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# **Prospective Cohort Studies of Disability Pension and Mortality in a Swedish County**

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Institutet**

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## ABSTRACT

The overall aim of this thesis was to study risk factors for disability pension, focusing on sociodemographic risk factors and sick-leave diagnoses, and also to investigate the risk of mortality among disability pension recipients. The research comprised four register studies of all people in the Östergötland County who were 16–64 years of age in December 1984, representing a total cohort of 245,704 persons. The first study was a 12-year follow-up based on the 229,864 individuals in the cohort who at baseline were not receiving disability pension or old-age pension. The second investigation constituted a 10-year follow-up of the 19,379 people aged 16–60 years who had a new period of long-term ( $\geq 56$  days) sick-leave spell in 1985–1987. The third and fourth studies were 12-year follow-ups of, respectively, the entire cohort, and all individuals in the cohort except those receiving a medically-based disability pension and missing disability pension diagnosis.

The likelihood of being granted a disability pension within 12 years was 14 % for women and 11 % for men, and this increased with age. Women younger than 54 years were at higher risk than men ( $P < 0.001$ ). The disability pensions were granted for full-time in 69% of the cases and more women received part-time pensions.

Five years after inclusion, 28% of the cohort with long-term sick leave had been granted disability pension. The risk of such pension was greater for those who were older, had a low income, previous sick leave, no employment, no young children, or were born in a country other than Sweden. There was a gender-related difference in sick-leave diagnoses ( $P < 0.001$ ): among the men, those with psychiatric diagnoses were at highest risk; among women, the risk was greatest for those with musculoskeletal diagnoses. This overall pattern of disability pension predictors was still apparent, albeit attenuated 5–10 years after inclusion. However, this was not true for income, the effect of which was reversed over time.

The relative risk (RR) of all-cause mortality was higher for disability pension recipients than for individuals not collecting these benefits, and this applied to both women (RR 2.8, 95% confidence interval [CI]: 2.6–3.0) and men (RR 3.0, 95% CI: 2.8–3.1), as well as all age groups. The relative risk of mortality was highest for the youngest disability pensioners, and it was lower for those with part-time benefits than for those collecting full pension.

All groups receiving medically-based disability pension showed increased mortality due to all main causes of death both directly and not directly associated with the disability pension diagnoses. The magnitude of this increase varied depending on the diagnosis legitimating disability pension. There was a strong relationship between disability pension and future suicide among those granted disability pension due to psychiatric disorders (hazard ratio [HR] = 12.0, 95% CI: 8.4–17.2 for women; and corresponding values 5.5, 95% CI: 4.0–7.6 for men), and the same was seen for men with cardiovascular diagnoses (HR = 2.4, 95% CI: 1.3–4.4). No increase in mortality due to any cause was found in the subjects over 55 years of age who were granted disability pension due to labour-market reasons.

*Key words: disability pension, risk factor, mortality, labour market, long-term sickness absence, cohort, diagnoses, musculoskeletal, psychiatric, cardiovascular, suicide.*

## LIST OF ABBREVIATIONS

BMI	body mass index
CI	confidence interval
DP	disability pension
HR	hazard ratio
ICD	International Statistical Classification of Diseases and Related Health Problems
LTSA	long-term sickness absence
OECD	Organisation for Economic Co-operation and Development
RR	relative risk
SMR	standardized mortality ratio
WHO	World Health Organization

## LIST OF PUBLICATIONS

The thesis is based on the following publications, which will be referred to the text by their Roman numerals:

- I. Karlsson N, Borg K, Carstensen J, Hensing G, Alexanderson K. **Risk of disability pension in relation to gender and age in a Swedish county; a 12-year population-based, prospective cohort study.**  
*Work*: 2006 27(2)173–179.
- II. Karlsson N, Carstensen J, Gjesdal S, Alexanderson K. **Risk factors for disability pension in a population-based cohort of men and women on long-term sick leave in Sweden.**  
*(submitted)*.
- III. Karlsson N, Carstensen J, Gjesdal S, Alexanderson K. **Mortality in relation to disability pension: Findings from a 12-year prospective population-based cohort study in Sweden.**  
*Scandinavian Journal of Public Health (in press)*.  
Doi: 10.1080/14034940601159229
- IV. Karlsson N, Carstensen J, Gjesdal S, Svedberg P, Alexanderson K. **Disability pension and cause-specific mortality in a 12-year population based cohort study in Sweden.**  
*(submitted)*.

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# 1 INTRODUCTION

A large number of people in many industrialized nations collect disability pension and sickness absence benefits, and that situation represents an important medical and socio-political challenge [1, 2]. In Sweden, despite an increase in life expectancy, improved living conditions, and better health status, the number of individuals who leave the labour market and live on disability benefits has increased since the 1980s [3-6]. Furthermore, this trend is not expected to decrease in light of the present unemployment rate and various demographic factors, such as the fact that members of the large birth cohorts of the 1940s are reaching the age at which they will strongly contribute to the incidence of disability pension [7]. Similar early exit from the labour market via disability pension has been observed in many other European countries [2, 8-10].

When considering this challenge to the welfare state, it is important to examine risk factors for disability pension. Several factors might influence the disability pension decision, amongst others: disease features, job features, interaction between these two, social position, social welfare features. In a systematic review published by the Swedish Council on Technology Assessment in Health Care [11], it was found that the available scientific evidence could establish a higher risk of disability pension only for persons with lower socioeconomic status [12], and that the risk of being granted such benefits due to back pain was greater for women and people in older age groups [13]. The authors of the cited review concluded that both more and better studies are needed in this field, preferably using a longitudinal approach [11].

Information about prognosis in terms of disability pensioning is of particular importance to physicians, employers, and sickness insurances officials who are faced with the task of managing persons who are on long-term sick leave due to specific disorders. An obstacle to research in this area is the lack of empirical data on sick-leave diagnoses. The present analyses were performed using a unique, large, population-based dataset. Also of interest is that few studies have examined the health impact of early withdrawal from the labour market via disability benefits, partly because it is commonly assumed that medical disorders or injuries are the cause, and not the effect, of disability pension [14]. Disability pensioners often report lower levels of quality of life or psychological well-being compared to other groups of retirees [2], although some do feel that receiving disability benefits has improved their quality of life [15, 16]. The nature and severity of the underlying disease decisively influences the wellbeing of disability pensioners.

The general aim of the current research was to understand the causes and consequences of disability pensioning. To achieve that goal, the work was focused on the following: demographic risk factors for being granted disability pension in a general population (paper I), risk factors for disability pension in people on long-term sick leave (paper II), and the impact of disability pension on mortality (papers III and IV).

## 1.1 DISABILITY PENSION

### 1.1.1 Work ability and disability pension

The aim of a sickness insurance plan for *disability pension* (incapacity benefit in the United Kingdom, social security disability insurance in the United States) is to provide economic security in the event of impaired work ability [17, 18]. According to the law now in effect in Sweden [19], all residents aged 16 to 64 years can be granted a disability pension on the condition that their ability to carry out gainful employment has been decreased as a result of mental or physical incapacity. The ability to work must be reduced by at least 25% (prior 1993, at least 50%) for at least one year.

Within the field of insurance medicine, *work ability* is defined as the capacity of an individual to manage gainful employment as a means of earning a living, and when deliberating the right to insurance benefits, it is presumed that this is affected by several factors besides any degree of incapacity, for example the demands of the labour market on both a national and local level, the occupational qualifications of the individual in question, and existing pay structures. However, within the social insurance system, assessment of the need for disability pension and other forms of sickness benefits is based solely on the assumption that work ability is reduced due to medically defined illness or injury. An application for disability pension is typically the outcome of interaction between the insured individual and staff at the social insurance office [20], and it must be accompanied by a medical certificate.

A full (100%) disability pension compensates at least 65% of the annual income, up to a certain limit. In many cases, there are also ancillary benefits, such as housing supplement. During the period under consideration in the present investigations (1985 to 1996), disability payments could be granted temporarily or permanently up to old-age retirement, and they could be given as full-time (1/1) or part-time (1/2 or 2/3) compensation. In this thesis, the term disability pension refers to all of the mentioned types of benefits.

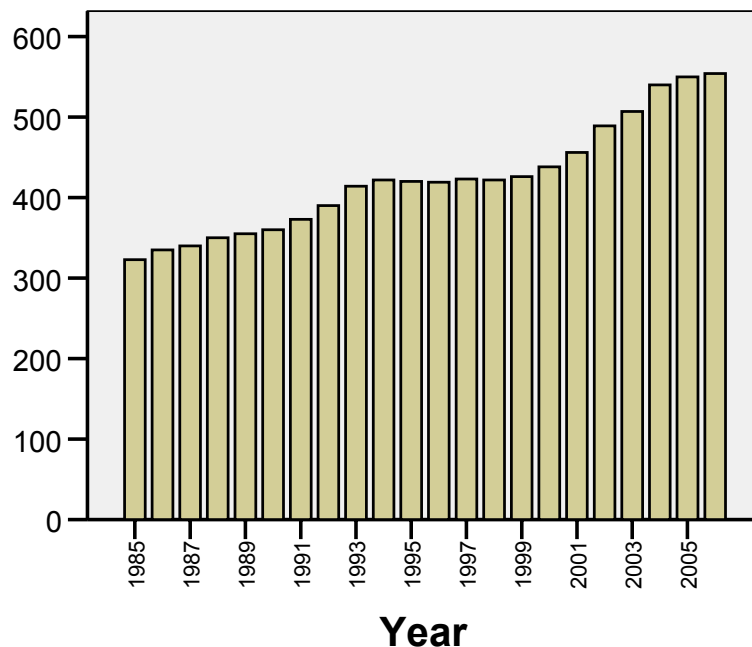
The disability pension system in Sweden was amended in January 2003, so that the terms *sickness compensation* and *activity compensation* replaced what was previously referred to as disability pension [18]. Activity compensation (always temporary) applies to people under the age of 30, whereas sickness compensation is for all other age groups. In 2005, the Swedish Social Insurance Agency merged with the National Social Insurance Board to become one public agency. The findings discussed in this thesis deal with the disability pension system that was in effect prior to 2003.

### 1.1.2 Historical overview

General sickness insurance was introduced in Sweden in 1955 [17, 18], and it constitutes an important part of the welfare system that was created to provide financial security to citizens stricken by illness or disability. In recent years, the cost of sickness insurance has increased considerably and is now a substantial burden on the national economy [5].

The number of individuals receiving disability pension has grown continuously since 1985 [3]. It is important to underline that the situation has been influenced by demographic factors, primarily changes in the *population at risk* with regard to age distribution and size of the labour force. Other factors have also been discussed such as the increasing number of women in paid work, pressure from the economic realm, and the fact that the large cohorts in the population born soon after World War II have

reached the age at which the incidence of disability pension is normally increased [21]. Between 1985 and 1996 (the period considered in the present research), the number of residents receiving disability pension in Sweden increased by 30%, from 323,000 to 419,000 persons [22, 23]. In 2006, just over 550,000 individuals were granted disability benefits [24] in a labour force of about 4.3 million persons [25] (see Figure 1).



*Fig. 1.* Number of individuals ( in 1000's) receiving disability pension in Sweden in 1985–2006 (Source: the Swedish Social Insurance Agency [24])

The prevalence of long-term sick-leave increased in the 1980s, which in turn might have heightened the risk of disability pension [26]. The beginning of the 1990s was characterized by raising unemployment in Sweden and other Western countries. Several reforms involving downsizing or reorganizations were implemented to control the problems in the Swedish economy and workplaces [4]. The number of individuals on prolonged sick leave increased dramatically after 1997, especially among women employed in the public sector, which was strongly affected by the reorganizations [27-29]. During the same period, the composition of sickness absence also changed, so that a larger proportion was due to psychiatric illnesses [27]. One explanation for this increase may be psychosocial working conditions entailing a combination of high demand and low decision latitude [4], since it is now well known that such high-strain jobs increase the risk of various stress-related symptoms [30]. An ageing population also implied a rise in the number of individuals on long-term sick-leave [27].

In the 1990s, the rules for disability pension became stricter to counteract the increase in granting of those benefits. Such compensation is intended for people who are unable to work because of a chronic illness or injury, although up to 1991 it was also used to pension off unemployed workers over the age of 55 years. From October 1991, conditions on the labour-market were no longer considered to be a valid reason for

granting disability pension [31]. Moreover, in January 1997, the law making it easier for older people to get disability pensions was revoked.

### 1.1.3 Disability pension diagnoses

Older people constitute the majority of those receiving disability pension, and such benefits are most often legitimated by musculoskeletal, psychiatric, and cardiovascular diagnoses [32-34]. Among young disability pensioners, psychiatric disorders constitute the dominant group, and a substantial proportion are granted payments due to congenital disorders or defects [33, 34].

The number of people given disability pension as a results of psychiatric disorders has increased since the 1990s in Sweden (Figure 2) [35], which is of particular concern because these disorders more often affect people in early adulthood [36, 37].

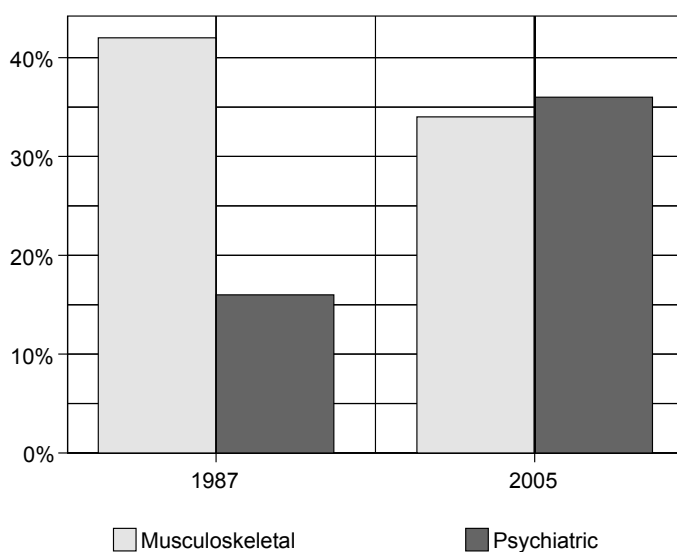


Fig. 2. Proportions of psychiatric and musculoskeletal diagnoses among those granted disability pension and sickness-activity compensation in 1987 and 2005 [35]

## 1.2 FACTORS ASSOCIATED WITH DISABILITY PENSION

### 1.2.1 Review of explanatory models

Concepts such as work, disease, illness, and disablement are to a great extent defined culturally and by social structure and priorities in the society [38-40]. Sickness absence and disability pension are influenced not only by individual factors, but also by factors at other structural levels [11, 38, 41-45], the various perspectives of which have been reviewed by the Swedish Council on Technology Assessment in Health Care [46].

The aspects relevant to the thesis are indicated in bold type in Table I, which show that the focus was on possible causes for and consequences of disability pension considered from the societal perspective.

Table I. *Aspects used to classify studies on disability pension (DP)*

<b>Perspective taken in the study</b>	<b>Discipline</b>	<b>Topic studied</b>	<b>Structural level of included factors</b>
<ul style="list-style-type: none"> <li>• <b>Society</b></li> <li>• Insurance</li> <li>• Health care</li> <li>• Worksite</li> <li>• Individual</li> </ul>	<ul style="list-style-type: none"> <li>• Medicine</li> <li>• <b>Epidemiology</b></li> <li>• Sociology</li> <li>• Psychology</li> <li>• Economics</li> <li>• Management</li> <li>• Law</li> <li>• History</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Risk factors for DP</b></li> <li>• Sickness certification practices</li> <li>• <b>Consequences of DP</b></li> <li>• Methods</li> </ul>	<ul style="list-style-type: none"> <li>• International</li> <li>• National</li> <li>• Community</li> <li>• Worksite</li> <li>• Family</li> <li>• <b>Individual</b></li> </ul>

### **1.2.2 Risk factors for disability pension**

Some risk factors found to be associated with disability pension have been reviewed by the Swedish Council on Technology Assessment in Health Care, independently of diagnosis legitimating the disability pension [12].

#### *1.2.2.1 Demographic and socio-economic factors*

##### 1.2.2.1.1 Age

Age is one of the most important risk factors for disability pension [12, 47-50], and a majority of recipients of such compensation are older than 45 years [2]. For most diseases, the variation in frequency that occurs with age is greater than those observed with any other variable. Other factors that might affect older people include a reduced capacity of employment caused by accumulated exposure to hard work, a difficult labour market for that age group, and a possible more lenient attitude from social security towards granting disability pensions with increasing age [2, 49, 51, 52].

##### 1.2.2.1.2 Gender

Female gender is associated with a higher risk of disability pension [53, 54]. Notably, women also have a higher rate of sickness absence than men, according to most scales of measurement [6, 12, 27, 53, 55-59], and studies have also indicated that women more frequently report ill health and use more of the available medical resources [6, 51, 54, 60]. There are two plausible explanations for this situation:

- The first is what is referred to as the biomedical model [54], which postulate that differences between women and men with regard to the reproductive and immune systems lead to gender differences in ill health. The female reproductive system is more complicated than that of the male counterpart. Other biological differences per se cannot explain the gender-related disparities in ill health, although they may do so if for instance the workplace is designed using male biology as the standard [54], since women e.g. only about 40-60% of men's muscle strength possessed by men [6].

- The second explanation concerns difference in exposure to paid and unpaid work. Characteristic of the Swedish labour market is a high level of gender segregation across sectors, jobs, and position levels [54]. This segregation means that women are overrepresented in more monotonous and lower paying occupations with lower scope for decision making, and they are more likely to have jobs that involve a high degree of repetitive strain than men which might account for elevated health risks [51, 54, 60, 61]. In addition, due to the gendered division of housework and child care, women frequently bear the larger share of responsibility for unpaid work (e.g. house-keeping, child rearing, care of the elderly) over and above their hours of paid work [62, 63]. However, there is no evidence that women with children have higher rates of sick leave [12, 64].

#### 1.2.2.1.3 Marital status

Marriage is considered to be beneficial for health, by providing either a safeguard effect (e.g. in the face of setbacks or difficulties), or due to a selection effect [65]. According to official statistics, being single increases the risk of disability pension, and divorce has been shown to increase the risk of sickness absence [12].

#### 1.2.2.1.4 Country of birth

Residents of Sweden who were born in some other country are at higher risk of disability pension compared to native Swedes, although this disparity varies largely depending on their country of birth [6, 66-68]. The higher risk of disability pension might be related to the reciprocal influence of work, health and migration [69]. In some circumstances, immigration may cause poor health, which as a selection factor might lead to unemployment and/or the need of sickness benefit (disability pension). It is also possible that immigration results in an inferior position in the labour market, which might be detrimental to health due to an exposure effect.

#### 1.2.2.1.5 Socioeconomic factors

The association between socioeconomic level and health [70] and sickness absence [46, 71] is well-established. Several studies have found a higher prevalence of disability pension among persons with low levels of education [10] and socioeconomic status [10, 12, 72-75]. Defined in relation to occupation, low socioeconomic level may be an independent risk factor for disability pension, with a many-times higher relative risk of collecting disability benefits for blue-collar workers than for white-collar workers [73]. Work demands, such as physically demanding tasks, and low control over the work situation, are more common among less qualified occupations and might make it more difficult to remain in work for employees suffering from specific disorders. Unfavourable circumstances early in life have also been suggested to explain the increased risk of disability pension related to low socio-economic status [12, 76-78].

#### 1.2.2.2 *Lifestyle, living conditions, health behaviour*

Several studies have shown that the risk for disability pension is particularly high for smokers [79-82]. A positive association has also been observed between high alcohol

consumption and future disability pension [77, 83], although one investigation has detected a decrease in alcohol consumption among male alcoholics after disability pension [84]. In addition, a link with use of hypnotics and analgesics has been reported [85]. A high [86-88] or a low [88] body mass index have been associated with a higher risk for disability pension. Loneliness has been noted to increase the risk of disability pension in young men aged 20-49 years [10].

#### *1.2.2.3 Job-related factors*

Environmental risk factors for disability pension have also been identified, including performance of heavy manual tasks [75], and repetitive or continuous muscle strain [81]. Furthermore, psychosocial aspects such as mental job strain [81], low control, high demands, and low job satisfaction [10], have further been identified as occupational risk factors for disability pension. On the other hand, having the ability to communicate with co-workers and receiving social support from supervisors reduced the risk of requiring disability benefits [81]. Furthermore, the degree to which the workplace can be adapted for ill-health and the kind of attendance requirements placed upon employees have been found to be important in continuing to work despite disease [45, 89].

#### *1.2.2.4 Conjunction, unemployment, residence*

Industry closures and rationalizations may result in work redundancy, as well as poor work environment, change of skill demands, and shrinking occupations. Unemployment was found to be associated with poorer health, which might be due either to a health-related selection process comprising an overrepresentation of disease preceding or following unemployment, or to the harmful effects of lack of vocational activity [90-94]. The rules of unemployment were found to have an important impact on sick-leave [95]. A number of investigations have revealed a positive association between unemployment and disability pension [81, 96-98].

Official statistics in Sweden show higher prevalence of disability pension in rural areas, which can be attributed to a weaker labour market and selection of individuals with work impairments in those communities, implying that healthy, more active subjects would have a greater tendency to relocate [12].

### **1.2.3 From long-term sickness absence to disability pension**

Disability pension and long-term sickness allowance can both be seen as compensations for prolonged incapacity, provided during different administrative periods. Nonetheless, in Sweden, an important difference between these two forms of benefits is that to receive sickness allowance, a person must have been employed or self-employed, whereas qualification for disability pension is subject only to the condition of residence. Thus, disability pension is usually, but not always, preceded by a long period of sickness absence.

There is no general consensus as to how “*long-term sickness absence*” should be defined and therefore when comparing the results of several studies, it is important to bear in mind that different definitions are often used. Indeed, period of > 3 days, > 7 days, ≥ 28 days, and more than 10 weeks have all been classified as prolonged sickness

absence [99, 100]. In this thesis, the definition is set as spells of sick-leave lasting at least 56 days [49, 101].

The distribution of diagnoses is the same for cases involving long spells of sick leave and those leading to disability pension. The diagnoses seen most often are musculoskeletal (Figure 3) [27, 33], although psychiatric disorders have increased steadily as reasons for long-term sickness absence [27].

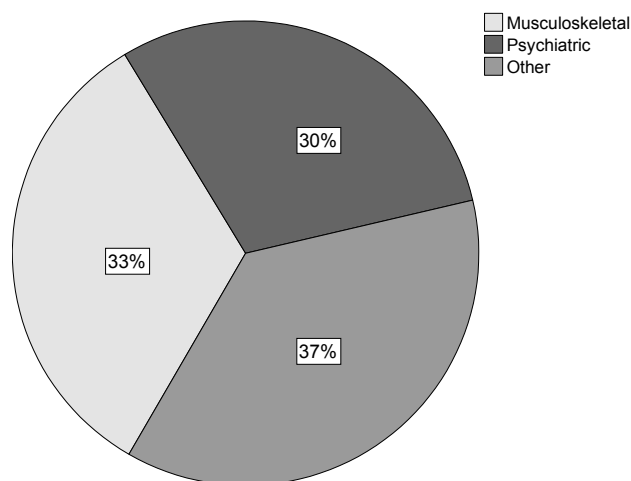


Fig. 3. Diagnoses for long-term ( $\geq 60$  days) sickness absence in 2003 (Source: National Social Insurance Board [102])

Prolonged periods of sick leave are associated with a reduced probability of eventual return to work [103-108], and the decision to grant disability pension is often made after such absence [49, 50, 96, 109, 110]. The role of disease becomes more pronounced with increasing length of sick-leave spells [55, 111], and extended episodes of that nature contribute disproportionately to the statistics on sickness absence. Although the long spells constitute only a small fraction of all sickness absence, they comprise the greatest number of days of reimbursement. Moreover, the number of such spells has grown significantly after 1997, and women constitute the majority in that group [27].

Two population-based studies [48, 49] performed in Norway have assessed the risk of disability pension among men and women long-term sickness absentees ( $\geq 56$  days) [43]. In the first of those investigations [48], 10,077 persons (56% women) with long sick-leave spells were followed for three years initiating from 1990–1991, and it was found that the risk of disability pension was increased by higher age and duration of sickness absence. Having sick-leave diagnosis “psychiatric”, “cardiovascular”, “respiratory” (compared to musculoskeletal) increased the risk for disability pension among men. Having a musculoskeletal sick-leave diagnosis or “nervous” sick-leave diagnosis (compared to musculoskeletal) increased the risk for disability pension among women. The diagnostic groups “pregnancy-related” or “injury” implied low risk for disability pension. By comparison, the risk was decreased by higher education and among women by having children  $< 11$  years. The other study [49] was a five-year



follow-up of 3,628 persons (56% women) that was initiated in 1994. It was found that the risk of disability pension among individuals who were off sick for more than eight weeks varied considerably according to sick-leave diagnosis. Furthermore, the risk was increased by higher age, low income, past sick-leave, and among women unemployment. Among men having a “psychiatric” sick-leave diagnosis (compared to musculoskeletal) increased the risk; among women no sick-leave diagnoses had a higher risk for disability pension than musculoskeletal disorders. A pregnancy related sick-leave diagnostic decreased the risk of disability pension (compared to musculoskeletal).

A three-year follow-up conducted from 1986 to 1994 in Sweden [98] using databases of the National Social Insurance Board indicated that the following factors increased the risk of disability pension among individuals with long-term ( $\geq 60$  days) sickness absence: high age, certain sick-leave diagnosis (i.e. psychiatric, and respiratory disorders, compared to all other diagnoses), low social status in terms of occupation (blue-collar and low level white collar workers), being unemployed, and high unemployment rates in the home community. The analysis presented was not stratified by sex. The cited study revealed a decreased risk for disability pension in cases with long-term sick leave due to injury as compared to all other causes of ill-health. Considering marital status, being single per se was not reported to be a risk factor for disability pension, although the risk was increased by being single in combination with one or more psychosocial risk factors (i.e. unemployment, a psychiatric diagnosis, high alcohol consumption).

### 1.3 IMPACT OF DISABILITY PENSION ON MORTALITY

#### 1.3.1 The migration from working life

The typical progression towards disability pension that often is preceded by a period of long-term sickness absence is illustrated in Figure 4.

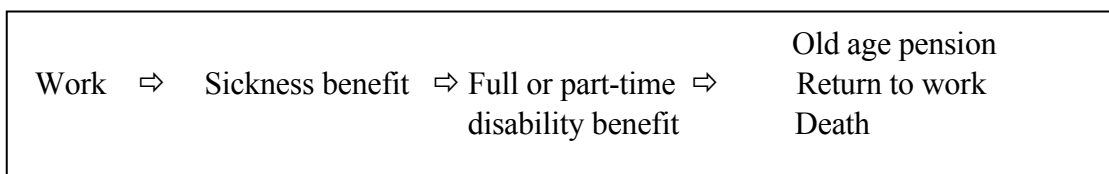


Fig. 4. The typical progression towards disability pension [2]

Long-term sickness absence can be seen as involving a marginalization process similar to that associated with unemployment that can lead to a vicious circle of inactivity and isolation [14, 112-114]. Possible health effects of loss of work are suggested to be mediated through disruption of community and personal and social relationships, as well as stress [115, 116]. Unemployment has been reported to be associated with a higher risk of morbidity and mortality [90-94], and hence it is plausible that disability pension has comparable effects.

### **1.3.2 Risk factors for mortality**

#### *1.3.2.1 Age and gender*

Cardiovascular disease, cancer, and injuries constitute the three main causes of death in the general population [6], although there are large age and gender differences. In the age group 15–44 years, death among women is due primarily to cancer and cardiovascular disease, whereas injuries (including suicide, traffic accidents and alcohol-related accidents) and cardiovascular diseases affect more men. After the age of 45, death occurs primarily due to cardiovascular diseases and cancer in both sexes. The average lifespan is shorter for men than for women, whereas morbidity is higher among women [117].

#### *1.3.2.2 Socioeconomic factors*

The relationship between socioeconomic status and morbidity and mortality is well known, and considerable attention has been given to the issue of inequalities in health [118-122]. Low socioeconomic status and economic hardship are associated with poorer health and quality of life, as well as increased mortality rates. It has also been reported that the quality and quantity of interactions in social networks that are assumed to influence health vary between different social groups [123].

#### *1.3.2.3 Other factors*

In addition to biological and genetic factors, mortality is affected by environmental or external factors, such as working conditions, health technology, smoking, diet, body mass index, physical exercise, and stress. Furthermore, it has been observed that mortality rates are higher among single people than among those who are married, and this marital mortality differential has been found to be more marked for males than for females [124].

### **1.3.3 Mortality and disability pension**

Despite general improvements in health and longevity [6], the number of people on disability pension is growing, and the actual ill health of those individuals is increasingly being questioned [5, 11, 74]. One way to assess the ill-health component of disability pension is to study the extent to which disability pension is related to excess mortality [125].

#### *1.3.3.1 Previous findings on mortality and disability pension*

Publications concerning disability pension and mortality are summarized in Table II.

The authors of those reports have arrived at several conclusions. First of all, they have suggested that disability pension is linked to very high relative risks of mortality, with the magnitude of effect generally between 2 or 3 after adjustment for age [126-132]. Two studies also indicated that disability pension has a stronger effect on younger individuals [126, 131].

One of those investigations was an 18-year longitudinal follow-up conducted by Wallman and colleagues [131] in Sweden, which combined data from five different cohorts that together comprised 6,887 persons. The results of that study showed that a higher hazard ratio for mortality among disability pensioners persisted after adjustment for a range of potential confounding variables. After adjustment for a wide range of background variables, including age, social class (educational level), marital status, health behaviour (smoking habits and drug abuse), and underlying disease (disability pension diagnosis), the hazard ratio for mortality was reduced but was nonetheless still significantly increased. The risk of death was elevated due to cardiovascular diseases and miscellaneous causes. Wallman et al. [131] showed no significant relationship between reason for disability pension and cause of death.

An open cohort study [130] based on data from the Survey of Living Conditions was performed in 1981–1991 (36,915 individuals) and 1992–2000 (32,648 individuals) to examine the relationship between sickness absence, disability pension, and mortality. It was observed that adjustment for age, underlying disease, daily smoking, having economic difficulties, social isolation, and civil status reduced the magnitude of the effect, but the association between disability pension and mortality persisted.

In a recent study carried out in Norway [132], it was found that the higher hazard ratio for mortality among disability pensioners persisted after adjustment for age, gender, and socio-economic status (education, income).

After adjustment for a wide range of background variables, including age, socioeconomic status ([130-132]), marital status [130, 131], health behaviour (smoking habits [130, 131] or hospital care for alcohol or drug abuse [131]), and underlying disease [130, 131], the hazard ratio of mortality was reduced to some degree but nonetheless remained significantly increased. The results of the cited studies indicate that *sociodemographics, behavioural risk factors, and underlying disease* play a role, but they can not explain the excess mortality observed among disability pensioners with a medically-based disability pension.

Considering other aspects, Medhus [133] showed a 2.6 higher than expected risk of death due to cardiovascular diseases among male disability pensioners.

In addition, two studies [134, 135] have reported an elevated risk of suicide among disability pensioners.

### *1.3.3.2 Methodological consideration*

The greatest difficulty when studying the relationship between disability pension and mortality is to disentangle selection and underlying factors that influence both those entities. The fact that the risk of mortality is higher for disability pensioners might be explained by the adverse health effect of disability pension itself, but it might also be due to underlying factors that increase the probability of both disability pension and mortality.

Table II. *Studies of disability pension (DP) and mortality*

<b>Outcome, author [ref], year , country</b>	<b>Population/Length of follow-up</b>	<b>Type of study</b>	<b>Key explanatory variables</b>	<b>Results</b>
<b>Total mortality,</b> Hasle 1988 [126] , Denmark	8,897 men, 10-year follow-up	Longitudinal	Age (20-59 years), DP, degree of DP	RR for DP high 10 years after DP. RR = 3.3 among highest grade of DP, 1.9 among middle grade of DP, in relation to non DP. Mortality highest among youngest DP
<b>Total mortality,</b> Jeune 1982 [127], Denmark	2,706 men, 3.5-year follow-up	Longitudinal	DP, degree of DP	HR = 6.8 for DP. Mortality highest among highest grade of DP.
<b>Total mortality,</b> Olsen 1980 [128], Denmark	185 men, 5-year follow-up	Longitudinal	DP	HR for DP = 7 times higher compared to non DP. HR of mortality high during all-follow up.
<b>Total and cause-specific mortality,</b> Quaade 2002 [129] , Denmark	496,532 persons (51% women), 8-year follow-up	Longitudinal 1986–96	Age (60–70 years) , sex, employment status	SMR for employed = 0.6/0.5 for men/women, for DP = 2.3/1.7 for men/women, for early retired = 0.9/0.7 for men/women. Increased SMR among disability pensioners for all causes of death
<b>Total mortality,</b> Lindholm 2004 [130], Sweden	36,915 (1981–91) /32,648 (1992–2000) persons (49% women), 10-year follow-up	(I) 1981–1991 (II), 1992–2000	Sick leave/DP, sex, occupation, smoking, social isolation, marital status, economic problems, disease	HR = 4.6 for DP men in period I, HR = 3.0 for DP men in period II, HR = 5.6 for DP women in period I, HR = 3.9 for DP women in period II, Mortality increase with sick-leave length (highest among DP).
<b>Total and cause-specific mortality,</b> Wallman, 2006 [131] , Sweden	6,887 persons (46% women), 18-year follow-up	Longitudinal	Age (<65), sex, education, smoking, drug abuse, marital status, DP diagnosis	HR = 2.8 for DP women, HR = 3.4 for men DP. HR highest among youngest DP (HR>7). No association between cause of death and DP diagnosis.

Table II (Continued)

<b>Outcome, Authors [Ref], Year , Country</b>	<b>Population/length of follow-up</b>	<b>Type of study</b>	<b>Key explanatory variables</b>	<b>Results</b>
<b>Total mortality,</b> Gjesdal, 2007 [132], Norway	148,920 persons (49% women), 7-year follow-up	Longitudinal,	DP, age (30–59y), sex, education, income (socio- economic status SES)	HR (early/late DP) = 3.5/2.5 for women, 4.3/3.3 for men HR (early/late DP after adjustment SES) = 2.9/2.2 for women 2.2/1.9 for men
<b>Cause-specific mortality,</b> Medhus, 1977 [133], Sweden	235 men, 10.5-year follow-up	Longitudinal	Age (16–66 years), DP diagnosis	Median age 62 years General mortality SMR = 2.6. Mortality due to cardiovascular cause of death SMR = 2.6. Main causes of deaths cardiovascular, cancer, respiratory.
<b>Suicide,</b> Virkkunen, [134], Finland	284 suicide cases (70% men), Cross- sectional 1967	1967, Cross- sectional	DP, DP diagnosis, sex, marital status, town, alcohol, method of suicide, institution	Among suicides in DP: 53% psychiatric; 11% cardiovascular diagnosis; 12% infections (tuberculosis); 4% neurological diseases; 4% cancer; 16% other.
<b>Total mortality, external deaths,</b> Åhs, 2006[135], Sweden	25,125 (1984–9) /19,282 (1992–7) persons (49% women), 8.5-year follow-up	1984-9 (I) and 1992-7 (II)	Age (18–64y), sex, region of residence, country of birth, education, disease, employment status, cohabitating status, global self-rated health	HR total mortality = 1/1.4/2.3 for employed/unemployed/ retired or DP HR external causes = 1/3.9/4.2 for employed/unemployed/ retired or DP HR suicide = 1/3.3/4.5 for employed/unemployed/ retired or DP
<b>Total mortality and cardiovascular and cancer cause of death</b> Morris, 1994 [93], United Kingdom	6,191 men, 5.5-year follow-up	Longitudinal	Age (40–59y), town, BMI, employment status, social class, smoking, alcohol intake, pre- existing disease	RR = 3.1 for those unemployed or retired due to illness, RR = 1.5 for those unemployed not due to illness, RR = 1.9 for those retired not due to illness

Abbreviations: DP, disability pension; RR, relative risk; SMR, standardized mortality ratio; HR, hazard ratio; BMI, body mass index

## **2 AIMS**

### **2.1 GENERAL OBJECTIVES**

The overall aim of the present research was to study risk factors for disability pension, focusing on the sociodemographic risk factors and sick-leave diagnoses, and to investigate the risk of mortality among disability pensioners.

### **2.2 SPECIFIC GOALS**

- To estimate the demographic distribution of the risk of being granted full- or part-time disability pension and to compare the risk of disability pension according to gender (paper I).
- To assess the importance of sick-leave diagnosis and sociodemographic variables as risk factors for disability pension among individuals with long-term sickness absence and to compare those factors by gender and over time (paper II).
- To estimate all-cause mortality in people receiving full- or part-time disability pension (paper III).
- To estimate the all-cause and cause-specific mortality among persons granted disability pension due to musculoskeletal, psychiatric, or cardiovascular disorders (paper IV).
- To estimate the all-cause and cause-specific mortality in individuals over 55 years of age and granted disability pension for labour-market reasons (paper III and IV).

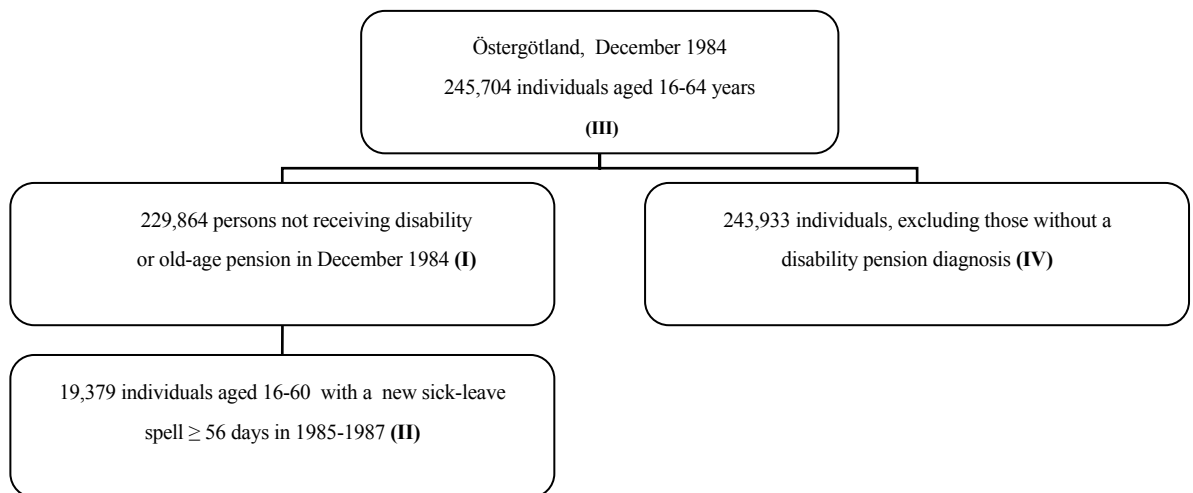
### 3 METHODS

The research reported in this thesis comprised four investigations based on cohort studies [136, 137] of the total population of all persons aged 16-64 years in Östergötland County, Sweden. Two of the present investigations analysed the risk of disability pension and two analysed the risk of mortality associated with disability pension. Furthermore, disability pension was assessed in relation to demographic predictors in a general population, and to a range of predictors in a population of long-term sickness absentees. The data used came from registers compiled by the Department of Social Medicine at Linköping University.

#### 3.1 STUDY AREA AND POPULATION

Östergötland County is located in the south-eastern part of Sweden, and it has 13 municipalities, some of which are urban and some more rural. It is the site of two of Sweden's largest cities (Linköping and Norrköping), and it also includes large sparsely populated areas. In 1984, Östergötland County had a population of 392,887, which represented 5% of the total population of Sweden and the age distribution was similar to that of the whole country [138]. The study base for the current research comprised the 245,704 residents of Östergötland County who were aged 16–64 years on 31 December 1984, and they were followed from 1985 to 1996.

The four studies included in this thesis are outlined in Figure 5.



*Fig. 5.* Flow chart showing the cohorts analysed in the present investigations (papers I-IV) and the relationship between the studies

## **3.2 COLLECTION OF DATA**

The data used came from national registers of disability pensions and death and also a research register of sick leave.

### **3.2.1 Data on disability pension, old age retirement and death**

Data on the following were obtained from the National Social Insurance Board: date of birth, gender, and for individuals granted a disability pension during the period 1985–1996, the date of the first benefit decision, the reason (medical or related to the labour market) for and grade (full-time or part-time) of pensioning, and the diagnosis in cases of medically-based disability pensions. Information on disability pensions awarded before 1985 was also obtained from the National Social Insurance Board. The diagnoses were coded according to the International Classification of Diseases (ICD): the 8<sup>th</sup> revision (ICD-8) was used until 31 December 1986 and thereafter the 9<sup>th</sup> revision (ICD-9). The grade of disability pension (full-time [1/1], or part-time [1/2 or 2/3] granted during the study period 1985–1996) is related to the level of reduction of ability to work. A person with part-time employment could be given a full-time disability pension, with the benefits being based on the part-time income. Dates of old age retirement were also obtained from the National Social Insurance Board.

Dates and information on causes of death [139] during the period 1985–1996 were obtained from the National Board of Health and Welfare. The causes of death were coded according to ICD-8 up to 31 December 1986 and thereafter according to ICD-9.

### **3.2.2 Long-term sickness absence**

The data used in the study on long-term sickness absentees (paper II) came from the research register of the “Sick Leave Registration Project of Östergötland” [140], which was initiated in 1983 at the Department of Social Medicine, Linköping University. That project was an epidemiological study with two objectives: to assess the occurrence of sickness absence (pattern, diagnoses, and change) as a means of providing a basis for preventive measures; to evaluate occupational injuries and changes in the social insurance system.

The sick leave registration project recorded the number of new spells of sickness absence lasting longer than 7 days (and thus requiring a sick-leave certificate issued by a physician) in 1985, 1986, and 1987 (around 180,000 spells) [51, 52, 140]. Based on information from the project register, the variables were constructed as follows at the time of inclusion in the present study (paper II): age groups (16–29, 30–39, 40–49, and 50–59 years); mean number of sick leave days per year in the three years prior to inclusion (in days per year) ( $\leq 7$ , 7–28, 29–90, and  $> 90$ ); sick-leave diagnosis coded according to the 18 categories of the ICD8 [141], income from work per year ( $\leq 50\,000$ , 50 000–100 000, and  $> 100\,000$  SEK; 1 USD = 8.24 SEK in 1984); marital status: (single /never married, married, divorced/widowed); country of birth (Sweden, other); employment status (employed vs. not gainfully employed – the latter representing being unemployed, a housewife, a student, or living on welfare benefits); number of children under 10 years of age: 0, 1,  $\geq 2$ .



### 3.3 MEASUREMENTS

An overview of the measures and samples used in the present studies is given in Table III. Data on disability pension and death were used in all four studies. The people in the cohort who had a new long-term sick-leave spell  $\geq 56$  days during the three years after inclusion (paper II) were identified in the sick leave register.

Table III. *The present studies of disability pension and mortality*

	<b>Paper</b>			
	<b>I</b>	<b>II</b>	<b>III</b>	<b>IV</b>
<b>Material</b>	Population based* (excluding: those on DP or old-age pension at baseline)	Population based* (selection of persons aged 16-60 with a new sick-leave spell $\geq 56$ days in 1985–1987)	Population based*	Population based* (excluding those on medical DP without a DP diagnosis)
<b>No. of people</b>	229,864	19,379	245,704	243,933
<b>% women</b>	49 %	57 %	49 %	49 %
<b>Follow-up</b>	12 years	0–5, 5–10 years	12 years	12 years
<b>Outcome measures</b>	- RR of DP - Cumulative probability of DP	- HR of DP - Cumulative probability of DP	- RR of all-cause mortality	- HR of all-cause and cause-specific mortality
<b>Risk factors:</b>				
Age, gender	<b>x</b>	<b>x</b>	<b>x</b>	<b>x</b>
Marital status		<b>x</b>		
No. of young children		<b>x</b>		
Employment		<b>x</b>		
Country of birth		<b>x</b>		
Income		<b>x</b>		
Previous sick-leave		<b>x</b>		
Sick-leave diagnoses		<b>x</b>		
DP			<b>x</b>	<b>x</b>
DP diagnoses				<b>x</b>
Grade of DP	<b>x</b>		<b>x</b>	
Labour-market related DP			<b>x</b>	<b>x</b>

\* The cohort includes all persons who were residents of Östergötland County, Sweden and aged 16-64 years on 31 December 1984.

*Abbreviations: DP, disability pension; HR, hazard ratio; RR, relative risk*

### 3.4 STATISTICAL ANALYSIS

The statistical evaluations were done using survival methods [142] and SAS<sup>®</sup> and Stata<sup>®</sup> statistical software.

The date of inclusion was 1 January 1985 in three of the studies (papers I, III, and IV). In the investigation reported in paper II, inclusion was defined as when an individual reached the eighth week of the period of long-term sickness absence that was used as an inclusion criterion. The end of the study period was 31 December 1996 in all four investigations. Follow-up was performed in two time frames in paper II: 0–5, and 5–10 years after inclusion. Each person in the cohort was followed from inclusion until a particular event occurred (disability pensioning in papers I and II; death in papers III and IV), censoring (death or old-age retirement in papers I and II) or the end of the follow-up (paper II) or the study period.

Life table methods were used to estimate the cumulative probabilities of being granted a disability pension (papers I and II). The relative risks of disability pension were estimated using a Cox's proportional hazard model stratified by age, gender and grade of disability pension (paper I). The chi-square test was applied to test the difference in the proportions of women and men (paper I). The hazard ratios for disability pension in relation to sick-leave diagnosis and sociodemographic factors were assessed by Cox's proportional hazard regression analysis of the 19,379 individuals who, in 1985–1987, were aged 16–60 years and had a new sick leave spell lasting  $\geq 56$  days (paper II). Interactions between gender and the predictor variables were tested using the likelihood ratio test (papers II and III). Cox's proportional hazards model with attained age as the timescale was applied to estimate the relative risk (paper III) or hazard ratio (paper IV) of mortality adjusted for attained age as a function of disability pension used as a time-dependent predictor [143] (papers III and IV).

The hazard ratios for total and cause-specific mortality were analysed separately by gender and for each cause of disability pension (i.e., musculoskeletal, psychiatric, and cardiovascular disorders, and labour-market reasons). The mortality of disability pension recipients was compared with the mortality of all individuals who were not receiving such benefits or were on disability pension for some disorder other than the specific diagnosis motivating the pensioning (paper IV).

The hazard ratio or relative risk estimates are presented with 95% confidence intervals (CI). P-values less than 5% were regarded as statistically significant.

#### *Ethical considerations*

The study was approved by the Swedish National Data Inspection Board and the local research ethics committee.

## 4 RESULTS

### 4.1 PAPER I

The likelihood of being granted a disability pension within 12 years in the cohort of 229,864 persons (49% women) at risk was calculated after adjusting for mortality and age retirement, which gave values of 14 % for women, and 11 % for men, and the values increased with age. The cumulative estimates (in %) of the probability of being granted disability pension increased considerably over the years, and they were higher for women.

The relative risks of disability pension with 95% confidence intervals for women vs. men were 1.6 (CI 1.4-1.8), 1.9 (CI 1.7-2.0), 1.7 (CI 1.6-1.8), 1.2 (CI 1.2-1.3), and 0.9 (CI 0.9-0.9) in the age groups 16–24, 25–34, 35–44, 45–54, and 55–64 years. With the exception of the group 55–64 years, women were at higher risk of disability pension than men ( $P < 0.001$ ).

Among all disability pensions granted, 69% were full-time and 31% were part-time. A larger rate of the women received part-time pensions ( $P < 0.001$ ).

### 4.2 PAPER II

Five years after inclusion, 28% of the cohort of 19,379 persons (57% women), with a long ( $\geq 8$  weeks) spell of sickness absence in 1985–1987 had been granted disability pension. The results also indicate that older age, low income, previous sick leave, no employment, not having young children, and being born in a country other than Sweden were associated with higher risk of disability pension.

There was a gender-related difference in type of sick-leave diagnoses ( $P < 0.001$ ). For the men, a psychiatric diagnosis implied was associated with a significantly higher risk of disability pension compared to a musculoskeletal diagnosis (HR 1.2, CI 1.1–1.4), whereas the opposite was seen for women (HR 0.8, CI 0.7–0.9). The hazard ratios for disability pension in relation to endocrine, respiratory, and urinary diagnoses were significantly higher for men than for women. Furthermore, of all the sick-leave diagnoses among the women, musculoskeletal disorders were associated with the worse prognosis with respect to future risk of disability pension. Among women, those with a pregnancy-related sick-leave diagnosis were at lowest risk of disability pension (HR 0.1, CI 0.1–0.2). For both sexes, the risk was low for those with long-term sickness absence due to an injury.

Except for income, the effect of which was reversed over time, the overall pattern of disability pension predictors was unchanged 5–10 years after inclusion, although it was attenuated.

### 4.3 PAPER III

In the cohort of 245,704 individuals (49% women) in December 1984, the relative risk of all-cause mortality was higher for those who were receiving disability pension than for those who were not. This was true for both women (RR 2.8, 95% CI 2.6–3.0) and

men (RR 3.0, CI 2.8–3.1), as well as for all age groups. Furthermore, the relative risk of mortality was greatest among the youngest pension recipients. Also, it was especially high the first year of disability pension but remained elevated over the whole follow-up period.

The relative risk of mortality was lower for part-time than for full-time disability pensioners and it was significantly higher for all people on disability pension than for those not collecting such benefits.

The relative risk estimates were also much lower for individuals who were older than 55 years and had been granted disability pension due to labour-market reasons than for all other disability pensioners (both men and women).

#### **4.4 PAPER IV**

The cohort described in paper III was further analyzed in this study introducing data on causes of death and disability pension diagnosis. A total of 1,771 individuals with a medically-based disability pension were excluded because the diagnosis for the pensioning was missing. In all, 243,933 individuals (49% women) were included.

All groups with a medically-based disability pension showed increased mortality that was directly and not directly associated with the pension diagnoses. The magnitude of this increase varied depending on the diagnoses that led to the pensioning.

The hazard ratio of all-cause mortality among those pensioned due to musculoskeletal disorders was statistically significantly higher than 1 for both women (HR = 1.2, CI 1.1–1.3) and men (HR = 1.1; CI 1.0–1.2). The same was true, and even more pronounced for those whose disability pension diagnoses involved either psychiatric disorders (women HR = 2.4, CI 2.2–2.7; men HR = 3.2, CI 2.9–3.4) or cardiovascular disorders (women HR = 3.2, CI 2.8–3.6; men HR = 2.7, CI 2.5–2.9).

The hazard ratio of mortality due to external causes of death was increased among all medically-based disability pension groups, except women with a cardiovascular disability pension diagnosis. The risk of suicide was extremely high among individuals whose disability pension was due to psychiatric disorders (women HR 12.0, CI 8.4–17.2; men HR 5.5, CI 4.0–7.6), and high among men with a cardiovascular disability pension diagnosis (HR 2.4; CI 1.3–4.4).

No increased risk of death was found to be associated with any underlying cause of death in the individuals who were over 55 years of age and had been granted disability for labour-market reasons.

## 5 DISCUSSION

The findings of the present studies are discussed in detail in the four papers included in this thesis. Instead of repeating that information, this section aims to synthesize the results for the general reader.

### 5.1 RISK FACTORS FOR DISABILITY PENSION

Results of study II confirm that sick-leave diagnosis, the long-standing health problem, is an important prognostic factor along with sociodemographic risk factors such as age, gender, and socioeconomic status for future disability pension [144].

#### 5.1.1 Sick-leave diagnoses

The same differential effect of musculoskeletal and psychiatric diseases among men and women in long-term sick leave was found in Norway [48, 49]: among men, those with psychiatric disorders had the highest risk to get disability pension, among women those with musculoskeletal disorders. However, considering the most detailed Norwegian study [48], among women diagnoses related to the nervous system led to a higher risk of disability pension compared to musculoskeletal diagnoses; among men, not only psychiatric, but also cardiovascular and respiratory diagnoses led to a higher risk of disability pension. The disparities in prognosis between the Norwegian and Swedish results might be explained by somewhat dissimilar study periods. Furthermore, there are differences between the two countries with regard to legislation on sickness absence; for example, a sick-leave spell can not last longer than 52 weeks in Norway [145], whereas there is no such limit in Sweden. The risk of disability pension was low in sick-leave due to injury [48] and in women with pregnancy-sick leave diagnoses [48, 49].

#### 5.1.2 Previous absence

In accordance with other studies [12, 49, 146-148], *previous sick leave* was found to be an important risk factor of disability pension. One reason for this might be that both long-term sick leave and disability pension are likely to have the same risk factor pattern [26].

#### 5.1.3 Sociodemographic predictors

*Higher age* which is an indicator of health status was an important risk factor of disability pension both in a general population (paper I) [26], and among individuals with long-term sickness absence (paper II) [48, 49, 98].

In agreement with other investigators, high socioeconomic status measured in study II in terms of *high income* from work reduced the risk of disability pension 0-5 years after inclusion [10, 12, 72-75, 81, 149]. People with a higher income are probably in a better position to pre-empt health deterioration through preventive practices ranging from

better health care to increased leisure time [6, 119]. Low socioeconomic status measured by education is often associated with low-status manual work and high prevalence of sick-leave. Work demands such as physically demanding tasks, and low control over the work situation, are more common among less qualified occupations and might make it more difficult to remain in work when suffering from specific disorders. Furthermore, the protective effect of higher income was reversed 5-10 years after inclusion. During the latter period, higher income (compared to low income) became a significant risk factor for disability pension. An explanation might be that the disability pension decision is postponed more among high incomes (because they have more possibilities to adapt to work demands [45]). Instead of taking sick-leave when they are ill, some people continue to go to work. Sickness presentism depends on the severity of the health situation and hence the work capacity; it also depends on the demands of the job and the possibilities to be flexible in work performance [150]. The consequences of sickness presentism for the individual are poorly investigated [151]. The interaction of income with time on risk for disability pension needs further investigation.

In study II, to be parent of young *children* reduced the risk of disability pension. One of the above mentioned Norwegian study [48] found that that applied only to mothers. Even though (younger) children impose certain responsibilities and workload, a large family might give a sense of coherence, than can promote health [12, 28, 64, 152].

*Non-Swedish country of birth*, which might be associated with difficulties on the labour market [6], was associated with a significantly elevated risk of disability pension, which is consistent with previous findings [6, 66-68, 98]. *Lack of employment* at baseline significantly increased the risk of disability pension among individuals on long-term sickness absence which is consistent with previous studies [96-98].

## **5.2 GENDER DIFFERENCES IN RISK FOR DISABILITY PENSION**

The greater risk of disability pension among women under 54 years of age (paper I) is consistent with previous findings [10, 53, 54]. Most types of measurement of sickness absence have indicated higher rates for women than for men [6, 12, 53, 55-59]. There are several plausible explanations for this higher risk: biomedical factors [54], gender-related variation in risk exposure to paid and unpaid work, and gender bias in medical knowledge and practice, in social insurance practice, and in vocational rehabilitation.

- The gender distribution of occupations between men and women varies substantially, and it has been suggested that this influences patterns of work-related illness and sickness absence [153]. In addition to paid work, women have a considerable load of unpaid work, taking the main responsibility for the home and children, which might indicate a stressful general life situation.

- In order to explain the gender differences described in paper I, further attention should be focused on effects of possible gender bias with regard to medical knowledge and practice [60, 154, 155], social insurance practice [156], and the types of rehabilitation offered to persons on long-term sick leave [148, 157, 158].

### **5.2.1 Interaction between age with gender**

In the HUNT study in Norway [10], 62,000 individuals (aged 20–66 years) were included in a 10-year follow-up of the risk of disability pension from 1985 to 1996. An interaction between age and gender was apparent in this study, with 50 years as a threshold in the risk of disability pension. This striking difference was consistent with the finding reported in paper I, and the HUNT investigators concluded that the risk might be due to social insurance practices [10]: disability pension has rarely been granted to homemakers without gainful employment, and in their study homemakers were more prevalent among older women with a low education [10].

### **5.2.2 Grade of disability pension**

Gender-related differences were also found when comparing relative risk of full- and part-time disability pension in people under 54 years of age. More women were found to have part-time disability pensions in paper I, which concurs with results in the literature [159]. This elevated risk for women might be explained by more severe reduction in work ability among the male disability pensioners, or perhaps there was gender bias in the definition of work ability. In a labour market where full-time employment is the norm for men [54, 160], men might be reluctant to leave the workplace or seek part-time work, and employers are probably more reluctant to offer part-time positions in male-dominated occupations. The higher risk of part-time disability pension among women might also indicate a gender bias in social insurance practices: social insurance personnel often ask women whether they are able to perform household tasks; if the answer is affirmative, a full-time disability pension is seldom approved; also, questions about unpaid work are rarely posed to men [54].

### **5.2.3 Difference in sick-leave diagnoses**

#### *5.2.3.1 Musculoskeletal sick-leave diagnoses for women*

Among women, the likelihood of receiving a disability pension was greatest for those with musculoskeletal sick-leave diagnoses, which supports previous findings [6, 13, 48, 49, 57]. This gender difference might be related to biological distinctions: women have approximately 40–60% of the muscle strength of men [6], which might be an important factor if the workplace is designed with the male biology as the standard [54]. This disparity in musculoskeletal distress might be linked to gender dissimilarities in paid and unpaid work, types of occupations, or medical treatment and rehabilitation [6, 56, 57, 148, 155, 157, 158, 161].

#### *5.2.3.2 Psychiatric sick-leave diagnoses for men*

Having a psychiatric sick-leave diagnosis was associated with a greater risk of long-lasting reduction of work ability for men than for women, which agrees with results reported by other researchers [162]. One possible explanation for the higher hazard ratio of disability pension associated with psychiatric sick-leave diagnoses among men compared to women might be the higher risk of alcohol abuse among men in Sweden [6, 83, 163-165].

Difference in disease features (for instance disease severity) and/or job features (in terms of physical and/or mental demands) could form an additional explanation for the differential effect of psychiatric and musculoskeletal disease among men and women.

## **5.3 PREMATURE DEATH AFTER DISABILITY PENSION**

### **5.3.1 Total mortality**

The high relative risk of total mortality among people with a medically-based disability pension (papers III and IV) coincides with previous findings [126-132]. The increased mortality exhibited by individuals long after being granted disability benefits (paper III) also agrees with results published by other investigators [129], which confirms that disability pension is given mainly to people in poor health. Similarly, a 13-year longitudinal prospective cohort study of the health care utilization by male disability pensioners showed that their patterns of ill-health persisted long after inception of the compensation [166].

#### *5.3.1.1 Adjustment for socio-demographic factors and behavioural risk factors*

After adjustment for a wide range of background variables, including age, socioeconomic status ([130-132]), marital status [130, 131], health behaviour (smoking habits [130, 131] or hospital care for alcohol or drug abuse [131]), and underlying disease [130, 131], the hazard ratio of mortality was reduced to some degree but nonetheless remained significantly increased. The results of the cited studies indicate that *sociodemographics, behavioural risk factors, and underlying disease* play a role, but they can not explain the excess mortality observed among disability pensioners with a medically-based disability pension.

#### *5.3.1.2 Differences in age*

The same high relative risk of total mortality in young disability pension recipients described in paper III has been observed by other investigators as well [126, 131]. This might be due to the fact that the primary endpoint analysed was all-cause mortality which is strongly related to age. The distribution of diagnosis for disability pension provided by the National Social Insurance Board shows that this distribution differs between young and older disability pensioners [34]. Among those who are young, psychiatric diagnoses dominate, and many are granted a disability pension due to congenital disorders or defects [33, 34]. Further research is warranted in this area.

### **5.3.2 Cause-specific mortality**

For the medically-based disability pensioners, it may seem obvious that they have a high mortality considering that they have diagnoses for underlying disease. However, the results reported in paper IV indicate that a medically-based disability pension is associated not only with death due to a specific disease but also with external causes of deaths, including suicide.



### 5.3.2.1 *Non-external causes of death*

The hazard ratios for mortality were increased for all causes of death, regardless of whether they were or were not directly associated with the diagnoses given for pensioning (paper IV), which is consistent with previously published results [131]. The lack of a significant link between reason for disability benefits and cause of death supports the hypothesis that the pension diagnosis does not take into account all the information about morbidity leading to premature death. Plausible hypotheses regarding the excess mortality due to non-external causes are as follows:

- The risk of disability pension has been found to be increased by a number of risk factors for mortality associated with chronic diseases (smoking-related cancers and diseases of the circulatory system [6]): *smoking* [79, 80], *high body mass index* [86-88], and *stress* [115, 116].
- Reports have indicated the possibility that side effects of *medication* given to combat the underlying disease can be involved in the causal chain leading to death, and an example of this is the use of neuroleptics in schizophrenic patients [167].
- *Co-morbidity* of psychiatric disorders has been observed in chronically ill patients such as disability pensioners, and indeed research results have shown that a substantial proportion of patients with a chronic physical condition also suffer from psychiatric diseases [168, 169]. Perhaps psychiatric-somatic co-morbidity implies worse prognosis in terms of mortality compared to purely physical disease, because it may involve one or more of the following: 1) difficulty to perceive and analyse physical symptoms, which might delay medical treatment; 2) lack of compliance with the prescribed medical treatment; 3) lack of compliance with a diet that is necessary in some types of physical ailments [168, 170].

### 5.3.2.2 *External causes of death and suicide*

According to the present results (paper IV), being a disability pensioner was associated with an increase hazard ratio for death due to *external causes* in all groups of disability pensioners and in both sexes – with the exception of females with cardiovascular disease.

Collecting disability pension due to a psychiatric disorder or being a male and on disability pension because of cardiovascular disease was associated with a high hazard ratio for death due to *suicide*. Those findings of an association between suicide and disability pension agree with previous reports [134, 135, 171]. There are two conceivable explanations for this observation:

- Studies have demonstrated that the strongest risk for suicide is a psychiatric disease [171, 172]. This concurs with our investigation showing very high hazard ratios for suicide among both male and female disability pensioners with psychiatric diagnoses.
- The second explanation is physical disease [171-175], since the many consequences of such illness can include pain and suffering, and very often also incapacitation, separation from the community, and psychosocial effects of loss of work.

Having a job and an independent active life promotes good health in many ways, provides social support, and leads to social integration [176]. It is presumed that social networks influence health, by giving social support, social influence, social engagement and attachments, and access to resources [123]. On the other hand, social exclusion from employment might influence a person's health status and even increase the risk of mortality [94]. According to sociological theory, the rate of suicide is a marker of the extent of social exclusion and disintegration in a society [177]. The elevated suicide risk among disability pensioners might also be interpreted as a marker of increased vulnerability in very sick people who are *socially isolated* [178] due to loss of work [171, 179].

### **5.3.3 Disability pension for labour-market reasons**

Persons over the age of 55 and granted disability pension due to labour-market reasons did not have higher hazard ratios of mortality in relation to any cause of death (paper IV). In agreement with that, other investigators [180] found no adverse health effects in older steelworkers who performed physically demanding tasks on the job and were forced to retire early following plant closings. Thus, disability pension for labour-market reasons may have only negligible negative effects, if any at all, on mortality in people age over 55 years. Perhaps the difference in mortality between the individuals collecting medically- and labour-market-based disability pension simply reflects the fact that those in the former group were granted benefits because they had a higher level of disease or disability than those in the latter group.

## **5.4 METHODOLOGICAL CONSIDERATIONS**

### **5.4.1 Strengths and limitations**

#### *5.4.1.1 Strengths*

A major strength of the present research was the 12-year population-based cohort design. All data on disability pension, age retirement, and death were obtained from national registers and could be linked to individual subjects by use of the national personal identification number. Furthermore, all four studies had access to information on the entire population aged 16–64 years in a whole county, and it was possible to monitor cases of disability pension and old age retirement even if the persons in question moved away from Östergötland County.

An advantage for gender comparisons was that fairly equal and high employment rates for men and women were characteristic of the labour market in Sweden in the mid 1980s [54]. In the study reported in paper II, it was also very helpful having access to a unique, high quality database that included sick-leave diagnoses. Such information is usually not available due to reasons of confidentiality. Moreover, the large sample size with a long follow-up insured the high statistical power that is necessary to analyse mortality (papers III and IV).

#### 5.4.1.2 *Limitations*

A limitation of the current research was that the study period ended in 1996 and thus the results do not refer to the most recent decade. Also, the work was confined to a single county, and the data used did not include at least two of the three essential socioeconomic indicators (occupation, education, and income).

Moreover the analyses in two of the studies (papers III and IV) were not adjusted for background factors, which might have confounded the association between disability pension and mortality (social class, marital status, health behaviour) due to lack of such information.

Other methodological aspects that affect all studies of sickness absence and disability pension in all countries include changes in insurance benefits, in employment rates, and the demands of the labour market, all of which are partly related to economic fluctuations. Regarding the present study period of 1985 –1996, the following changes might have been of importance. In 1991, the rules pertaining to disability pensions were altered: after that date conditions on the labour market were no longer considered to be sufficient reason for being granted a disability pension. In addition, there were changes in unemployment over time in Sweden. In 1985, the unemployment ratio was low (2.8%) in 1985, but subsequently increased during the recession in the 1990s to reach a level of 7.5% in 1996. In 1985, Sweden had the highest employment ratios in the Western world for both women (85%) and men (90%) [181]. With the rise of unemployment, those ratios in 1996 had dropped to 70% and 73%, respectively [182]. These changes might have affected the flow between the groups that were unemployed, employed, on sick-leave, or receiving disability pension [11], but despite that, they probably had the same impact on the whole cohort, and thus the mentioned elements were not controlled for in the analyses of the data.

#### **5.4.2 Validity of sick-leave and disability pension diagnoses**

In a previous study of the validity of sick-leave diagnoses, the same sick-leave register as reported in paper II was employed [183], and the authors identified several possible sources of errors, affecting the quality of diagnoses, such as the use of unspecific – or even wrong – diagnoses, avoidance of stigmatizing diagnoses or the use of different diagnoses for the same conditions. However, even though the validity of the specific diagnoses can be low in some cases, it is adequate to use diagnoses for sick leave and disability pensioning on an aggregated level [26, 183], as was done in the thesis.

#### **5.4.3 Validity in underlying causes of death**

The underlying cause of death is defined as the major factor initiating the sequence of events leading to death. There are two main sources of statistical unreliability in this context: the clinical examination on which the cause-of-death diagnosis is based, and the accuracy of the findings reported by the physician on the death certificate. Furthermore, in chronically ill patients, such as disability pension recipients, using cause of death as an outcome might be problematic due to possible misclassification of some pathologies [184, 185]. Many deaths, especially those due to chronic illnesses, can be attributed to more than one disease and cannot be characterized by a single

cause. Some chronic conditions present at the time of the death (e.g., hypertension, diabetes, cardiovascular disorders, and bronchitis) may not be given as the underlying cause. In addition, it is possible that the number of suicides is underestimated in vital statistics, because under some circumstances it can be difficult to ascertain whether a death was a suicide or an accident [186].

## 6 SUMMARY OF RESULTS

The overall aim of the research described in this thesis was to study risk factors for disability pension, focusing on sociodemographic risk factors and sick-leave diagnoses, and also to investigate the risk of mortality in disability pensioners.

The results of this thesis can be summarized as follows:

- The likelihood of being granted disability pension increased with age. Women under 54 years of age were at higher risk of disability pension than men. Also, 69% of the disability pensions were full-time, and more women received part-time disability pensions.
- Five years after inclusion, 28% of the cohort on long-term sick leave ( $\geq 8$  weeks) had been granted disability pension.
- Higher age, low income, previous sick leave, no employment, not having young children, and being born in a country other than Sweden increased the risk of disability pension after long-term sickness absence.
- The pattern of the including sick-leave diagnoses in risk of disability pension differed between men and women. The greatest risk was related to psychiatric disorders in men but was associated with musculoskeletal disorders among women.
- The protective effect of higher income for the risk of disability pension observed after the including spell of long-term sick leave was reversed over time.
- Subjects with a medically-based disability pension had an increased relative risk of mortality compared to those without a disability pension.
- The relative risk of mortality was highest among the youngest disability pension recipients.
- In all medically-based disability pension groups, there was an increase in mortality due to main causes directly and not directly associated with the pension diagnoses. The magnitude of this increase was greatest for psychiatric and cardiovascular disability pensioners and lowest for musculoskeletal disability pensioners.
- The risk of suicide was extremely high in all disability pensioners with a psychiatric diagnosis and high in male disability pensioners with a cardiovascular diagnosis.
- Disability pensioning due to labour-market reasons in individuals over 55 years of age was not associated with increased mortality due to any cause.

## 7 SUGGESTIONS FOR FUTURE RESEARCH

- More knowledge is needed about factors that affect the age and gender differences in the risk of being granted part-time or full-time disability pension.
- Studies should be performed to ascertain why the risk of disability pension differs between women with prolonged sick leave due to musculoskeletal disorders and men with such absence due to psychiatric disorders.
- The reversal over time of the protective effect of higher income on the risk of disability pension merits further investigation.
- The risk factors behind the higher relative risk of mortality among young disability pensioners should be investigated. Such efforts are particularly important in light of the recent trend towards an increase in the number of people aged 20-39 granted sickness-activity compensation.
- Studies should be conducted to elucidate the change in lifestyle habits (smoking, alcohol habits, body mass index, and physical exercise) and quality of life that occur following the granting of disability pension.
- The importance of co-morbidity and type of co-morbidity on the risk of mortality among disability pensioners needs to be investigated, for example by using information on more than the first diagnosis given to motivate disability pensioning.

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