcelona City Council (11,647 men and 9,001 women) between 1984–1993 showed clear hierarchical occupational class differences in over 10-days-long sickness absence but less pronounced gradients in short (1-10 days) sickness absence. For men, the gradient in long absences was, however, less prominent among young employees (aged 16–34 years) than in older age groups. Two French studies, one of which examined the employees of national gas and electricity company (8,847 men and 2,886 women) (the GAZEL Cohort Study) in a longitudinal setting (Melchior et al., 2005) and the other participants drawn from a cross-sectional national working population survey (14,241 men and 10,245 women) (Niedhammer et al., 2008), demonstrated an inverse occupational class gradient in sickness absence. The class differences remained even after adjustments for several covariates. In both studies, employees in lower occupational class had approximately two times higher rate ratios of sickness absence (absence episode of all lengths in the GAZEL Cohort Study and absence episodes of eight days or more in the latter study) than employees in the highest occupational class.

Few studies have performed cross-country comparisons on occupational class differences in sickness absence. Fuhrer et al (2002) studied occupational class differences in sickness absence of over seven days among French office workers (n=6,818) (the GAZEL Cohort Study) and London civil servants (n=5,825) (the Whitehall II Study) in a longitudinal setting. The study showed similar inverse occupational class gradients in both cohorts in spite of the two different cultures and concluded that some universal factors may predispose to sickness absence and further to the class differences despite differences in country-specific exposures. Another longitudinal study (Morikawa et al., 2004) examined occupational class differences in sickness absence of over seven calendar days among Japanese male factor workers (n=2,504) and male civil servants (n=6,290) in London. In both countries, clear occupational differences in sickness absence were found, however, the gradient appeared steeper in Britain than in Japan.

3.2 CHANGES OVER TIME IN OCCUPATIONAL CLASS DIFFERENCES IN ALL-CAUSE SICKNESS ABSENCE

Despite a prominent evidence on occupational class difference in sickness absence and several studies seeking out explanations to the differences, few studies have examined changes in the class differences in sickness absence over time. Moreover, these studies have solely focused on specific workplaces or work sectors.

A Danish repeated cross-sectional study (Johansen et al., 2009) examined sickness absence rate among private sectors employees from 1973 (in 1973, for instance, covering approximately 197,700 employees) to 2007 and found stable hierarchical occupational class differences in sickness absence over time among both genders. The trend estimates, based on a linear regression analysis, showed an almost flat line in each group: -0.007 (95% CI -0.030, 0.016) for blue-collar women, 0.006 (95% CI -0.006, 0.019) for white-collar women, 0.001 (95% CI -0.013, 0.014) for blue-collar men and -0.007 (95% CI -0.013, -0.001) for white-collar men. Lowest sickness absence rate, approximately two per cent, appeared among male white-collar workers while female blue-collar workers had the highest sickness absence rate, varying from six to seven per cent, throughout the study period.

A Finnish study (The Helsinki Health Study) (Piha et al., 2007) examined occupational class differences in medically certified, over three-days-long sickness absence episodes among municipal employees aged 25–59 years between 1990 and 1999. The yearly number of participants varied from 24,029 to 27,861 among women, and from 6,523 to 7,521 among men. The study showed widening hierarchical absolute occupational class differences in sickness absence during the 1990s, the most pronounced increase taking place between 1994 and 1999. This change occurred mainly due to larger increases in sickness absence in lower occupational classes compared to those in higher classes. Among female manual workers, for instance, the age-adjusted long sickness absence spells/100 person years increased from approximately 90 to nearly 110 from 1990 to 1999. Among female managers, the age-adjusted long sickness absence spells/100 person years remained relatively steady, slightly under 40, during the study period. For male manual workers, in turn, sickness absence spells/100 person years increased from approximately 80 to approximately 90 between 1990 and 1999. The corresponding change among male managers was from roughly 20 to 30. Test for difference in linear time trend for manual workers compared to managers was statistically significant among both women (p=0.0006) and men (p=0.0020). The changes were hypothesised to be caused by changing labour market conditions and health selection as a consequence of economic downturn in the early 1990s and decreasing unemployment towards the end of the study period.

Sumanen et al. (2015a) examined occupational class differences in short, 1–3 days self-certified sickness absence among female municipal employees aged 18–34 years in Finland from 2002 (n=8,582) to 2013 (n=9,468) (The

Helsinki Health Study). The study showed that the class differences remained relatively stable during the study period but widened slightly towards the year 2013. Sickness absence rate increased first from 2000 to 2008, with the exception of manual workers, after which a decrease occurred in all studied occupational classes. The turning point in 2008 coincided with the occurrence of the recession in Finland. From 2009 to 2013, the strongest decrease in sickness absence rate, i.e. 6.9% (95% CI -12.6, -0.8), took place among managers and professionals which explained the slight widening of the class differences towards the end of the study period. Another study of Sumanen et al. (2017) examined the magnitude of relative occupational class differences in sickness absence days by means of the Relative Index of Inequality (RII) among Finnish municipal employees (The Helsinki Health Study, yearly n being approximately 37,500) annually from 2002 to 2016. The study showed that the class differences remained broadly stable among younger (18–34 years) and older (35–59 years) female employees between the years 2002 and 2016, though a temporal widening of the class differences took place in the younger age group in 2013. The RII values showed approximately 2.5 times more sickness absence days to those in the hypothetical bottom compared to those in the top of the occupational class hierarchy for younger women throughout. For older women, the corresponding RII values were around 3 during the study period. Among younger and older men, in turn, relative occupational class differences were smaller in 2016 than in 2002, though annual variation was detected during the study period; the RII values varied between 1.68 (95% CI 1.44, 1.97) and 3.74 (95% CI 3.13, 4.48) among younger men and between 3.31 (95% CI 2.98, 3.68) and 6.43 (95% CI 5.85, 7.06) among older men.

3.3 OCCUPATIONAL CLASS DIFFERENCES IN DIAGNOSIS-SPECIFIC SICKNESS ABSENCE

Previous studies examining occupational class differences in sickness absence across various different diagnostic causes, both in cross-sectional and longitudinal settings, have shown that the magnitude of the class differences vary by diagnostic cause of absence. In most of these studies, the focus has been on the major diagnostic causes of sickness absence, namely musculoskeletal diseases, mental disorders and injuries. Furthermore, the majority of the studies have been conducted on specific workplace or work sector samples. Studies examining changes over time in occupational class differences in diagnosis-specific sickness absence are, however, lacking.

Sickness absence due to musculoskeletal diseases

Large occupational class differences in sickness absence due to musculoskeletal diseases have been found in previous studies examining the

class differences across various diagnostic causes in French, Finnish and British employee cohorts (Chevalier et al., 1987; Feeney et al., 1998; Vahtera et al., 1999; Melchior et al., 2005). Chevalier et al. (1987) were amongst the first to study occupational class differences in diagnosis-specific sickness absence, including 16 different diagnostic causes of sickness absence in the study. The study showed that, among 135,299 employees of the French National Electric and Gas Company (the GAZEL Cohort Study), there were clear hierarchical occupational class differences in the frequency rate of sickness absence in almost all studied diagnostic causes during a 12-month follow-up period. The class differences were particularly profound in sickness absence attributable to musculoskeletal diseases. Another French study (Melchior et al., 2005) examining the cohort of the employees of the French National Electric and Gas Company (the GAZEL Cohort Study) showed that the class differences were large in sickness absence attributable to musculoskeletal diseases among both genders. A longitudinal Finnish study (Vahtera et al., 1999) examined medically certified, over 3-days long sickness absence among government employees in three towns and showed that the occupational class gradient appeared most profound in the case of musculoskeletal diseases. A British study (Feeney et al., 1998) focusing on a cohort of London-based civil servants (n=5,626) (the Whitehall II Study) reported particularly large differences in both short (7 days or less) and long (over 7 days) sickness absence due to musculoskeletal diseases.

Similar findings have appeared also in studies focusing on sickness absence attributable to musculoskeletal diseases of any cause in Norway and Spain. Morken et al. (2003) showed clear hierarchical occupational class differences in both short (1–12 days) and long (over 12 days) sickness absence based on self-reported data on absence among 5,654 Norwegian aluminium plant workers. The occupational class gradient appeared steeper in longer periods of absence compared with short episodes. A Spanish study (Abásolo et al., 2008) among 3,311 Madrilenian patients showed that manual workers had an increased risk of prolonged absence due to any-cause musculoskeletal disease, but work-related factors (e.g. physically demanding work) were not independently associated with the duration of absence.

In line with the abovementioned studies, hierarchical occupational class differences have been found also in studies examining the class differences in sickness absence due to specified diseases within musculoskeletal diseases. A British study (Hemingway et al., 1997) examined a cohort of civil servants (n=5,620) (the Whitehall II Study) and showed that lower occupational class was associated with higher rate of both short (1–7 days) and long (over 7 days) sickness absence due to back pain across the occupational classes. A Swedish longitudinal study (Bergström et al., 2007) examining 2,187 employees in four different workplaces showed that white-collar workers had a significantly lower risk of sickness absence due to back and neck pain both at the 18-months and 3-years follow-up compared to blue-collar workers. A further analysis conducted separately on blue-collars workers showed that repetitive work

procedures were associated with the risk of sickness absence at the 3-year follow-up compared to employees having seldom to do similar procedures. A cross-sectional study (Alexopoulos et al., 2006) on 853 Greek shipyard employees found that blue-collar workers had higher risk of sickness absence due to low back pain and shoulder/neck pain and also due to hand/wrist pain compared to white-collar workers. Lower occupational class was associated with higher annual incidence of sickness absence due to upper limb disorders covering several diagnoses in a French study on 134,255 employees of a national power and gas company (the GAZEL Cohort Study) (Wilson d'Almeida et al., 2008). An Australian study (Agaliotis et al., 2013) on a cohort of 360 employed patients with chronic knee pain of over six months and radiological findings participating in a randomized controlled clinical trial showed that semi-manual workers, such as service and sales persons, had a two-fold risk of sickness absence due to knee pain compared to non-manual employees. Previous studies on occupational class differences in sickness absence due to rheumatoid arthritis are scarce. A Finnish longitudinal study (Puolakka et al., 2005) examined sickness absence among 162 patients with early rheumatoid arthritis and found that patients in blue-collar occupations, interpreted as physically demanding jobs, had an increased the risk of sickness absence at the follow-up, however, the association appeared marginally statistically insignificant.

Sickness absence due to mental disorders

Previous studies on the association on occupational class and sickness absence due to mental disorders have demonstrated varying results, showing evidence on a reverse association (Stansfeld et al., 1995; Feeney et al., 1998), an inconsistent association (Melchior et al., 2005) and a non-existent association for some specified diagnoses (Virtanen et al., 2011). A British longitudinal study (Stansfeld et al., 1995) on civil servants (n=5,620) (the Whitehall II Study) found clear hierarchical occupational class differences in short (1-7 days), long (over 7 days) and very long (over 21 days) sickness absence due to psychiatric illness across the classes among both genders. Compared to the highest grade, the age-adjusted rates of short, long and very long sickness absence appeared approximately two to 10 times higher in the lowest employment grades compared to those at the highest grades. The occupational class gradient in short sickness absence was steeper in ill-defined mental conditions, such as nervous breakdown, than for more clearly defined mental disorders, i.e. depression and anxiety disorders. Another British longitudinal study (Feeney et al., 1998) examined the class differences across various diagnostic causes with the same cohort data on civil servants and showed large occupational class differences in sickness absence due to mental disorders. For long (over 7 days) sickness absence, the class differences appeared large in well-defined mental disorders, whereas in ill-defined mental conditions the gradient was steep in short (7 days or less) sickness absence. A French

longitudinal study (Melchior et al., 2005) examining a cohort of employees in a national electric and gas company (the GAZEL Cohort Study) found a less consistent occupational class gradient in sickness absence due to mental disorders than in the case of musculoskeletal diseases. A Finnish longitudinal study (Virtanen et al., 2011) examined occupational class differences in long-term work disability (i.e. 90-days or more sickness absence and disability pension) due to different mental diseases among public sector employees (n=141,917) and found that manual workers had an increased risk of psychiatric work disability in almost all specified diagnostic causes within mental disorders. There was, however, no evidence on occupational class gradients in the occurrence and duration of work disability attributable to bipolar disorders and adjustment disorders. Occupational class was neither associated with duration of work disability in the case of anxiety disorders.

Sickness absence due to injuries

Large occupational class differences have been found in sickness absence due to injuries (Chevalier et al., 1987; Feeney et al., 1998; Vahtera et al., 1999; Melchior et al., 2005; Piha et al., 2013; Johannessen et al., 2015). A British study (Feeney et al., 1998) found large class differences both in short (7 days or less) and long (over 7 days) sickness absence due to injuries of any cause within a cohort of London-based civil servants (the Whitehall II Study). A French, six-year long follow-up study of the employees of the French National Electric and Gas Company (the GAZEL Cohort Study) found that occupational class differences in sickness absence attributable to injuries, including both work- and non-related accidents, were particularly large among men (Melchior et al., 2005). The study showed further that physical exposures at work were major contributors to the observed occupational class gradient in the case of injury absence. In line with the French study, a Finnish longitudinal study (Vahtera et al., 1999) examining government employees in three towns found that hierarchical occupational class differences in over 3-days long sickness absence due to injuries of any cause were larger among men than among women. Another Finnish longitudinal study (Piha et al., 2013) examining municipal employees (16,471 women and 5,033 men) (the Helsinki Health Study) demonstrated clear hierarchical occupational class gradients in work injury absence among both genders. Among women, the highest work injury absence rates were found for cooks, bus drivers and hospital attendants whereas youth mentors, firemen and janitors had the highest rates among men. A Norwegian longitudinal study (Johannessen et al., 2015) examining an employee cohort (n=6,745) drawn from the general population demonstrated also a clear occupational class gradient in sickness absence caused by occupational injuries.

Sickness absence due to other diagnostic causes

Clear hierarchical occupational class differences have been also found in several other diagnostic causes of sickness absence in previous studies examining simultaneously multiple diagnostic causes (Chevalier et al., 1987; Feeney et al. 1998).

Specifically, large occupational class differences have been previously found in sickness absence attributable to respiratory diseases (Chevalier et al., 1987; Feeney et al. 1998). A British longitudinal study (Feeney et al., 1998) (the Whitehall II Study) examining the class differences across various diagnostic causes with data on civil servants found large class differences in the case of respiratory disease for long, over 7-days sickness absence episodes. A longitudinal study (Alexopoulos & Burgdorf, 2001) examining employees in two constructions companies (n=853) showed that sickness absence episodes due to respiratory diseases, such as asthma and chronic obstructive pulmonary disease, were more common and lasted longer among blue-collar workers compared to white-collar office workers.

As for cardiovascular diseases, the aforementioned British study (Feeney et al., 1998) showed large occupational class differences in long sickness absence among men, but not among women. A similar result was found in a Swedish longitudinal study (Voss et al., 2012) examining long-term sickness absence following coronary revascularisation, i.e. coronary artery bypass grafting (CABG) and percutaneous coronary intervention (PCI) over the years 1994–2006. The study population comprised 22,985 patients with CABG and 40,891 patients with PCI drawn from national registers. Among men, manual workers and assistant non-manual employees had an increased risk of sickness absence following CABG and PCI compared to higher non-manual employees. Similar associations were not found among women.

In contrast, rather small occupational class differences have appeared in sickness absence rate of malignant neoplasms overall; among the employees of the French National Electric and Gas Company (the GAZEL Cohort Study), the frequency rate was 0.3 among manual workers whereas the corresponding figures were 0.3 and 0.4 among foremen and managerial staff, respectively (Chevalier et al., 1987). Duration of absence, in turn, showed no clear occupational class gradient in malignant neoplasms: the mean duration of absence were 113.7 days, 90.4 days and 99.0 days among manual workers, foremen and managerial staff, respectively. With regard to different cancer sites, breast cancer constitutes the most common cancer among women (Schnitt & Lakhani, 2014), approximately half of whom are working-aged at time of the diagnosis (Vehko et al., 2016). Individuals of high occupational classes have higher incidence of breast cancer (Pukkala & Weiderpass, 1999; Danø et al., 2004; Pukkala et al., 2009; Lundqvist et al., 2016; Kullberg et al., 2017) but better survival (Karjalainen & Pukkala, 1990; Lundqvist et al., 2016) from the disease than those in low occupational classes. Previous studies examining sickness absence and return to work among employed women with

breast cancer have shown that non-manual work is associated with higher likelihood of having no sickness absence among Quebecer women (n=1,536) (Drolet et al., 2005) and manual work, in turn, with lower likelihood of return to work after breast cancer diagnoses among women in Detroit, USA (n=416) (Bouknight et al. 2006). In Sweden, however, no association was found between job type and return to work after curative surgery due to breast cancer in a study examining a cohort of 102 employed women diagnosed and operated at the Karolinska University Hospital (Johnsson et al., 2009).

3.4 SUMMARY OF AND GAPS IN THE PREVIOUS RESEARCH

Studies on occupational class differences in all-cause sickness absence accumulating over the course of time show consistent hierarchical differences in sickness absence between occupational classes. However, only few studies have examined changes over time in the class differences. A Danish study examining private sector employees showed that occupational class differences in all-cause sickness absence stayed relatively stable from the 1970s to 2007 among private sectors employees (Johansen et al., 2009). Among Finnish municipal employees, the class differences in all-cause sickness absence widened in the late 1990s but have stayed relative stable among women and narrowed among men during the first years of 2000s (Piha et al., 2007; Sumanen et al., 2015a; Sumanen et al., 2017).

Clear hierarchical occupational class differences have been previously found also in sickness absence due to different diseases. A few studies examining occupational class differences in sickness absence simultaneously across different diagnostic causes showed that the magnitude of the class differences varied between the diagnostic causes of sickness absence. Occupational class differences appeared particularly large in sickness absence attributable to musculoskeletal diseases and injuries. The results regarding sickness absence due to mental disorders were heterogeneous and even differed between specific psychiatric diagnoses. Minor occupational class differences, in turn, appeared, for instance, in sickness absence due to neoplasms of any cause.

The literature review raises gaps in the current knowledge of occupational class differences in sickness absence, which are addressed in this study. First, new studies examining occupational class differences in sickness absence over time using broad representative populations covering the whole employed population are needed. The external validity of the previous investigations conducted on specific workplace or work sector samples is limited since they may not cover the full range of occupational classes and related working conditions with different job security in different ages. Second, studies examining the class differences in sickness absence simultaneously across various diagnostic causes in a nationwide employed population are also

missing. Third, specifically for musculoskeletal diseases, there is lack of evidence on the class differences in sickness absence examined simultaneously across different musculoskeletal diagnoses, although musculoskeletal diseases are the major diagnostic causes of sickness absence in the Western countries. Fourth, within malignant neoplasms, in turn, breast cancer constitutes the most common cancer among Western women, with a greater incidence occurring in higher socioeconomic positions than in lower classes; however, little is known how this phenomenon is reflected in occupational class differences in sickness absence caused by the disease among employed women.

4 AIMS OF THE STUDY

The general aim of the study was to examine occupational class differences in all-cause and diagnosis-specific sickness absence and changes over time in the differences among women and men in the Finnish employed population.

The specific aims were:

1. To examine the magnitude of and changes over time in absolute and relative occupational class differences in all-cause sickness absence (I).

2. To examine occupational class differences in diagnosis-specific sickness absence
   a) by assessing the magnitude of and changes over time in the absolute and relative class differences by major diagnostic causes of sickness absence (II).
   b) due to different musculoskeletal diagnoses (III).
   c) due to breast cancer among women over time (IV).

5 MATERIAL AND METHODS

5.1 DATA SOURCES

This study used various data sets obtained from the registers of The Social Insurance Institution of Finland (Kela) and Statistics Finland. The data sets are summarised in Table 1. All data sets were linked by means of personal identity codes given to each Finnish resident.

This study was based on a nationally representative 70% random sample of residents of Finland. The sample data were retrieved from the registers of Kela. Sub-study I used a 70% random sample of working-age Finns covering the period of 1995–2012. Sub-study II, in turn, was based on a 70% random sample of working-age Finnish residents during the years 2004–2013. Sub-study III used a nationally representative random 70% sample of working-age Finns at the end of 2013. In sub-study IV, a 70% random sample of Finnish working-age women between the years 2004–2012 was applied. In the sub-studies I, II and IV, the sample data constituted a form of an unbalanced panel (Andreß et al., 2013): individuals could be included in the sample each year or they could move in and out of the data set. The inclusion to the sample each year was based on three criteria: being alive, age and residence status in Finland. The number of individuals may thus differ between the years. In all sub-studies, the sample data were representative of Finns of a given age limit at the end of each year.

In this study, data on sickness absence were based on information on reimbursed sickness allowance episodes obtained from the registers of Kela. By definition, this study examined sickness absence episodes of over 10 working days on the basis of the receipt of sickness allowance, i.e. at least one allowance day. The focus was on the regular sickness allowance, and the receipt of partial sickness allowance was not included in the study. The register data on sickness absence episodes included information on beginning and ending dates of each sickness allowance episode. All sickness absence episodes based on the receipt of sickness allowance were taken into account regardless of how the absence episodes ended, such as return to work, a payment of rehabilitation subsidy or disability pension. The diagnostic codes (based on International Classification of Diseases 10th Revision, ICD-10) for all absence episodes were available in the registers from 2004 onwards. In sub-study I, all sickness absence episodes from 1996 to 2013 were linked to the sample data. In sub-study II, all absence episodes between the years 2005–2014 were linked to the random sample. In sub-study III, sickness absence episodes initiated during the year 2014 due to musculoskeletal diseases based on the ICD-10 diagnostic codes M00–M99 were selected and linked to the sample. For the sub-study IV, sickness absence episodes attributable to breast cancer over the period of 2005–2013 on the basis of ICD-10 code C50 were selected.

The data on occupational classes, in turn, were obtained from the registers of Statistics Finland (2018). The data were available annually for the years 1995 and 2000, and 2004 onwards.

Table 1 *The register data used in the study*

Datasets from Kela	Data from Statistics Finland
Sub-study I:	
A 70% random sample of the Finns aged 25–63 from 1995 to 2012	Data on occupational class from the years 1995, 2000 and 2004–2012
All sickness absence episodes >10 working days due to any diagnostic cause from 1996 to 2013	
Sub-study II:	
A 70% random sample of the Finns aged 25–64 from 2004 to 2013	Data on occupational class 2004–2013
All sickness absence episodes >10 working days due to different diagnostic causes from 2005 to 2014	
Sub-study III:	
A 70% random sample of the Finns aged 25–64 in 2013	Data on occupational class in 2013
Sickness absence episodes >10 working days due to musculoskeletal diseases (M00–M99) initiated in 2014	
Sub-study IV:	
A 70% random sample of the Finnish women aged 35–64 from 2004 to 2012	Data on occupational class 2004–2012
All sickness absence episodes >10 working days due to breast cancer (C50) from 2005 to 2013	

5.2 VARIABLES AND MEASUREMENTS

Sickness absence

In sub-studies I and II, sickness absence was measured through annual prevalence. This was done by taking into account both ongoing and new sickness absence episodes during a given calendar year (Hensing, 2009). The outcome was hence a binary measure, for which 1 referred to those persons having at least one sickness absence episode due to any cause or due to a specified diagnostic cause and 0 to individuals with no sickness absence episode during a given calendar year. In sub-study I, sickness absence episodes due to any diagnostic cause were assessed. In Sub-study II, the diagnoses of sickness absence were categorised into the following 10 groups on the basis of ICD-10 codes: musculoskeletal diseases (M00–M99), mental disorders (F00–F99), injuries (S00–T98), neoplasms (C00–D48), diseases of the nervous system (G00–G99), cardiovascular diseases (I00–I99), respiratory diseases (J00–J99), diseases of the digestive system (K00–K93), other diagnoses (all

other ICD-10 diagnosis codes in the data) and any diagnostic cause (any of the ICD-10 diagnosis codes in the data). In Finland, sickness allowance is paid as a compensation for work disability caused by an illness or by a home and leisure injury. Work-related and traffic injuries are compensated by insurance companies and are therefore not included in the study.

In sub-study III, sickness absence episodes attributable to musculoskeletal diseases were categorised as follows: back disorders (M40–M54), shoulder disorders (M75), osteoarthritis (M15–M19), rheumatoid arthritis (M05–M06), other musculoskeletal diseases (all other ICD-10 codes within M00–M99) and any musculoskeletal disease (any of the ICD-10 codes within M00–M99). Back disorders were further categorised into back pain (M54) and disc disorders (M50–M51). Likewise, osteoarthritis was further examined in the subgroups of knee osteoarthritis (M17) and hip osteoarthritis (M16). In sub-study III, two outcomes were used: 1) occurrence of at least one new sickness absence episode due to any cause musculoskeletal disease and due to specified diagnostic causes within musculoskeletal diseases during the year 2014 and 2) the total number of sickness absence days attributable to any cause and specified diagnostic causes with musculoskeletal diseases for those having at least one new absence episode initiated due to a given diagnostic cause. For the latter outcome, sickness absence episodes initiated during 2014 were followed until the end of each episode, i.e. at most until the end of 2015 according to the definition of long-term sickness absence in the study.

In sub-study IV, the focus was on sickness absence episodes attributable to breast cancer based on the ICD-10 code C50. Sickness absence was measured through the occurrence of new sickness absence episodes attributable to breast cancer during a given calendar year and by the mean number of absence days in an episode initiated due to breast cancer on a given calendar year over the period 2005–2013.

Occupational class

Categorisation of occupational class was based on the classification of socio-economic groups of Statistics Finland, comprising seven different categories (1989) (Statistics Finland, 2018). Since the focus in this study was on the employed population, three different categories were selected in the analyses: upper non-manual employees (including, for instance, doctors, lawyers and professors), lower non-manual employees (including, for instance, nurses, policemen and firemen) and manual workers (including, for instance, cleaners, bus drivers and cooks). Of the employed population, we excluded self-employed and farmers from the analyses; in 2013, individuals in this occupational class comprised approximately 8% of all employed women and approximately 16% of all employed men in the data. The other categories of the classification of socio-economic groups of Statistics Finland not included in the study were students, pensioners and others, such as long-term unemployed (Statistics Finland, 2018).

Age and gender

In sub-studies I and III, age was treated as a continuous independent variable. In sub-study II, age was divided into five-year age groups: 25–29, 30–34, 35–39, 40–44, 45–49, 50–54, 55-59 and 60–64 years. In sub-study IV, age was divided into six age groups: 35–39, 40–44, 45–49, 50–54, 55-59 and 60–64 years. Analyses were stratified by gender in sub-studies I–III. In sub-study IV, only women were included in the analyses.

5.3 PARTICIPANTS

The characteristics of the study population by gender and occupational class at the end of a year used in the sub-studies are presented for the years 1995, 2000 and 2012/2013 in Table 2. Throughout, the majority of female participants were lower non-manuals whereas the largest occupational class comprised manual workers among men. Among both genders, the proportions of manual workers declined and non-manual workers increased in the course of time.

Table 2 *The participants of the study by occupational class at the end of each year, n (%)*

Sub-study I	**1995**	**2004**	**2012**
Women, 25–63 years	572 246 (100)	656 880 (100)	678 603 (100)
Upper non-manual	111 525 (20)	149 489 (23)	167 348 (25)
Lower non-manual	301 600 (53)	351 592 (54)	380 261 (56)
Manual workers	159 121 (28)	155 799 (24)	130 994 (19)
Men, 25–63 years	525 698 (100)	616 985 (100)	610 238 (100)
Upper non-manual	128 485 (24)	160 141 (26)	165 831 (27)
Lower non-manual	133 850 (26)	156 777 (25)	163 703 (27)
Manual workers	263 363 (50)	300 067 (49)	280 704 (46)
Sub-study II		**2004**	**2013**
Women, 25–64 years		658 148 (100)	675 636 (100)
Upper non-manual		149 783 (23)	170 860 (25)
Lower non-manual		352 058 (53)	376 383 (56)
Manual workers		156 307 (24)	128 393 (19)
Men, 25–64 years		618 367 (100)	604 715 (100)
Upper non-manual		160 443 (26)	168 209 (28)
Lower non-manual		157 726 (25)	160 297 (26)
Manual workers		300 198 (49)	276 209 (46)
Sub-study III			**2013**
Women, 25–64 years			675 636 (100)
Upper non-manual			170 860 (25)
Lower non-manual			376 383 (56)
Manual workers			128 393 (19)
Men, 25–64 years			604 715 (100)
Upper non-manual			168 209 (28)
Lower non-manual			160 297 (26)
Manual workers			276 209 (46)
Sub-study IV		**2004**	**2012**
Women, 35–64 years		499 778 (100)	513 147 (100)
Upper non-manual		111 016 (22)	128 783 (25)
Lower non-manual		270 150 (54)	286 411 (56)
Manual workers		118 612 (24)	97 953 (19)

5.4 STATISTICAL METHODS

SAS statistical software version 9.4 was used to conduct all the analyses in sub-studies I, II and III. In sub-study IV, statistical program R version 3.3.1 was used together with SAS 9.4.

In sub-studies I and II, the magnitude of absolute and relative occupational class differences in sickness absence were analysed by the age-adjusted Slope Index of Inequality (SII) and the age-adjusted Relative Index of Inequality (RII), respectively. SII and RII are suitable for making comparisons in the magnitude of socioeconomic differences over the course of time (Mackenbach

& Kunst, 1997); they are regression based summary measures which take simultaneously into account the size and relative socioeconomic position of all the socioeconomic categories that are compared. Initially when calculating SII and RII (Shaw et al., 2007; Khang et al., 2008; Ernstsen et al., 2012), occupational classes were ordered from highest to lowest, after which the occupational class variable was transformed into a relative rank indicator by calculating the midpoint of the range of each occupational class in the cumulative distribution. The relative rank indicator values vary from 0 (the hypothetical top of the hierarchy) to 1.0 (the hypothetical bottom of the hierarchy). Then, the rank indicator was used as a continuous independent variable in the binomial models, with an identity link function for SII and a log-link function for RII (Ernstsen et al., 2012). The models were adjusted for age using age as a continuous independent variable in sub-study I and using five-year age groups in sub-study II. The resulting SII can be interpreted as the rate difference of having sickness absence between the theoretical top and the theoretical bottom of the occupational class hierarchy, with values above 0 indicating higher and values below 0 lower sickness absence in lower occupational classes compared to those in higher classes. The RII, in turn, can be interpreted as the rate ratio of having sickness absence between the hypothetical top and the hypothetical bottom of the hierarchy. RII values above 1.0 imply higher sickness absence in lower occupational classes and values below 1.0 the reverse. In sub-study I, the age-adjusted SII and RII values and their 95% confidence intervals (CI) for sickness absence due to any diagnostic cause were calculated annually for the years 1996, 2001, 2005, 2009 and 2013 due to availability of year-end data on occupational class in 1995, 2000 and 2004 and then shown at four-year intervals. In sub-study II, the corresponding figures for sickness absence by different diagnostic causes were calculated annually for the years 2005, 2008, 2011 and 2014.

Linear time trend in absolute (SII) and relative (RII) occupational class differences over time was examined in sub-studies I and II. In the second sub-study, this was done by including a calendar year and an interaction term of calendar year and the rank indicator in the abovementioned models on data with all the years, i.e. 2005–2014, pooled. In sub-study I, a generalised estimating equation (GEE) method was applied: this was done by entering a calendar year and an interaction term of calendar year and the rank indicator in the beforementioned binomial models on data with the years of 1996, 2001 and 2004–2013 pooled using SAS procedure proc genmod with an autoregressive correlation structure. This method takes into account that same individuals could be measured repeatedly during the study period (Lee et al., 2007), with an assumption of a smaller correlation between the measurements of an individual the farther in time the measurements occurred.

In sub-study III, a negative binomial hurdle model, a two-part model, was used to examine the occurrence of sickness absence and the amount of absent days due to different musculoskeletal diagnoses in the association with occupational class. At first, this model assumes that all individuals are at risk

for an event (Baughman, 2007). After the event has occurred, namely the hurdle is passed, the number of events are modelled in the second part of the model for the individuals with events (Baughman, 2007). The analyses of the third sub-study were made in two separate steps (Zuur et al., 2009): first, age-adjusted relative risks (RR) and their 95% CIs of having at least one new sickness absence episode due to different musculoskeletal diagnoses during the study period associated with occupational class were produced by a log-binomial regression. Then, a zero-truncated negative binomial model was applied to produce age-adjusted incidence rate ratios (IRR) and their 95% CIs for the number of sickness absence days associated with occupational class among those having at least one new sickness absence episode during the study period. The IRR implies how many times more (IRR above 1.0) or less (IRR below 1.0) absent days those in the occupational class in question were expected to have compared to upper non-manual employees. The models were adjusted for age using age as a continuous independent variable.

In sub-study IV, age-adjusted cumulative incidence of sickness absence and age-adjusted duration of absence due to breast cancer by occupational class were calculated annually. A direct age-standardisation method was applied using five-year age groups, with the study population of 2008 as the standard population for both measures. Cumulative incidence was presented as per 100,000 individuals at risk with 95% CIs. The population at risk for sickness absence due to breast cancer for each study year constituted of 35–64-year-old women with no ongoing sickness absence episode due to breast cancer at the turn of the year in question. Duration of absence, in turn, was reported as days with 95% CIs. It was calculated by dividing the sum of absence days in sickness absence episodes due to breast cancer by the sum of these episodes in each occupational class annually on the basis of ended episodes (Hensing et al., 1998). To illustrate, if a sickness absence episode started on a certain year and ended in the following one, all absent days of the episode in question were included in the latter year.

5.5 ETHICAL CONSIDERATIONS

This study was based solely on secondary data retrieved from national registers. Therefore, ethics approval was not required according to the Finnish law (Finnish Advisory Board on Research Integrity, 2018). Permission to use the data were obtained from Kela and Statistics Finland. Conventions of good scientific practice, data protection and information security were applied in analysing the data and in presenting the results. The fact that such a large scale and comprehensive data set was used in the study means that the results could benefit the nationwide working populations through increased knowledge of problems related to work disability and, thereby, potentially improved

targeting and planning of preventive actions by different stakeholders in the future.

6 RESULTS

6.1 SICKNESS ABSENCE BY OCCUPATIONAL CLASS

Among the study population, approximately 15% of women and 11% of men had long-term sickness absence of over 10 working days of any diagnostic cause in 1996 (Table 3). In 2013, the corresponding figures were 15% and 10%, respectively. Throughout, the prevalence of sickness absence due to any diagnostic cause was higher in lower occupational classes compared to those in higher classes. In all occupational classes, the sickness absence prevalence persisted at a relatively stable level at the end of the 1990s but increased from the beginning of the 2000s until 2005 among both genders. The upward trend was particularly prominent among female lower non-manuals. However, sickness absence prevalence decreased in all occupational classes from 2005 to 2013, reaching the lowest level in 2013 with the exception of lower non-manual employees among women. Female lower non-manuals were the only group that had a higher sickness absence prevalence in 2013 compared to the beginning of the study period.

Table 3 *Proportions of employed population with at least one long-term sickness absence episode due to any diagnostic cause by occupational class* in 1996, 2001, 2005, 2009 and 2013, %

	Women, 25–63 years					Men, 25–63 years				
	1996	2001	2005	2009	2013	1996	2001	2005	2009	2013
Upper non-manual	10.1	10.6	11.4	10.5	9.7	6.2	6.2	6.9	6.5	6.0
Lower non-manual	13.8	14.7	17.2	16.1	15.6	9.0	9.0	10.3	9.6	9.0
Manual workers	19.8	19.8	21.5	19.1	18.2	14.4	14.8	16.3	14.1	13.5
All	14.7	15.2	16.9	15.4	14.7	11.0	11.2	12.3	10.8	10.2

Table 4 presents the proportions of persons with long-term sickness absence due to eight major diagnostic causes and due to other diagnostic causes by occupational class in 2005, 2008, 2011 and 2014. Musculoskeletal diseases were the most common diagnostic cause of long-term sickness absence among the study population, with higher proportion of persons with sickness absence in lower occupational classes. In each occupational class, the proportion of both women and men with sickness absence due to any musculoskeletal disease declined from 2005 to 2014, but the decline was most prominent among manual workers.

Within musculoskeletal diseases, back disorders (1.7%), especially back pain (1.1%), comprised the most common diagnostic causes of new absence episodes among women in 2014; the next most common causes were shoulder

disorders (0.6%), osteoarthritis (0.6%) and rheumatoid arthritis (0.1%), respectively. Osteoarthritis (98 days), in particular hip osteoarthritis (119 days), disc disorders (96 days) and rheumatoid arthritis (90 days), in turn, induced the longest average lengths of absences, whereas the shortest episodes within the studied musculoskeletal diseases were caused by back pain (46 days) among women. Among men, parallel results were found as among women, however, the proportions appeared smaller and the average lengths longer compared to those of women. As for disc disorders, the proportion of individuals having at least one new sickness absence episode during 2014 (0.4%) was equal among men and women.

Mental disorders comprised the second and third most common causes of long-term sickness absence among women and men, respectively (Table 4). Contrary to musculoskeletal diseases, the proportion of persons with sickness absence due to mental disorders was highest among lower non-manual employees among both genders. Among women and men, a slight decrease in the proportions of persons with sickness absence due to mental disorders took place in all occupational classes between the years 2005 and 2014.

Injuries constituted the third most common causes of sickness absence among women and the second most common cause among men (Table 4). As with musculoskeletal diseases, the proportion of both women and men with sickness absence due to injuries was highest among manual workers and lowest among upper non-manual employees. A slight decrease in the proportions took place among both female and male manual workers from 2005 to 2014.

With regard to the remainder of the diagnostic causes, low proportions of persons having long-term sickness absence due to each of these causes, i.e. up to approximately one per cent, were found among both women and men (Table 4). In general, higher proportion of persons with sickness absence in lower occupational class was found across the remaining diagnostic causes, with the exception of neoplasms and, for women, respiratory diseases in 2014.

Table 4 *Proportions of employed population with at least one long-term sickness absence episode due to different diagnostic causes by occupational class in 2005, 2008, 2011 and 2014, %*

	Women, 25–64 years				Men, 25–64 years			
	2005	2008	2011	2014	2005	2008	2011	2014
	Musculoskeletal							
Upper non-manual	2.5	2.4	2.4	2.1	1.5	1.7	1.5	1.4
Lower non-manual	5.8	5.9	5.8	5.3	3.0	3.1	3.1	2.7
Manual workers	9.9	9.5	9.3	8.3	7.1	6.8	6.2	5.5
All	6.0	5.9	5.6	5.0	4.6	4.5	4.1	3.6
	Mental							
Upper non-manual	2.9	2.8	2.4	2.3	1.4	1.4	1.1	1.0
Lower non-manual	3.5	3.5	3.2	3.1	1.8	1.9	1.6	1.5
Manual workers	3.3	3.2	2.7	2.6	1.7	1.6	1.3	1.2
All	3.3	3.3	2.9	2.8	1.6	1.6	1.3	1.2
	Injuries							
Upper non-manual	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Lower non-manual	1.8	1.9	1.9	1.9	2.0	2.0	2.0	2.0
Manual workers	2.3	2.3	2.3	2.2	3.3	3.1	3.0	2.8
All	1.8	1.8	1.8	1.8	2.4	2.3	2.3	2.1
	Neoplasms							
Upper non-manual	0.9	0.9	0.9	0.9	0.3	0.3	0.4	0.3
Lower non-manual	1.0	0.9	0.9	0.9	0.3	0.4	0.4	0.4
Manual workers	0.9	0.9	0.9	0.9	0.4	0.4	0.4	0.4
All	0.9	0.9	0.9	0.9	0.4	0.4	0.4	0.4
	Nervous system							
Upper non-manual	0.4	0.4	0.4	0.4	0.2	0.2	0.2	0.2
Lower non-manual	0.7	0.7	0.7	0.7	0.4	0.4	0.3	0.3
Manual workers	1.3	1.2	1.2	1.1	0.7	0.6	0.6	0.7
All	0.8	0.8	0.8	0.7	0.5	0.5	0.4	0.4
	Cardiovascular							
Upper non-manual	0.6	0.5	0.4	0.3	0.7	0.6	0.5	0.5
Lower non-manual	0.9	0.7	0.6	0.5	0.8	0.7	0.6	0.5
Manual workers	1.1	0.9	0.7	0.7	1.1	1.0	0.9	0.8
All	0.9	0.7	0.6	0.5	0.9	0.8	0.7	0.6
	Respiratory							
Upper non-manual	0.8	0.8	1.1	0.8	0.5	0.4	0.5	0.4
Lower non-manual	1.1	1.0	1.4	1.0	0.7	0.6	0.7	0.5
Manual workers	1.2	1.0	1.2	0.9	0.9	0.8	0.9	0.6
All	1.1	1.0	1.2	0.9	0.7	0.6	0.7	0.5
	Digestive system							
Upper non-manual	0.5	0.5	0.5	0.4	0.7	0.6	0.5	0.5
Lower non-manual	0.7	0.6	0.6	0.6	0.8	0.7	0.7	0.7
Manual workers	0.7	0.6	0.6	0.6	1.1	0.9	0.9	0.9
All	0.7	0.6	0.6	0.6	0.9	0.8	0.8	0.7
	Other diagnoses							
Upper non-manual	2.4	2.1	2.0	1.8	0.8	0.7	0.7	0.6
Lower non-manual	3.1	2.9	2.8	2.7	1.1	1.0	0.9	0.9
Manual workers	3.1	2.8	2.6	2.5	1.6	1.5	1.3	1.2
All	2.9	2.7	2.6	2.4	1.3	1.1	1.0	0.9

6.2 OCCUPATIONAL CLASS DIFFERENCES IN ALL-CAUSE SICKNESS ABSENCE: MAGNITUDE OF AND CHANGES OVER TIME (I)

Sub-study I examined the magnitude of and changes over time in absolute and relative occupational class differences in all-cause sickness absence. Between 1996 and 2013, a yearly prevalence of long-term sickness absence was assessed separately for both women and men. All analyses were adjusted for age.

Clear hierarchical absolute occupational class differences in all-cause sickness absence were found among both genders (Table 5, part A). The magnitude of absolute occupational class differences measured by SII remained fairly stable during the study period. Among women, the age-adjusted SII value showed 11 percentage points higher sickness absence prevalence among manual workers compared to upper non-manual employees both in 1996 (SII 0.11, 95% CI 0.11–0.12) and in 2013 (SII 0.11, 95% CI 0.11–0.12). Among men, a modest decrease in the absolute occupational class differences took place from 1996 to 2013 ($p<0.0001$): in 1996, sickness absence prevalence was 13 percentage points higher among manual workers than among upper non-manuals (SII 0.13, 95% CI 0.13–0.14), the corresponding figure being 11 percentage points in 2013 (SII 0.11, 95% CI 0.11–0.12). For both genders, absolute occupational class differences widened transiently in 2005 in coincidence with a peaking sickness absence prevalence in the mid-2000s.

Large relative occupational class differences in all-cause sickness absence were found during the study period, especially among men (Table 5, part B). The magnitude of relative occupational class differences measured by RII decreased, however, among both women ($p<0.0001$) and men ($p<0.0001$) over time. Among women, the age-adjusted RII value declined from 2.29 (95% CI 2.23–2.34) to 2.10 (95% CI 2.06–2.15) between 1996 and 2013. For men, the corresponding figures were 3.98 (95% CI 3.85–4.11) and 3.45 (95% CI 3.34–3.55), respectively. The decreasing trend in the relative class differences levelled off, however, towards the end of the study period.

Table 5 *Absolute (SII) and relative (RII) occupational class differences in all-cause sickness absence*

	1996	2001	2005	2009	2013	p for trend
A) Slope Index of Inequality (SII)[1]						
Women						
SII	0.11	0.11	0.12	0.11	0.11	0.1874
95% CI	0.11, 0.12	0.11, 0.11	0.12, 0.13	0.11, 0.11	0.11, 0.12	
Men						
SII	0.13	0.13	0.15	0.12	0.11	<0.0001
95% CI	0.13, 0.14	0.13, 0.14	0.14, 0.15	0.11, 0.12	0.11, 0.12	
B) Relative Index of Inequality (RII)[2]						
Women						
RII	2.29	2.14	2.09	2.02	2.10	<0.0001
95% CI	2.23, 2.34	2.09, 2.19	2.05, 2.13	1.98, 2.06	2.06, 2.15	
Men						
RII	3.98	4.00	3.79	3.33	3.45	<0.0001
95% CI	3.85, 4.11	3.88, 4.12	3.69, 3.90	3.24, 3.43	3.34, 3.55	

[1]Slope Index of Inequality, by log-binomial regression using an identity link function
[2]Relative Index of Inequality, by log-binomial regression using a logarithmic link function
CI=confidence interval

6.3 OCCUPATIONAL CLASS DIFFERENCES IN DIAGNOSIS-SPECIFIC SICKNESS ABSENCE

6.3.1 MAGNITUDE OF AND CHANGES OVER TIME BY MAJOR DIAGNOSTIC CAUSES (II)

Sub-study II examined the magnitude of and changes over time in absolute and relative occupational class differences in diagnosis-specific sickness absence. A yearly prevalence of sickness absence was used as the outcome, diagnostic categories comprising musculoskeletal diseases, mental disorders, injuries, neoplasms, diseases of the nervous system, cardiovascular diseases, respiratory diseases, diseases of the digestive system, other diagnoses (all other ICD-10 diagnosis codes in the data) and any diagnostic cause (any of the ICD-10 diagnosis codes in the data). The study period covered the years from 2005 to 2014. All analyses were stratified by sex and adjusted for age.

Among women, the magnitude of absolute occupational class differences measured by SII was by far the largest in sickness absence due to musculoskeletal diseases (Table 6, part A). A decreasing trend in the absolute class differences took place during the study period: the age-adjusted SII for sickness absence due to musculoskeletal diseases appeared smaller in 2014 (SII 0.07, 95% CI 0.06–0.07) than in 2005 (SII 0.08, 95% CI 0.07–0.08) ($p<0.0001$). In contrast, modest and stable absolute occupational class

differences were found in sickness absence attributable to mental disorders and injuries. Of the remaining diagnostic causes, small or non-existent absolute occupational class differences in sickness absence were found throughout the study period among women.

Reflecting the results concerning the absolute class differences, the magnitude of relative occupational class differences measured by RII was by far the largest in sickness absence due to musculoskeletal diseases among women (Table 6, part B). The age-adjusted RII was marginally smaller in 2014 (RII 4.88, 95% CI 4.68–5.08) than nine years earlier (2005: RII 4.99, 95% CI 4.80–5.18), but the change was not confirmed to be statistically significant ($p = 0.0570$). As for mental disorders and injuries, the relative class differences were modest among women and no major changes took place over time. Of the remaining diagnostic causes, large relative class differences were found in sickness absence due to diseases of the nervous system: the age-adjusted RII declined between 2005 (RII 4.70, 95% CI 4.23–5.23) and 2014 (RII 3.62, 95% CI 3.24–4.05) ($p=0.0002$). As for cardiovascular diseases, clear hierarchical relative occupational class differences were found, with a modest increase in the class differences taking place over time ($p=0.0227$).

Among men, absolute occupational class differences in sickness absence measured by SII were also largest in musculoskeletal diseases (Table 7, part A). The age-adjusted SII by 2014 (SII 0.06, 95% CI 0.05–0.06) appeared smaller than the corresponding figure in 2005 (SII 0.08, 95% CI 0.07–0.08), hence showing a tendency of decline over time in the magnitude of absolute class differences in sickness absence attributable to musculoskeletal diseases ($p<0.0001$). With regard to injuries, the second largest absolute class differences were found, with no major changes over time. Absolute occupational class differences in sickness absence due to mental disorders, in turn, remained non-existent throughout the study period. Of the remaining diagnostic causes, modest or non-existent absolute class differences were found among men.

Among men, relative occupational class differences in sickness absence measured by RII appeared by far the largest in musculoskeletal diseases (Table 7, part B). Despite of a 23-per-cent decline in the age-adjusted RII from 2005 (RII 10.77, 95% CI 10.20–11.37) to 2014 (RII 8.54, 95% CI 8.06–9.05) ($p<0.0001$), the relative class differences remained very large throughout the study period. As with musculoskeletal diseases, notable relative class differences were found also in sickness absence due to injuries in spite of a declining trend over time ($p<0.0001$). In contrast, the smallest relative class differences among men appeared in mental disorders, with no major changes over time. Of the remaining diagnostic causes, large and stable relative class differences were found in sickness absence due to diseases of the nervous system, hence reflecting the results concerning women. As for cardiovascular diseases, clear hierarchical relative occupational class differences were found also among men throughout the study period.

Table 6 *Absolute (SII) and relative (RII) occupational class differences in sickness absence by diagnostic causes, women*

Diseases	2005	2008	2011	2014	p for trend
			A) Slope Index of Inequality (SII)[1]		
Any cause	0.12 (0.12, 0.13)	0.12 (0.11, 0.12)	0.12 (0.12, 0.12)	0.11 (0.11, 0.12)	< 0.0001
Musculoskeletal	0.08 (0.07, 0.08)	0.08 (0.07, 0.08)	0.07 (0.07, 0.07)	0.07 (0.06, 0.07)	< 0.0001
Mental	0.01 (0.00, 0.01)	0.01 (0.00, 0.01)	0.01 (0.01, 0.01)	0.01 (0.01, 0.01)	0.5135
Injuries	0.01 (0.01, 0.01)	0.01 (0.01, 0.01)	0.01 (0.01, 0.02)	0.01 (0.01, 0.01)	0.8005
Neoplasms	0.00 (0.00, 0.00)	0.00 (0.00, 0.00)	0.00 (0.00, 0.00)	0.00 (0.00, 0.00)	0.4891
Nervous system	0.01 (0.01, 0.01)	0.01 (0.01, 0.01)	0.01 (0.01, 0.01)	0.01 (0.01, 0.01)	< 0.0001
Cardiovascular	0.00 (0.00, 0.01)	0.00 (0.00, 0.00)	0.00 (0.00, 0.00)	0.00 (0.00, 0.00)	< 0.0001
Respiratory	0.00 (0.00, 0.01)	0.00 (0.00, 0.00)	0.00 (0.00, 0.00)	0.00 (0.00, 0.00)	< 0.0001
Digestive system	0.00 (0.00, 0.00)	0.00 (0.00, 0.00)	0.00 (0.00, 0.00)	0.00 (0.00, 0.00)	0.6261
Other diagnoses	0.01 (0.01, 0.01)	0.01 (0.01, 0.01)	0.01 (0.01, 0.01)	0.01 (0.01, 0.01)	0.9142
			B) Relative Index of Inequality (RII)[1]		
Any cause	2.12 (2.08, 2.16)	2.08 (2.04, 2.13)	2.09 (2.05, 2.14)	2.12 (2.08, 2.17)	0.8737
Musculoskeletal	4.99 (4.80, 5.18)	4.67 (4.50, 4.84)	4.67 (4.50, 4.85)	4.88 (4.68, 5.08)	0.0570
Mental	1.18 (1.12, 1.24)	1.19 (1.14, 1.25)	1.24 (1.18, 1.31)	1.26 (1.19, 1.33)	0.2494
Injuries	2.21(2.07, 2.37)	2.08 (1.95, 2.28)	2.08 (1.94, 2.22)	2.04 (1.91, 2.19)	0.2226
Neoplasms	1.00 (0.91, 1.10)	0.89 (0.81, 0.98)	0.98 (0.89, 1.08)	0.96 (0.87, 1.05)	0.8106
Nervous system	4.70 (4.23, 5.23)	4.08 (3.67, 4.54)	3.87 (3.47, 4.31)	3.62 (3.24, 4.05)	0.0002
Cardiovascular	2.10 (1.90, 2.32)	2.13 (1.90, 2.37)	2.00 (1.77, 2.25)	2.59 (2.27, 2.96)	0.0227
Respiratory	1.49 (1.36, 1.63)	1.34 (1.22, 1.47)	1.18 (1.08, 1.28)	1.15 (1.04, 1.27)	< 0.0001
Digestive system	1.43 (1.27, 1.60)	1.46 (1.29, 1.64)	1.42 (1.26, 1.60)	1.56 (1.38, 1.76)	0.6433
Other diagnoses	1.38 (1.31, 1.45)	1.43 (1.36, 1.52)	1.44 (1.36, 1.52)	1.53 (1.44, 1.62)	0.0042

[1]Age-adjusted; age was classified into 5-year age groups.
95% confidence intervals are shown in parentheses.

Table 7 *Absolute (SII) and relative (RII) occupational class differences in sickness absence by diagnostic causes, men*

Diseases	2005	2008	2011	2014	p for trend
			A) Slope Index of Inequality (SII)[1]		
Any cause	0.14 (0.14, 0.15)	0.13 (0.13, 0.14)	0.12 (0.12, 0.13)	0.11 (0.11, 0.12)	< 0.0001
Musculoskeletal	0.08 (0.07, 0.08)	0.07 (0.07, 0.07)	0.06 (0.06, 0.06)	0.06 (0.05, 0.06)	< 0.0001
Mental	0.00 (0.00, 0.01)	0.00 (0.00, 0.00)	0.00 (0.00, 0.00)	0.00 (0.00, 0.00)	0.1907
Injuries	0.03 (0.03, 0.03)	0.03 (0.03, 0.03)	0.03 (0.03, 0.03)	0.03 (0.02, 0.03)	< 0.0001
Neoplasms	0.00 (0.00, 0.00)	0.00 (0.00, 0.00)	0.00 (0.00, 0.00)	0.00 (0.00, 0.00)	0.1079
Nervous system	0.01 (0.01, 0.01)	0.01 (0.01, 0.01)	0.01 (0.01, 0.01)	0.01 (0.01, 0.01)	0.0032
Cardiovascular	0.00 (0.00, 0.00)	0.00 (0.00, 0.00)	0.00 (0.00, 0.00)	0.00 (0.00, 0.00)	< 0.0001
Respiratory	0.01 (0.01, 0.01)	0.01 (0.00, 0.01)	0.01 (0.01, 0.01)	0.00 (0.00, 0.00)	< 0.0001
Digestive system	0.01 (0.01, 0.01)	0.01 (0.00, 0.01)	0.01 (0.00, 0.01)	0.01 (0.01, 0.01)	0.2039
Other diagnoses	0.01 (0.01, 0.01)	0.01 (0.01, 0.01)	0.01 (0.01, 0.01)	0.01 (0.01, 0.01)	< 0.0001
			B) Relative Index of Inequality (RII)[1]		
Any cause	3.76 (3.66, 3.87)	3.62 (3.52, 3.72)	3.51 (3.41, 3.61)	3.51 (3.40, 3.62)	< 0.0001
Musculoskeletal	10.77 (10.20, 11.37)	9.27 (8.82, 9.80)	8.33 (7.89, 8.79)	8.54 (8.06, 9.05)	< 0.0001
Mental	1.22 (1.13, 1.31)	1.13 (1.06, 1.22)	1.22 (1.13, 1.32)	1.22 (1.12, 1.33)	0.7980
Injuries	4.46 (4.17, 4.77)	4.07 (3.81, 4.35)	3.83 (3.59, 4.10)	3.53 (3.29, 3.78)	< 0.0001
Neoplasms	1.66 (1.42, 1.94)	1.42 (1.22, 1.65)	1.41 (1.22, 1.64)	1.39 (1.19, 1.62)	0.0081
Nervous system	5.95 (5.08, 6.97)	5.62 (4.81, 6.56)	6.23 (5.31, 7.32)	6.55 (5.57, 7.71)	0.6117
Cardiovascular	2.45 (2.21, 2.71)	2.59 (2.32, 2.88)	2.62 (2.34, 2.94)	2.62 (2.32, 2.96)	0.3322
Respiratory	2.65 (2.36, 2.98)	2.63 (2.33, 2.98)	2.35 (2.10, 2.63)	2.21 (1.93, 2.53)	0.0329
Digestive system	1.95 (1.76, 2.16)	2.14 (1.92, 2.38)	2.16 (1.94, 2.42)	2.38 (2.12, 2.67)	0.0125
Other diagnoses	2.92 (2.67, 3.19)	3.07 (2.80, 3.36)	2.78 (2.52, 3.01)	2.66 (2.41, 2.95)	0.5200

[1]Age-adjusted; age was classified into 5-year age groups.
95% confidence intervals are shown in parentheses.

6.3.2 SICKNESS ABSENCE DUE TO MUSCULOSKELETAL DIAGNOSES (III)

Sub-study III examined occupational class differences in long-term sickness absence due to specific musculoskeletal diagnoses. Sickness absence episodes due to musculoskeletal diagnoses initiated during 2014 were followed until the end of an episode. Both the occurrence and length of absence were examined using a negative binomial hurdle model in the third sub-study. Analyses were adjusted for age and conducted separately for women and men.

Among women, clear hierarchical occupational class differences were found both in the occurrence and length of sickness absence due to different musculoskeletal diagnoses (Table 8). Lower occupational class was consistently associated both with higher relative risk of having at least one new sickness absence episode and more sickness absence days due to any musculoskeletal disease as well as due to specific musculoskeletal diagnoses compared to those in higher occupational classes. The magnitude of the class differences varied, however, between the diagnostic causes. With regard to results concerning the occurrence of absence, the class differences were particularly large in shoulder disorders, back disorders and knee osteoarthritis. The smallest class differences, in turn, were found in sickness absence due to hip osteoarthritis and disc disorders. The results regarding length of absence showed somewhat different results. Large occupational class differences were found in rheumatoid arthritis, disc disorders and knee osteoarthritis: manual workers, for instance, were expected to have 78% (IRR 1.78, 95% CI 1.34–2.37), 55% (IRR 1.55, 95% CI 1.37–1.74) and 35% (IRR 1.35, 95% CI 1.17–1.55) more sickness absence days due to abovementioned diagnoses, respectively, than upper non-manual employees. The smallest class differences in length of absence, in turn, were found in back pain, shoulder disorders and hip osteoarthritis among women.

Among men, the results showed also clear hierarchical occupational class differences both in the occurrence and length of absence due to any musculoskeletal disease and across specified musculoskeletal diagnoses, with variations in the magnitude of the class differences by specific diagnoses (Table 8). The class differences in the occurrence of absence were largest in shoulder disorders and back pain and also in rheumatoid arthritis among men. In line with results regarding female employees, smallest class differences in the occurrence of absence were found in hip osteoarthritis and disc disorders. With regard to length of absence among men, the largest class differences were found in rheumatoid arthritis, hip osteoarthritis and disc disorders: manual workers were expected to have 129% (IRR 2.29, 95% CI 1.21–4.33), 79% (IRR 1.79, 95% CI 1.54–2.10) and 77% (IRR 1.77, 95% CI 1.59–1.98) more sickness absence days, respectively, than upper non-manual employees. The class

differences in length of absence were smallest in back pain, thus reflecting the results concerning women.

Table 8 *Age-adjusted relative risks (RR) of a new sickness absence episode and incidence rate ratios (IRR) for the number of sickness absence days by occupational class*

	Women, aged 25–64				Men, aged 25–64			
Occupational class	RR[1]	95% CI	IRR[2]	95% CI	RR[1]	95% CI	IRR[2]	95% CI
	All musculoskeletal diseases (M00–M99)							
Upper non-manual	1.00		1.00		1.00		1.00	
Lower non-manual	2.41	2.32–2.50	1.18	1.14–1.22	2.12	2.01–2.23	1.18	1.12–1.24
Manual workers	3.71	3.57–3.86	1.29	1.24–1.34	4.04	3.86–4.23	1.36	1.30–1.42
	All back disorders (M40–M54)							
Upper non-manual	1.00		1.00		1.00		1.00	
Lower non-manual	2.53	2.39–2.69	1.14	1.08–1.21	2.17	2.00–2.36	1.16	1.07–1.27
Manual workers	3.33	3.13–3.55	1.23	1.16–1.31	4.04	3.76–4.35	1.31	1.22–1.41
	Back pain (M54)							
Upper non-manual	1.00		1.00		1.00		1.00	
Lower non-manual	3.11	2.86–3.37	1.11	1.03–1.19	2.68	2.36–3.04	1.10	0.98–1.24
Manual workers	4.26	3.90–4.65	1.26	1.17–1.36	5.64	5.04–6.30	1.24	1.12–1.38
	Disc disorders (M50–M51)							
Upper non-manual	1.00		1.00		1.00		1.00	
Lower non-manual	1.72	1.54–1.93	1.27	1.15–1.41	1.80	1.57–2.07	1.43	1.26–1.62
Manual workers	1.97	1.73–2.23	1.55	1.37–1.74	2.73	2.42–3.09	1.77	1.59–1.98
	Shoulder disorders (M75)							
Upper non-manual	1.00		1.00		1.00		1.00	
Lower non-manual	3.13	2.79–3.53	1.22	1.09–1.37	2.53	2.15–2.98	1.22	1.06–1.42
Manual workers	6.06	5.37–6.84	1.29	1.15–1.44	6.35	5.51–7.30	1.38	1.22–1.57
	All osteoarthritis (M15–M19)							
Upper non-manual	1.00		1.00		1.00		1.00	
Lower non-manual	1.88	1.71–2.08	1.31	1.20–1.44	1.85	1.62–2.12	1.18	1.04–1.33
Manual workers	3.06	2.75–3.39	1.42	1.29–1.56	2.91	2.60–3.27	1.46	1.31–1.61
	Knee osteoarthritis (M17)							
Upper non-manual	1.00		1.00		1.00		1.00	
Lower non-manual	1.85	1.61–2.12	1.26	1.11–1.44	2.15	1.75–2.64	1.15	0.94–1.40
Manual workers	3.01	2.60–3.49	1.35	1.17–1.55	3.80	3.18–4.55	1.50	1.27–1.78
	Hip osteoarthritis (M16)							
Upper non-manual	1.00		1.00		1.00		1.00	
Lower non-manual	1.40	1.14–1.72	1.28	1.09–1.51	1.35	1.06–1.73	1.39	1.16–1.67
Manual workers	1.66	1.31–2.10	1.29	1.07–1.56	1.58	1.28–1.95	1.79	1.54–2.10
	Rheumatoid arthritis (M05–M06)							
Upper non-manual	1.00		1.00		1.00		1.00	
Lower non-manual	2.24	1.70–2.94	1.40	1.08–1.82	3.52	1.72–7.21	2.09	1.05–4.14
Manual workers	2.79	2.06–3.78	1.78	1.34–2.37	4.00	2.05–7.79	2.29	1.21–4.33
	Other musculoskeletal diseases							
Upper non-manual	1.00		1.00		1.00		1.00	
Lower non-manual	2.38	2.23–2.53	1.09	1.03–1.15	2.11	1.91–2.32	1.14	1.04–1.24
Manual workers	3.98	3.73–4.25	1.20	1.13–1.27	4.25	3.91–4.62	1.27	1.18–1.36

[1]Log-binomial regression
[2]Zero-truncated negative binomial regression
CI=confidence interval

6.3.3 SICKNESS ABSENCE DUE TO BREAST CANCER OVER TIME (IV)

The fourth sub-study examined occupational class differences in sickness absence due to breast cancer among employed Finnish women. Annual age-adjusted cumulative incidence and duration of absence were assessed by occupational class from 2005 to 2013.

Occupational class was positively associated with cumulative incidence of sickness absence due to breast cancer: the higher the class, the greater the cumulative incidence (Figure 1). This result is opposite to the beforementioned findings shown in the present study. Among upper non-manual employees, the age-adjusted annual cumulative incidence ranged from 314 to 384 per 100,000 persons during the study period. The corresponding figures among lower non-manuals and manual workers were between 295 and 318 per 100,000 persons and between 208 and 268 per 100,000 persons, respectively, with significant differences between all of the classes over time. Throughout the study period, the class differences in the cumulative incidence remained relatively stable. In 2009, however, a transient dip in the incidence took place among manual workers, whereas the opposite occurred among upper non-manual employees.

In contrast to the results regarding cumulative incidence, occupational class was shown to be inversely associated with duration of absence: the lower the class, the longer the duration of absence due to breast cancer (Figure 2). Among manual workers, the duration of absence ranged from 150 days (95% CI 149–152 days) to 173 days (95% CI 171–175 days) during the study period. The corresponding figures varied between 134 days (95% CI 133–135 days) and 153 days (95% CI 152–154 days) among lower non-manuals and between 114 days (95% CI 113–116 days) and 140 days (95% CI 138–141 days) among upper non-manual employees. The class differences in the duration of absence were significant throughout the study period, except in 2007, when the duration of absence was equally long among lower and upper non-manual employees.

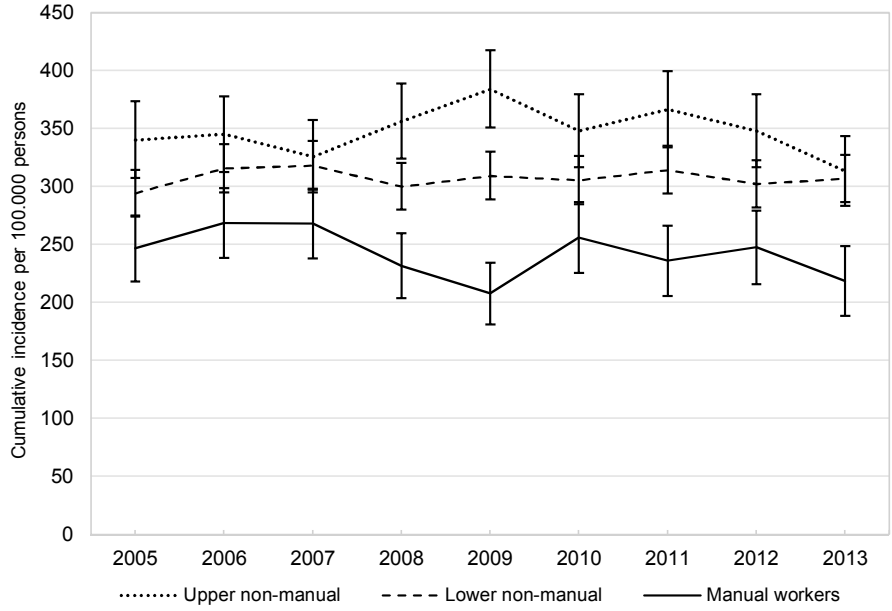

Figure 1 Age-adjusted annual cumulative incidence of sickness absence due to breast cancer by occupational class among Finnish women aged 35–64 years from 2005 to 2013

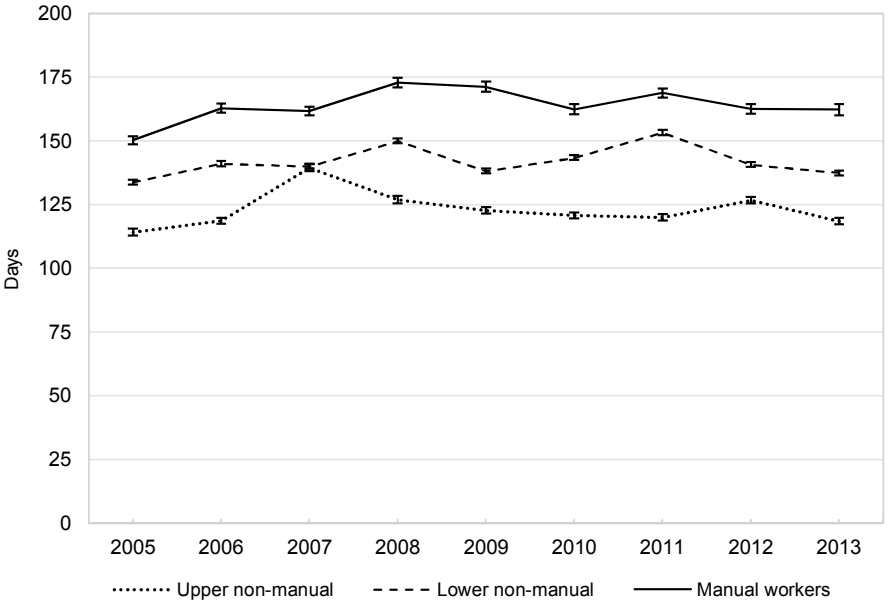

Figure 2 Age-adjusted annual duration of absence due to breast cancer by occupational class among Finnish women aged 35–64 years from 2005 to 2013

7 DISCUSSION

7.1 MAIN RESULTS OF THE STUDY

This study examined occupational class differences in all-cause and diagnosis-specific sickness absence of over 10 working days and changes over time in these differences among women and men in the Finnish employed population. The study period spanned the years between 1996 and 2014, the diagnosis-specific examination covering the years 2005–2014. The main results of the study can be summarized as follows.

First, occupational class differences in all-cause sickness absence, both in absolute and relative terms, were clear and persisted among women and men over time. The gradient appeared consistent across the occupational classes: the lower the class, the more the sickness absence. Throughout, men had larger occupational class differences in all-cause sickness absence than women.

Second, minor annual variation took place in the class differences in all-cause sickness absence during the study period. Absolute occupational class differences widened transiently in 2005 after which they restored the preceding level among women and continued to narrow towards the end of the study period among men. Among both genders, a narrowing trend over time in the relative occupational class differences in all-cause sickness absence was found but the trend levelled off between the years 2009 and 2013.

Third, by far the largest occupational class differences were found in sickness absence due to musculoskeletal diseases, i.e. the most common diagnostic causes of sickness absence, among both genders. Lower occupational class was consistently associated with higher sickness absence across the occupational classes. The relative class differences were particularly large among men. Among both genders, the magnitude of the class differences varied, however, between different musculoskeletal diagnoses and between the measures of absence. The class differences in the occurrence of absence were greatest in shoulder disorders and back pain. The class differences in the length of absence, in turn, appeared largest in rheumatoid arthritis, disc disorders and, among men, also in hip osteoarthritis. Between the years 2005 and 2014, a narrowing trend in absolute occupational class differences among both genders and also in relative class differences among men was found in sickness absence due to musculoskeletal diseases of any cause.

Fourth, large occupational class differences appeared in sickness absence due to home and leisure injuries, the third and second most common diagnostic cause of long-term sickness absence among women and men, respectively. Among men, the class differences were particularly large. There were stable absolute occupational class differences over time among both

genders. However, among men, the relative class differences showed a narrowing tendency over time.

Fifth, occupational class differences were small in sickness absence due to mental disorders, the second and third most common diagnostic cause of sickness absence among women and men, respectively. Absolute differences appeared negligible among men and modest among women, and no significant changes in relative differences took place over time. Among men, the relative class differences remained smallest in sickness absence due to mental disorders throughout the study period. With regard to neoplasms, diseases of the nervous system, cardiovascular diseases, respiratory diseases and diseases of the digestive system, sickness absence prevalence was at most 1% annually, and the absolute class differences appeared negligible over the course of time. Large relative occupational class differences were, however, found in diseases of the nervous system. These differences were larger for men than for women and remained stable over time.

Sixth, within neoplasms, a diagnosis-specific examination regarding breast cancer revealed hierarchical occupational class differences in sickness absence, but in contrast to the abovementioned results, higher occupational class was found to be associated with higher cumulative incidence of absence due to breast cancer across the classes over time. The duration of absence, in turn, showed an inverse gradient: the higher the class, the shorter the duration of absence due to breast cancer across the classes. The class differences according to both measures of absence remained largely stable throughout the study period.

7.2 COMPARISONS AND INTERPRETATION OF THE FINDINGS

Occupational class differences in all-cause sickness absence

Several previous studies have shown clear hierarchical occupational class differences in all-cause sickness absence in employed populations across different countries (North et al., 1993; Vahtera et al., 1999; Fuhrer et al., 2002; Moncada et al., 2002; Morikawa et al., 2004; Melchior et al., 2005; Piha et al., 2007; Christensen et al., 2008; Hansen & Ingebrigtsen, 2008; Niedhammer et al., 2008; Laaksonen et al., 2010b; Piha et al., 2010; Löve et al., 2013; Sumanen et al., 2017): the lower the class, the more the sickness absence. This study corroborates the previous findings. Consistent hierarchical occupational class differences in long-term sickness absence due to any diagnostic cause were found across the occupational classes among both women and men throughout the study period. Unlike previous studies conducted mainly on specific work sector or workplace samples, the present study was able to provide evidence on occupational class differences in sickness absence in a nationwide working-age employed population covering a full range of

different occupations. Moreover, the results were shown to be compatible using both absolute and relative measures, which is rarely done in previous studies (King et al., 2012). The class differences were found to be larger among men than among women; this finding echoes the results of previous studies examining occupational class differences in all-cause sickness absence (Christensen et al., 2008; Laaksonen et al., 2010b; Löve et al., 2013).

Changes over time in occupational class differences in all-cause sickness absence

There are only few previous studies examining changes over time in occupational class differences in all-cause sickness absence (Piha et al., 2007; Johansen et al., 2009; Sumanen et al., 2015a; Sumanen et al., 2017). The present study provides new insights into changes over time in occupational class differences in all-cause sickness absence in a nationwide working-age employed population covering a period of nearly 20 years.

Modest annual variation was observed in occupational class differences in all-cause sickness absence during the study period. In 2005, a transient widening in the absolute class differences took place in coincidence with increasing sickness absence prevalence in all studied occupational classes during the early 2000s. The increase in the prevalence coincided with an economic upturn and declining unemployment rate, hence, reflecting the earlier findings of procyclical nature of sickness absence (Pichler, 2015). Two main mechanisms have been suggested for this phenomenon: first, labour force composition may alter as a consequence employment of individuals with poor health (labour force composition effect), and second, absence behaviour of employees may also change due to less fear of job loss (moral hazard effect) during economic upturns with low unemployment rate, and vice versa (Pichler, 2015). The increase in sickness absence prevalence in the present study was most pronounced among lower non-manual employees, particularly among women, which largely explained the result. A similar trend has been previously reported in short, 1-to 3-days-long sickness absence among Finnish municipal lower non-manuals (Sumanen et al., 2015b), who were also shown to have more short sickness absence than other socioeconomic groups (Sumanen et al., 2015a; Sumanen et al., 2015b). Among female lower non-manuals, especially practical nurses, healthcare assistants and childminders were more prone to short sickness absence than, for instance, clerical employees in this group of municipal workers (Sumanen et al., 2015a). This finding may relate to many jobs in health care and social services that are physically but also mentally demanding (Sumanen et al., 2015a). Among nurses, for instance, job strain has been previously shown to associate with sickness absence (Bourbonnais & Mondor, 2001).

After 2005, all-cause sickness absence turned into a decrease in all occupational classes and, between 2006 and 2009, the decline was most marked among manual workers. Consequently, the absolute class differences

were shown to restore the preceding level among women and continue to decrease towards the end of the study period among men. After 2008, an economic downturn took place in Finland (Statistics Finland, 2017a), resulting in a growing unemployment rate (Statistics Finland, 2017b). This may have caused a more pronounced decrease in sickness absence among manual workers due to a greater fear of job loss compared to those in higher occupational classes (Grunberg et al., 2000). A previous Finnish study among 25–59-year-old municipal employees showed also narrowing occupational class differences in 4+ days sickness absence between manual workers and non-manual employees during the period of 2002–2013 (Sumanen et al., 2015b). The temporary increase in the absolute class in the early of 2000s appeared not large enough to have an impact on the relative class differences (Moonesinghe & Beckles, 2015) in the present study; a modest narrowing trend in relative occupational class differences took place among both genders over time, although the trend levelled off by 2013. A parallel declining trend in relative occupational class differences in sickness absence has been previously found among male municipal employees (Sumanen et al., 2017).

Despite annual variation and modest developments towards narrowing class differences, occupational class differences in all-cause sickness absence remained notable in Finland during the two decades. This finding reflects the result obtained previously regarding Danish private sector employees (Johansen et al., 2009). Overall, the results of the present study showed that occupational class differences in long-term sickness absence of any diagnostic cause have been similarly hierarchical and persistent over time than socioeconomic differences in health in general in Finland as well as in many other European countries (Mackenbach et al., 2008; Hu et al., 2016). In Finland, the class differences in all-cause sickness absence persisted in spite of considerable changes in the occupational class structure during the study period. To illustrate, the proportion of manual workers declined and the proportion of non-manual employees increased in Finland during the study period, as shown in the study. Moreover, the amendments of sickness insurance legislation may have influenced the results only slightly (The Social Insurance Institution of Finland, 2016b; Blomgren, 2016), because these changes did not have any substantial impact on the study population.

Occupational class differences in diagnosis-specific sickness absence and changes over time

Across the diagnostic causes under study, occupational class differences were by far the largest in sickness absence due to musculoskeletal diseases among both women and men. This finding reflects the results of previous studies showing large occupational class differences in this particular diagnostic category (Chevalier et al., 1987; Feeney et al., 1998; Vahtera et al., 1999; Melchior et al., 2005). This study was able to show further that the findings regarding the class differences in sickness absence due to musculoskeletal

diseases were compatible using both absolute and relative measures throughout the nearly 10-year study period. The relative differences were particularly large among men. In previous studies, hierarchical occupational class differences in sickness absence have been also found across different musculoskeletal diagnoses, such as back pain (Hemingway et al., 1997; Alexopoulos et al., 2006; Bergström et al., 2007), upper limb disorders comprising several diagnoses (Wilson d'Almeida et al., 2008), shoulder/neck pain (Alexopoulos et al., 2006; Bergström et al., 2007) and osteoarthritis (Agaliotis et al., 2013). The present study revealed that, within musculoskeletal diseases, the magnitude of the class differences was diagnosis-specific, though consistent hierarchical gradients were found throughout the studied musculoskeletal diagnoses. Occupational class differences in the occurrence of sickness absence appeared most pronounced in shoulder disorders and back pain, the most common causes of absence within musculoskeletal diseases among the study population. As for the length of absence, in turn, large occupational class differences were found in sickness absence due to chronic musculoskeletal diseases, namely rheumatoid arthritis, disc disorders and, among men, also in hip osteoarthritis in the present study. This result hence corroborates the previous recommendation to use both person- and time-based measurements of sickness absence in order to shed light comprehensively on the prevailing health problem (Hensing, 2009).

Musculoskeletal diseases overall comprised the most common cause of long-term sickness absence among the Finnish employed population and, consequently, the changes in the sickness absence prevalence due to musculoskeletal diseases emulated those of all-cause sickness absence across occupational classes in 2005–2014. The present study showed that the prevalence of sickness absence due to musculoskeletal diseases declined in all occupational classes, but the decline was most prominent among manual workers during the study period. Consequently, between 2005 and 2014, both absolute and relative occupational class differences in sickness absence due to musculoskeletal diseases were shown to decline among men, and a narrowing trend in the absolute class differences were found among women.

With regard to sickness absence due to home and leisure injuries, clear hierarchical occupational class differences were also found among both genders. Previous studies have shown similar occupational class differences both in work-injury absences (Chevalier et al., 1987; Piha et al., 2013; Johannessen et al., 2015) and sickness absence due injuries of any cause (Feeney et al., 1998; Vahtera et al., 1999; Melchior et al., 2005). Among Finnish working-age population, home and leisure injuries comprise the most common injury type (Impinen et al., 2015). They constitute the third and second most common cause of long-term sickness absence for women and men, respectively. This study showed that lower occupational class was consistently associated with higher sickness absence across the occupational classes, both in absolute and relative terms. The class differences were particularly large among men, with the absolute and relative class differences

being second and third largest of the diagnostic causes under study, respectively. This study revealed, however, that the relative class differences narrowed over time among men, as sickness absence prevalence due to injuries declined among male manual workers between 2005 and 2014.

Modest occupational class differences were found in sickness absence due to mental disorders in the present study. Mental disorders were the second and third most common diagnostic cause of long-term sickness absence for women and men, respectively. This study further revealed that no major changes took place in the class differences during the nearly 10-year study period. In previous studies, the associations between occupational class and sickness absence have been heterogeneous in mental disorders, varying from reversed (Stansfeld et al., 1995; Feeney et al., 1998; Virtanen et al., 2011) and inconsistent (Melchior et al., 2005) associations to non-existent associations for some of the diagnoses (Virtanen et al., 2011). The abovementioned studies have been based on work sector or workplace samples. In this study, small occupational class differences were found in the nationwide employed population throughout the study period both in absolute and relative terms, with fairly low sickness absence prevalence occurring in all of the studied groups. The highest sickness absence prevalence due to mental disorders was, in fact, found among lower non-manuals for both women and men. Similarly, less consistent socioeconomic gradients have been previously reported in minor psychiatric disorders (Laaksonen et al., 2007).

With regard to other diagnostic causes under scrutiny, the prevalence of sickness absence was low, at most approximately one per cent annually. However, among both genders, large relative occupational class differences were found in sickness absence induced by diseases of the nervous system. This diagnostic category comprises, for instance, the most common nerve entrapment syndrome, i.e. carpal tunnel syndrome, which is a relatively common disease among a working-age population, possessing an association with physically strenuous work (Shiri et al., 2009).

With regard to sickness absence due to breast cancer among women, divergent results regarding occupational class differences were found compared to the beforementioned findings of the study. The present study revealed that, across occupational classes over time, female employees in higher classes had greater cumulative incidence but shorter duration of absence due to breast cancer. In contrast, non-manual employees have been previously found to have higher likelihood of having no sickness absence than manual employees in a study performed on a small sample of Quebecker women with breast cancer (Drolet et al., 2005). The present study was able to provide new evidence on the class differences over time using a nationally representative sample of employed women. Breast cancer is the most common cancer among women (Schnitt & Lakhani, 2014), with greater incidence of the disease occurring in higher occupational classes (see, for instance, Lundqvist et al., 2016). The result regarding the class differences in sickness absence incidence parallels the observed occupational class gradient in the disease

incidence. Breast cancer is a serious disease, consequently forcing to take absence from work at least for a while (Alexanderson & Norlund, 2004). With regard to duration of absence, the result echoes those of a previous study, showing that manual work was related to lower likelihood of return to work after breast cancer diagnosis examined in a small sample of employed women in Detroit (Bouknight et al., 2006). Duration of absence can be considered as an indicator of severity of a sickness absence episode (Borg et al., 2006). These results reflect the earlier finding demonstrating better survival from breast cancer, i.e. lower case fatality, among women in higher occupational classes (Lundqvist et al., 2016).

Potential explanations for occupational class differences in sickness absence and changes in these differences over time

Previous studies have sought explanations for occupational class differences in sickness absence and found various factors affecting the formation of the class differences. Working conditions, particularly strenuous physical work factors, have been shown to account for a major part of occupational class differences in sickness absence overall (Christensen et al., 2008; Laaksonen et al., 2010b; Löve et al., 2013) and due to musculoskeletal diseases in particular (Melchior et al., 2005). In the present study, the relative class differences in sickness absence due to musculoskeletal diseases of any cause were particularly large among men. Between women and men, occupations and working conditions may vary within specific occupational class categories (Melchior et al., 2005), which could affect the results. Within musculoskeletal diseases, work-related aetiology has been shown to relate particularly to low back pain and upper extremity disorders (Punnett & Wegman, 2004). In this study, shoulder disorders and back pain were, in fact, shown to induce the most pronounced hierarchical occupational class differences in the occurrence of absence within musculoskeletal diseases.

Over the years, physical work demands have been shown to alleviate among manual workers (Lehto & Sutela, 2009; Sutela & Lehto, 2014) and a growing awareness of occupational and safety regulations has taken place among the Finnish employed population (Lehto & Sutela, 2009). These changes may have affected, at least in part, the narrowing of occupational class differences in sickness absence overall and due to musculoskeletal diseases specifically. Mental demands of work, in turn, have been shown an increasing tendency in Finland over time, with a slight alleviation occurring in recent years (Sutela & Lehto, 2014). Previously, mentally strenuous working conditions have been found to account for a significant part of the class differences in sickness absence due to mental disorders (Melchior et al., 2005). No major changes were, however, found in occupational class differences in long-term sickness absence due to mental disorders over time in the present study.

In addition to working conditions, part of the class differences in sickness absence has been previously explained by health behaviours, such as alcohol

consumption, smoking, physical activity and weight (Christensen et al., 2008; Laaksonen et al., 2010b). Among the Finnish adult population, there exist clear hierarchical socioeconomic differences in all of the beforementioned aspects of health behaviours, except in alcohol consumption (Helldán et al., 2013); in Finland, upper non-manual employees drink alcohol most frequently, but moderate amounts, whereas manual workers report highest rates of heavy drinking and frequent intoxication (Mäkelä, 2010). Among Finnish working-age population, intoxicants, such as alcohol, are major causes of injuries (Impinen et al., 2015). The risk of alcohol-related harms has been shown to be greater in lower occupational classes compared to those in higher classes; this applies even with similar drinking patterns (Mäkelä & Paljärvi, 2008). Risk of sickness absence, in turn, has been shown to increase as a consequence of unhealthy alcohol drinking habits, such as heavy drinking and binge drinking (Salonsalmi et al., 2009). These findings may partly affect the formation of the hierarchical class differences in sickness absence due to home and leisure injuries observed in the present study. Between the years 2007 and 2014, alcohol taxation was tightened five times in Finland, which resulted in increasing alcohol price and consequently reduced consumption (National Institute for Health and Welfare, 2017). Changes in alcohol price have been previously shown to have the greatest impact on manual workers' alcohol consumption (Kendell et al., 1983) and adverse alcohol-related consequences (Herttua et al., 2008), particularly among men, which may, at least in part, affect the observed changes in the relative class differences over time among men.

Previously, occupational class differences in sickness absence have been also shown to relate partly to ill-health (Löve et al., 2013). In Finland, socioeconomic differences in health are marked: higher morbidity is associated with lower socioeconomic position, and vice versa (Koskinen et al., 2009); the socioeconomic health differences have also remained significant over time (Hu et al., 2016). As for musculoskeletal morbidity, for example, clear hierarchical class differences exist in an employed population (Aittomäki et al., 2007). This study showed that lower occupational class was consistently associated with both the occurrence and length of absence due to different musculoskeletal diseases. With regard to the length of absence, the class differences appeared most pronounced in chronic musculoskeletal conditions. Particularly for severe musculoskeletal diseases, this result may indicate even worse health status in lower occupational classes than among those in higher classes. High pain intensity, for instance, has been shown to relate to a greater risk of prolonged sickness absence attributable to musculoskeletal diseases (Lötters & Burdorf, 2006). As for breast cancer, similar findings of the class differences were found with regard to the duration of absence. Furthermore, employees in higher occupational classes have generally better opportunities to influence one's job (Lehto & Sutela, 2009) which may allow to work despite of reduced working capacity due to an illness (Doeglas et al., 1995). Ill-health may also hinder the achievement of an occupational position due to poor

educational attainment (Galobardes et al., 2006) and, therefore, affect the formation of occupational class differences in sickness absence through health-related selection (Melchior et al., 2005).

The findings of the study regarding sickness absence due to mental disorders are in accordance with prior research showing that occupational class differences in mental health (Laaksonen et al., 2007) are not necessarily as hierarchical as they are for physical health (Aittomäki et al., 2007); employees in higher classes have often the most mentally demanding jobs that cause stress and strain, which may not be the same for manual workers. Health-related selection of the employed study population as a whole, in turn, could partly play a role in the formation of the modest class differences in sickness absence induced due to mental reasons: poor mental health has been shown to increase the risk of exclusion from the labour marker, i.e. the risk of permanent work disability (Ahola et al., 2011) and unemployment (Olesen et al., 2013). This phenomenon could also account for the observed negligible changes over time. Stable occupational class differences in sickness absence due to mental reasons in the employed population could partly reflect an ongoing selection process out of the labour market as a consequence of deteriorated mental health for workers across the occupational classes.

7.3 METHODOLOGICAL CONSIDERATIONS

All the data were obtained from comprehensive and reliable national register databases in the present study. A large nationally representative random sample of working-age women and men belonging to the Finnish population at each year end were linked through personal identity code to data on occupational classes and sickness absence of over 10 working days. The data on sickness absence were obtained from a nationwide register database which covers all medically certified sickness absence episodes based on sickness allowances paid and registered by Kela; the data on sickness absence comprised hence virtually no self-report bias and missing information. Data on occupational class, i.e. upper non-manual employees, lower non-manual employees and manual workers, encompassed information on a vast variety of occupations in various sectors. Hence, the results of the study can be directly generalised to the Finnish labour force with regard to the occupational classes under study and, additionally, with caution to other countries.

Sickness absence was measured in various ways in the study; both person- and time-based measurements, i.e. sickness absence prevalence (sub-studies I and II), occurrence and length of absence (sub-study III), cumulative incidence and duration of absence (sub-study IV), were incorporated in the analyses, thereby giving a comprehensive picture of the health problem, as suggested previously (Hensing, 2009). Prevalence and cumulative incidence of absence are basic measures in epidemiological monitoring (Hensing, 2009). Occurrence of absence refers to the cases, i.e. persons with at least one new

sickness absence episode during a given study period (Hensing, 2009). Number of days being sickness absent aka length, a time-base measurement, reflects the burden of disease, for instance, in society (Hensing, 2009). Duration of absence, in turn, refers to number of absent days in sickness absence episodes, thereby indicating the severity of absence episodes (Hensing et al., 1998). In the present study, time-based measurements were not incorporated in sub-studies I and II. In sub-study II, the inclusion of a time-based sickness absence measure could have complemented the picture of the magnitude of occupational class differences over different diagnostic categories in sickness absence. To illustrate, sub-study III found that the magnitude of the class differences varied across various musculoskeletal diagnoses between the occurrence and length of absence. Previously, the choice of measures of sickness absence has been shown to influence the findings (Borg et al., 2006). Despite different measurements, however, the present study gives a consistent picture of the class differences over time, with the findings of different sub-studies complimenting the overall picture.

Furthermore, a broad range of different diagnostic causes of sickness absence could be examined in the study; however, the diagnoses were available to be analysed at most at the 3-digit level of the ICD-10 codes because of the registration practices during reimbursement of sickness allowance. Therefore, in sub-study III, some common musculoskeletal diagnoses, such as epicondylitis, could not be examined separately among the study population. Certain limitations concerning the diagnoses may arise also due to health care system. To illustrate, setting a diagnosis is not an invariably straightforward task and differential diagnostics could be occasionally challenging for doctors. In addition, there exists some variation in physicians' sick leave prescribing practices concerning, for instance, length of absence (Kankaanpää et al., 2012).

This study focused on long-term sickness absence of over 10 working days in a nationwide employed population. Shorter sickness absence episodes could not be included in the study due to lack of nationwide data on sickness absence of this kind. Based on the findings of previous Finnish studies encompassing also short absence episodes (Piha et al, 2007; Sumanen et al., 2015a; Sumanen et al., 2015b), few changes could be hypothesised to have taken place if also shorter episodes were incorporated in the present study. In sub-study I, sickness absence prevalence could have probably been shown an increase already in the late 1990s, and the increase in the prevalence could have appeared even more pronounced among lower non-manuals in the early 2000s. In sub-study II, large occupational class differences may have been also found in the diseases of digestive system, if shorter sickness absence episodes were assessed simultaneously with the longer ones. Gastrointestinal infections, for example, are common diagnostic causes for short absence episodes; large occupational class differences have been previously found in this diagnostic category when shorter (at most 7 days) sickness absence episodes were examined in the analyses (Feeney et al., 1998). With regard to

sub-studies III and IV, however, this is not likely to affect the result to any substantial degree since musculoskeletal diseases are major causes of long-term sickness absence (Henderson et al., 2005) and also breast cancer tends to cause rather long sickness absence episodes overall (Drolet et al., 2005; Balak et al., 2008).

This study examined the magnitude of and changes over time in occupational class differences in sickness absence both in absolute and relative terms. Previous studies have not incorporated both scales by rule (King et al., 2012), although The World Health Organisation's Commission on Social Determinants of Health recommends to use both scales to obtain a more comprehensive picture of the differences (Kelly et al., 2007). In sub-studies I and II, the Slope Index of Inequality (SII) and the Relative Index of Inequality (RII) were used to analyse the absolute and relative class differences, respectively. These measures are suitable for making comparisons in the magnitude of socioeconomic differences over time (Mackenbach & Kunst, 1997). Furthermore, a linear time trend was examined in both of the sub-studies I and II. In sub-study I, the GEE method was applied to take into account that same individuals could have been measured repeatedly during the study period. This method was not applied in sub-study II; this could have increased the risk of type I error (Zuur et al., 2009). Data on occupational class, in turn, were available for the years 1995, 2000 and from 2004 onwards in the present study. Hence, sub-study I might have found more subtle changes in the class differences during the late 1990s and early 2000s, if data on occupational class were available also for the years 1996–1999 and 2001–2003.

Finally, the present study was unable to examine potential explanations concerning, for instance, health-related behaviours and working conditions for the observed occupational class differences in long-term sickness absence due to lack of data in the national registers.

7.4 AN OVERALL VIEW OF OCCUPATIONAL CLASS DIFFERENCES IN SICKNESS ABSENCE

This study examined occupational class differences in all-cause and diagnosis-specific sickness absence and changes in the differences over time in the Finnish nationwide employed population. The focus of the study was on over 10 working days long sickness absence, covering a nearly 20-year period from 1996 to 2014. In 2014, for instance, the study population consisted of 675,363 women and 604,715 men.

A consistent occupational class gradient in all-cause sickness absence was found across the classes: the lower the class, the more the sickness absence, and vice versa. This held true for both genders but throughout the differences were larger among men. The findings are in line with previous studies. The present study extends the previous results by showing that, despite slight

annual variation, both absolute and relative occupational class differences were rather persistent in all-cause sickness absence in the nationwide employed population during the study period. The class differences in long-term sickness absence endured in spite of the changes in occupational class structure, working conditions and sickness insurance legislation over time.

The study further showed that sickness absence followed a hierarchical occupational class gradient across different diagnostic causes of absence over time. However, the magnitude of the class differences diverged between the diagnostic causes. Among the study population, the most common diagnostic causes of sickness absence were musculoskeletal diseases, mental disorders, and home and leisure injuries. In line with previous studies, by far the largest occupational class differences were shown in sickness absence due to musculoskeletal diseases among both women and men. The study further revealed that the results were compatible by using both absolute and relative measures throughout the study period. Among men, the relative differences were particularly large in the study. Within musculoskeletal diseases, specifically, shoulder disorders and back pain caused the most pronounced class differences in the occurrence of absence, whereas chronic musculoskeletal diseases, such as rheumatoid arthritis, induced the largest class differences with regard to the length of absence. The study highlights the importance of musculoskeletal diseases, particularly shoulder disorders and back pain, for the class differences occurring in sickness absence.

The study showed large hierarchical occupational class differences also in sickness absence due to home and leisure injuries, particularly among men. This finding echoes the previous studies concerning work-injury absences and sickness absence due to injuries of any cause. In Finland, home and leisure injuries are the most common injury type in the working-age population. The study further underlines the importance of home and leisure injuries for the class differences occurring in long-term sickness absence. In contrast, the study revealed modest and stable occupational class differences in sickness absence due to mental disorders throughout the study period among both women and men. This finding suggests that, although mental disorders constitute a major diagnostic cause of long-term sickness absence overall, they contribute to the class differences to a lesser extent among employees.

With regard to the other diagnostic causes, i.e. neoplasms, diseases of the nervous system, cardiovascular diseases, respiratory diseases and diseases of the digestive system, low proportions of persons having long-term sickness absence due to each of these causes were found among both women and men; the absolute class differences, in particular, appeared negligible over the course of time. However, within neoplasms, contradictory findings were revealed. In breast cancer, lower occupational class was associated with longer sickness absence compared to those in higher classes among women, although women in higher classes were shown to have greater occurrence of absence due to breast cancer across the classes throughout the study period. This finding may indicate that, for those affected by the disease, even worse health

status and consequently deteriorated work ability may occur among women in lower occupational classes than among those in higher classes.

All in all, the results of the present study echo the earlier findings showing persistent hierarchical socioeconomic differences in health and mortality in Finland and in many other European countries over time. This study complements the previous evidence on socioeconomic differences in health in general by giving a comprehensive picture of the class differences in long-term sickness absence across several diagnostic causes in the Finnish nationwide population.

7.5 PRACTICAL AND POLICY IMPLICATIONS OF THE STUDY

The current Finnish government is committed to the target of fostering health and wellbeing and reducing inequalities in the population (Prime Minister's Office, 2015). The results of the present study showed that, despite several health policy programs aiming at reducing socioeconomic health differences over the years, health inequalities have persisted among the working population. The results highlight the discrepancy between the goals and the reality and, thereby, set a challenge to future actions.

One decade ago, the World Health Organization's Commission on Social Determinants of Health, aiming to draw the attention of governments and society to the social determinants of health, declared that addressing socioeconomic differences in health is a matter of tackling the prevailing causes of these differences (World Health Organization, 2008). As a part of the Commission's work (Kelly et al., 2007), a further recommendation was given; namely, political actions should take into account the whole spectrum of a population, not only the most disadvantageous, and focus on specific needs of the different population groups. For example, if health and its determinants improve at the top of the social class hierarchy, an effective policy should entail actions focused on the improvement of health or its determinants across the social class hierarchy, with the rate of these improvements increasing by decreasing position in the hierarchy (Kelly et al., 2007). In other words, the improvements should be greatest among the poorest, and so forth (Kelly et al., 2007).

Consequently, the results of this study underline that future actions should have a specific emphasis on employees in lower occupational classes and on manual workers in particular in order to tackle occupational class differences in sickness absence in working populations effectively. The results of the present study suggest further that sickness absence due to musculoskeletal diseases, especially prevention of sickness absence due to back pain and shoulder disorders, and home and leisure injuries should be paid attention by various stakeholders, such as occupational health care professionals and

decision-makers at the national level, since these diseases are common causes of temporal work disability possessing large occupational class differences in the employed population. Specifically, actions should entail improvements in physical working conditions and health-related behaviours on the basis of the findings of previous studies seeking explanations to these differences. From another viewpoint, the excess sickness absence in lower occupational classes could be seen as a justifiable outcome, for instance, due to more strenuous working conditions and fewer opportunities to adapt job tasks in lower classes compared to higher classes. The present study showed that the class differences in sickness absence due to musculoskeletal diseases have narrowed modestly over time in concordance with the alleviation of physical work demands and a growing awareness of occupational and safety regulations in the working population. The findings regarding the class differences in sickness absence due to home and leisure injuries over time, in turn, indicate that attention should be paid to decisions which affect alcohol consumption in the population.

The results of the present study were solely based on sickness absence episodes certified by doctors. Doctors are hence crucial stakeholders and gatekeepers in the process. There exits considerable variation in the sickness absence prescribing practices between doctors (Kankaanpää et al., 2012). Furthermore, doctors consider the sickness absence prescribing practices problematic and report shortcomings in their knowledge regarding the certification process (Hinkka et al., 2018). In Finland, a working group was set up to investigate the possibility of develop national guidelines to help doctors for evaluating the need and duration of sickness absence. In the final report (Oksanen and the working group, 2016), the working group stated that it is possible to make these guidelines for doctors; however, unanimity was not reached on the need for diagnostic recommendations in the working group. The results of the present study indicate the need for specific diagnoses-specific guidelines taking simultaneously into account working conditions for the abovementioned common diagnostic causes of sickness absence possessing large occupational class differences in the working population.

8 CONCLUSIONS

Overall, this study showed that, despite modest annual variations, occupational class differences in long-term sickness absence due to any diagnostic cause have been clear and persistent among women and men in the Finnish employed population over time. In general, the lower the class, the more the sickness absence. This held true also across different diagnostic causes of sickness absence. The most prominent class differences were detected in sickness absence due to musculoskeletal diseases and home and leisure injuries, respectively, with particularly large differences occurring among men.

This study indicates that, in general, employees in lower occupational classes are at greater risk in terms of work disability compared to those in higher classes, and no major progress has taken place in Finland, despite the reduction of socioeconomic health differences being an objective in several health policy programs over the years. In the early 2010s, diverse changes were made to the Finnish legislation to promote work ability and to prevent permanent work disability. This study highlights that actions should be carried on and targeted especially to employees in lower occupational classes and to manual workers in particular to reduce sickness absence and narrow the impact of the class differences on sickness absence efficiently. This can lead to major improvements in the overall amount of sickness absence in the employed population. Previous estimates show that sickness absence costs amounting to approximately 0,3% of the Finnish GDP could be saved each year if health, health-related behaviours and working conditions in lower social classes were as optimal as among those in the highest social class (Kaikkonen et al., 2015). This study further highlights that actions should be focused particularly on sickness absence due to musculoskeletal diseases and home and leisure injuries, i.e. the common causes of temporal work disability possessing large class differences in the employed population.

Further studies on the determinants of occupational class differences in sickness absence are needed to shed light on potential explanations of the class differences both in all-cause and diagnosis-specific sickness absence in nationwide employed populations. More studies covering specific diagnoses within major diagnostic causes using various measurements of absence are also needed to broaden the picture of prevailing problems in occupational class difference in sickness absence. Moreover, monitoring of the magnitude of and changes over time in occupational class differences in sickness absence should be continued to evaluate the impact of preventive actions in the future.

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