



# Mental health and impairment in disability benefits

Studies applying linkages between health surveys and administrative registries

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<b>ACKNOWLEDGEMENTS.....</b>	<b>5</b>
<b>SUMMARY .....</b>	<b>7</b>
OBJECTIVE .....	7
METHOD .....	8
RESULTS .....	9
CONCLUSIONS.....	10
<b>IMPORTANT TERMS AND ABBREVIATIONS.....</b>	<b>11</b>
<b>LIST OF PAPERS .....</b>	<b>13</b>
<b>LIST OF PAPERS .....</b>	<b>13</b>
<b>1 BACKGROUND.....</b>	<b>15</b>
1.1 THE ORIGIN OF BENEFIT ARRANGEMENTS .....	16
1.1.1 <i>Disability Benefit schemes in the western world</i> .....	16
1.2 BENEFIT ARRANGEMENTS IN NORWAY .....	18
1.2.1 <i>Work force participation</i> .....	18
1.2.2 <i>Unemployment and Social Security</i> .....	19
1.3 DISABILITY BENEFITS.....	20
1.3.1 <i>Sickness Benefits</i> .....	20
1.3.2 <i>Rehabilitation and Vocational Training</i> .....	21
1.3.3 <i>Disability Pension</i> .....	21
1.3.4 <i>Overlap between the arrangements</i> .....	22
1.3.5 <i>Physicians' role in disability benefit award</i> .....	23
1.4 CONSEQUENCES OF DISABILITY BENEFITS.....	25
1.4.1 <i>Societal consequences</i> .....	25
1.4.2 <i>Individual consequences</i> .....	27
1.4.3 <i>Policy consequences of an increase in disability benefits</i> .....	29
1.5 THE HEALTH ASPECTS IN DISABILITY BENEFITS .....	30
1.5.1 <i>Distribution of diagnoses in disability benefits</i> .....	31
1.5.2 <i>Physical conditions</i> .....	33
1.5.3 <i>Mental health</i> .....	35
1.5.4 <i>Somatic symptoms</i> .....	37
1.5.5 <i>Impairment</i> .....	40
1.5.6 <i>Challenges for the health criterion in disability benefit award</i> .....	41
1.6 THEORETICAL FRAMEWORKS ON DISABILITY BENEFITS BEYOND HEALTH.....	45
1.6.1 <i>Push model</i> .....	45
1.6.2 <i>Pull model</i> .....	47
1.6.3 <i>Social roles in disability benefits</i> .....	49
1.7 AIM OF THE STUDIES .....	50
<b>2 MATERIALS AND METHODS .....</b>	<b>52</b>
2.1 THE HORDALAND HEALTH STUDY (HUSK) .....	52
2.2 THE HEALTH STUDY OF NORD-TRØNDELAG COUNTY (HUNT) .....	53
2.3 FD-TRYGD.....	54
2.4 REGISTRY ON DISABILITY PENSION IN THE NATIONAL INSURANCE ADMINISTRATION .....	55
2.5 SCALES AND MEASUREMENTS IN THE STUDIES .....	55
2.5.1 <i>Hospital Anxiety and Depression Scale</i> .....	55
2.5.2 <i>SF-12</i> .....	56
2.5.3 <i>Somatic diagnosis</i> .....	57
2.5.4 <i>Somatic symptoms</i> .....	59
2.5.6 <i>Sleep problems and Insomnia</i> .....	60
2.5.7 <i>Variables on demographics and health behaviour</i> .....	61
2.5.8 <i>Ethical approval and data clearance</i> .....	61
<b>3 DESIGN, ANALYSIS AND RESULTS.....</b>	<b>63</b>

3.6.1	<i>Paper I</i> .....	63
3.6.2	<i>Paper II</i> .....	65
3.6.3	<i>Paper III</i> .....	68
<b>4</b>	<b>DISCUSSION</b> .....	<b>71</b>
4.1	MAIN RESULTS.....	71
4.2	METHODOLOGICAL STRENGTHS.....	71
4.3	METHODOLOGICAL LIMITATIONS.....	72
4.3.1	<i>Residual confounding in paper I</i> .....	74
4.3.2	<i>Bias from health selection</i> .....	76
4.3.3	<i>Variable operationalization and handling of missing values</i> .....	78
4.3	IMPAIRMENT FROM HEALTH PROBLEMS.....	80
4.4	HEALTH STATUS ACROSS THE DISABILITY PENSION PROCESS.....	83
4.5	UNDERESTIMATION OF MENTAL ILLNESS IN DISABILITY BENEFITS.....	87
4.5.2	<i>Under-treatment of mental illness</i> .....	88
4.6	INSOMNIA IN DISABILITY BENEFITS.....	90
4.7	SOCIO-ECONOMIC GRADIENTS AND DISABILITY BENEFITS.....	92
4.8	GENDER ISSUES.....	94
4.9	THE EFFECT OF AGE IN DISABILITY BENEFITS.....	95
4.10	RESULTS IN RELATION TO PUSH AND PULL MODELS.....	96
4.11	SICK ROLES AND DISABILITY BENEFITS.....	98
4.12	INTERNATIONAL RELEVANCE OF THE RESULTS.....	100
4.13	EVIDENCE FOR INTERVENTIONS.....	101
4.14	NEED FOR RESEARCH.....	102
<b>5</b>	<b>REFERENCES</b> .....	<b>105</b>

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# Summary

## *Objective*

An increasing number of people in Norway and most other western countries leave the workforce earlier than retirement age and depend on disability benefits for income security. There is no consensus concerning which factors may serve as an immediate explanation for this trend. The scientific community can at present not provide research based information on the general causes and consequences of disability benefits. This leaves those who must make decisions in this field short of evidence to inform their choices. The aim of the present thesis is to expand the empirically based knowledge on factors relevant as causes and consequences of disability benefits by combining data from public health surveys and registry information on disability benefit awards.

The thesis is based on three papers that all focus on mental health and impairment in relation to disability benefits. First, we examined differences in impairment between employed, unemployed and disability benefit recipients. Impairment has, in the context of disability benefits, previously been seen as an obvious consequence of disease. We aimed at empirically examining aspects of that presumption.

Second, previous studies have found that both depression and insomnia are underestimated as risk factors for disability pension award. As these frequently co-occur, we aimed at comparing their relative impact on disability pension award.

Third, there is very little knowledge on health across stages before, during and after disability pension award, and variation in both positive and negative directions are plausible. We wanted to compare health status in disability pensioners across these stages from seven years before disability pension award to seven years after the award.

## **Method**

All three studies employ data material that is a combination of population based health surveys and data on disability benefits from official registries. Papers I and III are based on population data from the Hordaland Health Survey (HUSK) in 1997-99. The 18 581 born in the years 1953-57 (aged 40-47 at participation) who participated (63 %) answered questionnaires on physical conditions, mental health, somatic symptoms, and perceived health, as well as socio-economic status. Paper II is based on the second wave of the population based Nord-Trøndelag Health Study (HUNT 2) 1995-97. Of those invited, 37 308 eligible participants within working age answered questions on insomnia and depression as well as covariates including somatic illness, health behaviour and socio-economic status.

These health surveys were linked to comprehensive registries on disability benefits using the national person identification number. The merged datasets comprising information on health and benefit receipt were used to study the aims through three different designs.

In paper I we used a cross-sectional design. We compared the extent of self-reported impairment (measured with SF-12) between participants who were disability benefit recipients and those employed. Further, employing linear regression models, we examined to what extent the group difference in impairment could be explained by mental health, somatic symptoms, and physical conditions.

In paper II we compared the risk of disability pension award across four groups defined by case-level depression and insomnia, employing a historical cohort design with an 18-48 month follow-up period. Logistic regression models were employed and results were also presented as population attributable fractions (PAFs).

In paper III, we aimed at examining if health status differs between strata of individuals defined by time between the health survey and disability pension award. Groups were defined as 3-7, 1-3, and 0-1 years before the award, and 0-1, 1-3, and 3-7 years after.



Measures of impairment, somatic symptoms, physical conditions, and mental health were compared between these groups.

## ***Results***

In the first study we found that disability benefit recipients reported more impairment than employees. While most of the difference in mental impairment (SF-12, perceived mental health) was explained from anxiety and depression, about half of the difference in physical impairment (SF-12 perceived physical health) remained unexplained after adjustment for all physical conditions, mental health and symptoms.

In the second study, insomnia was found to be an equally strong predictor of disability pension award as depression. Both the effects of depression and insomnia were confounded by socio-economic factors and other health problems, but the relative difference between insomnia and depression remained through all steps of adjustments in the employed regression models. Due to differences in prevalences, the population attributable fractions of insomnia exceeded that of depression. Significant effect moderation was found for age; both depression and insomnia were stronger risk factors for disability pension award in younger strata (<45 years) than older.

In the third study, disability pensioners reported more somatic illness, somatic and mental symptoms, and impairment than the remaining sample (participants who were not awarded a disability pension during the observation period). This difference was observed in all groups in the observation period ranging from seven years before to seven years after the disability pension award. Measures on physical conditions were stable across the strata defined by time between health survey participation and disability pension award, though the groups measured after time of the award, reported more prescribed medication. However, we

found a non-linear trend of an increase in mental and physical symptoms and impairment in the groups closer to the award, followed by a subsequent reduction after the award.

## ***Conclusions***

The results over these three studies support previous notions that mental health is important and might be underestimated in relation to disability benefits.

Impairment, as measured by perceived health, might not only be a result of somatic and mental health problems, but may also be an independent factor leading up to disability pension award. Individuals' perceptions of own health and impairment might take into account many factors that are not caused by medical conditions. The results suggest that an increased focus on health perceptions might be needed in studies on disability benefits.

In Norway, disability pension is officially not awarded for insomnia. Yet does insomnia predict disability pension award just as strong as depression, which is the most common diagnoses in disability pension award. Clinically, insomnia is often regarded as reactive to any other present condition. As insomnia often is left untreated, improved treatment can perhaps serve to reduce work disability following from insomnia.

Finally, the design in paper III precludes any firm conclusions as to what causes the observed group differences. Candidate explanations include temporary health deteriorating effects from the disability pensioning process, beneficial effects of being removed from harmful work conditions and spontaneous recovery after increasing health problems leading up to disability pension award. If the results in part are caused by features of the disability pension process itself, the results are relevant for rehabilitation and treatments of patients where a disability benefit is a topic. Recent policy changes have introduced temporary benefits with regular re-evaluations of health and impairment. Such repeated pension assessments, may have unintended adverse effects.

## Important terms and abbreviations

ATC	Anatomical Therapeutic Chemical
BMI	Body Mass Index
CAGE	Abbreviation for four questions concerning alcohol problems: thought of <u>C</u> utting down, <u>A</u> nnoyed by others' criticism of drinking, <u>G</u> uilt of your drinking, and morning <u>E</u> ye opener
CBT	Cognitive Behavioural Therapy
CI	Confidence Interval
CRN	Cancer Registry of Norway
CVD	Cardio-vascular disease
DALY	Disability Adjusted Life-Years
Disability Benefits	General term including benefits awarded as a response to health problems
Disability Pension	Benefits given for permanent work disability or work disability expected to endure over foreseeable future
DP	Disability pension
DSM-IV	Diagnostic and Statistical Manual of Mental Disorders, 4 <sup>th</sup> edition
ECT	Electro-Convulsive Therapy
EGP	Erikson, Goldthorpe and Portocareros scheme for social class
EU	European Union
EUPHA	European Public Health Association
FD-Trygd	Forløpsdata Trygd
GDP	Gross Domestic Product
HADS	The Hospital Anxiety and Depression Scale

HUNT	The Nord-Trøndelag Health Study, 1984-86
HUNT-II	The Nord-Trøndelag Health Study, 1995-97
HUSK	The Hordaland Health Study, 1997-99
ICD-10	International Classification of Diseases, 10 <sup>th</sup> edition
MCS	SF-12 Mental Component Summary
MUPS	Medically Unexplained Physical Symptoms
NIA	Norwegian Insurance Agency (Rikstrygdeverket)
NOK	Norwegian Kroner
OECD	Organisation of Economic Co-operation and Development
OR	Odds ratio
PAF	Population Attributable Fraction
PCS	SF-12 Physical Component Summary
RTV	Rikstrygdeverket (Norwegian Insurance Agency)
RTW	Return to work
SES	Socio-economic status
SF-12	Measure of perceived health, short version of SF-36
Sickness Absence	The act of being away from work due to illness or disease
UK	United Kingdom
US/USA	United States of America
WHO	The World Health Organization

## List of papers

- Paper I        Simon Øverland, Nicholas Glozier, John Gunnar Mæland, Leif Edvard Aarø, Arnstein Mykletun (2006). Employment Status and Perceived Health in the Hordaland Health Study (HUSK). *BMC Public Health* 6; 219
- Paper II        Simon Øverland, Nicholas Glozier, Børge Sivertsen, Robert Stewart, Dag Neckelmann, Steinar Krokstad, Arnstein Mykletun. A comparison of insomnia and depression as predictors of disability pension. The HUNT Study (Resubmitted after review)
- Paper III        Simon Øverland, Nicholas Glozier, Max Henderson, John Gunnar Mæland, Matthew Hotopf, Arnstein Mykletun. Health status before, during and after disability pension award. The Hordaland Health Study (HUSK) (Submitted)



# 1 Background

The provision of economic security through benefits for those in need is an integral function of welfare systems in most western countries. One of the major groups of benefits are those designed to aid persons who are unable to retain a job due to health problems. While this is seen as a cornerstone of welfare states, the policies that govern such disability benefits and how they function are also subject to great dispute. The steady increase in disability expenditure and number of recipients despite a general improvement in public health indicators, is fuelling this debate (1).

The general improvements in health enable us to live longer. Young adults start their working life later due to lengthy education. An increasing rate of the population receive government benefits as their main source of income over stretches of time (2). In sum, these factors are said to comprise a major fiscal problem for welfare systems in the near future. None of the member countries of the Organisation for Economic Co-operation and Development (OECD) seem to have found the appropriate countermeasures towards a development where every work hour performed needs to provide for an increasing amount of benefits.

More people out of the work force also translate to loss of production and reduced tax income. For the individuals affected, loosing the attachment with working life can be a great loss (3), and many of them express a wish to have a job again (4). At present, the status of scientific knowledge on the causes of benefits, what keeps recipients on benefits and its consequences is labelled as “underdeveloped in terms of theory, methodology as well as concepts” in a recent literature review (5). The lack of knowledge leaves those who need to make decisions related to welfare and benefits short of evidence to inform their choices.

The present dissertation aims to amend some of these shortcomings. Employing

analytic epidemiological approaches, the thesis explores factors involved in disability benefits with a particular focus on the role of mental health and impairment.

The introduction part of this thesis is organized in four main themes. First a brief overview of central aspects of benefit systems will be provided. Second, health operationalized over four concepts will be presented, and in a third section, factors beyond health that are relevant for the topic of disability benefits will be presented. In the last section, the specific aims of this thesis will be presented in more detail.

## **1.1 *The origin of benefit arrangements***

As varying physical and mental capacity is an inherent quality of humans, differences in work ability must evidently have been a challenge throughout human history and across societies. In peasant societies, the extended family was likely to take care of the disabled. When selling of labour caught on, this gave rise to a need for some form of sickness insurance (6). In the early developments of such arrangements, abnormality or loss was restricted to physical “defects” as in persons who were blind, deaf or paralysed, or without an organ or a limb. For these conditions or injuries, fixed defect-percentage scales listing specific needs for compensation were developed. These were often called “Baremas” after its developer, the French mathematician François Barême (1640-1703). Later, similar but more fuzzy scales have been developed to incorporate mental and psychological problems (7). Though this approach may seem as an anachronism, modern adaptations of Baremas are still widely used as guidelines for compensation of injuries (7, 8).

### **1.1.1 Disability Benefit schemes in the western world**

The World Health Organization (WHO) defines disability (in behavioural terms and as a result of impairment) in the following terms: “An impairment is any loss or abnormality of



psychological, physiological or anatomical structure or function; a disability is any restriction or lack (resulting from an impairment) of ability to perform an activity in the manner or within the range considered normal for a human being” (9). The term “disability benefits” is commonly used in disability policy, and hence also in international scientific articles and policy reports. The term “disability” in a work context is tricky, as it often cannot be observed directly, but must be inferred from presumed causes (impairments) with distinct consequences: a restriction or incapacity to perform normal work roles (7). In the following, the term “disability benefits” will be used as a general term describing economic benefits offered in face of work inhibiting health problems, lasting beyond shorter term sick-leaves. A shorter term sick-leave is defined as lasting from one to sixteen days. This term (“disability benefits”) is possibly more apt the longer the benefit is lasting, as the concept of disability has connotations to lasting conditions.

Disability benefits are generally not based on fixed benefits for certain diseases as in the sense of “Baremas”, but legislation across countries usually states that disability benefits are to be awarded only when a medically acknowledged condition inhibits the ability to work. Across the OECD, stricter work requirements in unemployment and social assistance programmes, and a gradual retrenchment of early retirement systems, contributes to increase the pressure on long-term sickness and disability benefit schemes (10). As none seem to have readily available solutions to this challenge, it is held pertinent to increase our knowledge about causes of disability benefits (11).

As one contribution, a recent report from the OECD analysed similarities and differences in policies across countries, and country specific challenges were identified (1). Differences are found in terms of compensation levels, permanency of benefits and also eligibility criteria. A corresponding variation in terms and concepts complicates direct comparisons across nations (12). Also, the age-span defined as the working-age span, and the

rate of this group who is active on the labour market, varies between countries (13). Thus, the size of the work-force varies, and with it, the number of people eligible for disability benefits (14). The “pathways” between work and long-term or permanent disability benefit reciprocity differ since features of policies influence trajectories, regulate time spent within the different sub-groups of benefits and thus influences the point prevalence of people in any particular benefit.

Despite such differences, all countries share the basic challenge: There seems to be an increase in disability expenditure across nations. Most employees are occasionally off work due to short spells of illness, but an increasing rate of the work force have lasting spells, where they are off work and depend on benefits as income. Why this happens is not clear, and there is currently no consensus as to what would constitute an optimal level of disability benefit expenditure.

## **1.2 *Benefit arrangements in Norway***

Health insurance in Norway is regulated in the Act of Social Insurance of 1997 (15). In general have all who legally reside in Norway a compulsory membership in the national insurance system. Under certain circumstances, the same applies to Norwegian citizens living abroad. Social security policy is a part of the broader set of policies aiming at correcting or ameliorating consequences of job loss, unemployment and reduced employability (16).

### **1.2.1 *Work force participation***

Previous work force participation or income is often an eligibility criterion in benefit policy. Therefore, pro capita work force participation rates are relevant when comparing benefit prevalence across nations. Among the OECD countries in 2005, Norway had the fourth highest work force participation rate in the age group 15-64 (74.8 %) after Iceland (83.8 %),

Switzerland (77.2 %) and Denmark (75.9 %) (13). The participation rate for women in Norway is among the highest in the world, but the fraction of these in less than full-time employment is comparatively high. In terms of “hours worked”, the female work participation rate is near the EU-average (table 1).

Table 1 – Labour force participation, age 15-64 from the 2005 European Union Labour Force Survey (EU LFS)

	Norway	Sweden	Denmark	UK	EU-25
Employment rate (%) ♪	74.8	72.5	75.9	71.7	63.8
Men	77.8	74.4	79.8	77.6	71.3
Women	71.7	70.4	71.9	65.9	56.3
Part-time employment rate (%)	20.7	16.9	16.3	17.5	11.4
Men	10.2	7.5	9.4	7.1	4.7
Women	31.5	26.6	23.3	27.6	17.9
Hours worked full time ♫	38.7	39.9	39.4	42.6	40.4
Men	39.0	39.9	40.4	44.1	41.3
Women	38.0	39.8	37.9	40.1	39.1
Hours worked part time	19.4	25.3	18.6	19.1	20.0
Men	17.1	21.3	14.1	18.1	19.1
Women	20.1	26.4	20.5	19.3	20.2

♪ Employment rate: The in the age specific strata who report working for a public or private employer and who receive compensation in the form of wages, salaries, payment by results or payment in kind.

♫ Hours worked: Hours spent working the last week, not including time spent commuting and meal breaks.

*Contents of table adapted from Jouhette and Romans (2006) (13)*

## 1.2.2 Unemployment and Social Security

As in many European countries, the Norwegian social security system has two main schemes where the awarding criteria are not related to health problems. Work-capable individuals who

have had an income, and who have their working hours reduced by at least 40 %, may register for unemployment benefits. The benefits are dependant on previous income, and are available for a maximum of two years, but duration may be extended upon application given particular circumstances (17).

There are also social security cash benefits available for temporary needs, aiming to facilitate re-establishment of economic independence. The framework for these benefits is wide, and often requires documentation of specific economic needs.

### **1.3 Disability Benefits**

Disability benefits are a group of benefits under the National Insurance Scheme that are meant to assist those in working age who cannot work due to health problems (15). For the disability benefit scheme, legislation states explicitly that the inability to work shall be caused by illness, disease or injury, and that a causal association between the health problem and work impairment must be established. To underline this, it is stated that needs for support due to social problems, does not qualify for support within these schemes (15). There are several sub-groups of benefits within the health related benefits, presented in the following<sup>1</sup>.

#### **1.3.1 Sickness Benefits**

The sickness benefits scheme (in Norwegian “sykepengen”) provides an income replacement during spells of sickness absence. This scheme is applicable until a person has received such benefits for over 248 work days within the last three years. To be eligible for sickness benefits one must have been working for at least four weeks before a health problem causes an inability to work. The application for benefits must include an approval or certification from a physician, which is considered an advisory statement for the Norwegian Insurance Agency

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<sup>1</sup> The following is based on information from the Norwegian Act of Social Insurance (1997), unless otherwise is stated.

(NIA) case-managers, who are authorized to approve or reject benefit claims. Sickness absences up to three consecutive days are exempt from this, and in this period the employee receives full wage compensation without any formal certification. Self-certified absences are limited to four spells a year. Generally, the first 16 days of an absence period are covered by the employer, while the NIA covers benefits that exceed 16 days duration (18). In cases where a health problem is chronic with frequent relapses, the employer can apply for full NIA-coverage from the first day. Statutory sickness benefits replace 100 % of pensionable income, with an upper limit of six times the basic amount (an index regulated figure, Norwegian Kroner 62 892 in 2007 (18)).

### **1.3.2 Rehabilitation and Vocational Training**

Rehabilitation benefits can be awarded after the maximum period of sickness benefits has expired, and provided that additional treatment is meant to restore working capacity. As a general clause, those who receive rehabilitation benefits shall be involved in a treatment program aiming at return to work as soon as possible. The benefit is offered for a maximum of 52 weeks, but expansion of the period can be applied for in special circumstances (18).

Vocational training is a program that offers training or education for those with a permanent health problem which makes return to the previous line of work impossible. There are less formal criteria attached to this program as it is more tailored to individual needs. If treatment is unsuccessful in restoring work capacity and any effect of rehabilitation is unlikely, vocational training should be attempted before disability pension is awarded (17).

### **1.3.3 Disability Pension**

The disability pension scheme provides a livelihood for those unable to generate an income for periods that outlasts the time-limited arrangements presented above. Disability pension

was until 1<sup>st</sup> of January 2004 awarded as a permanent benefit. Recent policy reform has incorporated time limited pensions lasting one to four years, with a re-evaluation of impairment at the end of the defined period (18). Return to work from disability pension in Norway has been uncommon under the previous policy. Across all exits from the disability pension scheme in 2004, the reasons were due to receipt of other kind of pension (74.4% - mostly old age pension), mortality (18.4%), and other causes, including return to work (7.2%) (19). It remains to be seen if the recent policy change introducing time limited disability pension translates into increased return to work. As for the previously described schemes, award of disability pension shall also be based on medically acknowledged health problems. In the application for disability pension, the main diagnosis causing the impairment is stated, in addition to a possible secondary diagnosis of a condition that also contributes to the impairment and/or the chronic course of the problem.

#### **1.3.4 Overlap between the arrangements**

Many of those who receive any of these specific benefits will at some point have received one or more of the others. Award of disability pension generally requires that adequate treatment and/or rehabilitation or vocational training has been attempted and found insufficient in reinstating work ability. Those who receive long-term benefits will therefore most often have received benefits within other schemes. Thus, many disability pensioners will be transferred from other forms of benefits (20).

Some may also be recipients of several benefits simultaneously, for instance may recipients of graded benefits (less than 100 % impaired) lose their part time job and thus be eligible for unemployment benefits. Such client overlap between all the specific schemes is possible. Most of those who receive a graded disability pension go on to a 100 % disability pension over time. For many of those who end up on disability pension, their record in the

benefit system can be portrayed as a rather continuous process, where severity and chronicity of the benefits are gradually increased. This argument is underlined by studies showing that length of time-limited benefits spells is in itself an important predictor of disability pension (21, 22).

Despite commonalities and a degree of overlap in terms of recipients, the different arrangements within the Norwegian model have distinct features. Thus, in research, advantages and disadvantages should be considered both when combining these or using these separately. In the present thesis, two of the papers focus on disability pension only, while one combines the specific arrangements described above into one variable indicating receipt of any health related benefits.

### **1.3.5 Physicians' role in disability benefit award**

Physicians have an important role in disability benefit certification in most countries. As with other aspects of disability benefits, the certificates used takes various forms. The requested information is usually related to determining the patient's diagnoses, their prognosis, as well as current and future work ability (6).

The physicians' role in the process of sick-listing has been described as containing six tasks:(23) (a) Determine if the disease or injury is present according to existing criteria; (b) and if it implies impaired ability to work. Currently in Norway, more than 50% impairment is necessary for award of disability benefits. (c) Further, advantages and disadvantages of being awarded benefits must be considered in dialogue with the patient, (d) the grade and duration of benefits must be determined, (e) as must also the need for contact with specialists, the social insurance office, or other parties. (f) Finally, the formal certificate must be completed by the physician.

The physicians' role in the process of disability benefits is further described as balancing between being the patient's advocate and being a gate-keeper restricting the access to welfare systems (23). According to formalities, the physician is supposed to decide on work ability and possible diagnosis based on examinations of the patient. The execution of that function has been questioned based on the information imbalance in the patient-physician dyad. This is exemplified in the following quote from the article "Who shall help the Doctor?" published by the Lancet already in 1964: *"Examining by the doctor is usually a meaningless formality, since it is the patient who decides when he is fit for work"* (24). Studies suggest that both physicians and patients raise the question of disability benefits in consultations, and in questions on shorter benefit spells, physicians most often issue certificates when requested by the patient (23). To the best of our knowledge, the extent of gatekeeping behaviour has not been examined in cases where long-term or permanent benefits are considered.

Physicians generally find assessing work impairment difficult (23). Although, patients and physicians usually agree on the need for sick-leave in each case (23), case-vignette studies have demonstrated a great deal of variation in physicians' assessments concerning the need for disability benefits. The variation is observed at the level of general practitioners, but also at the level of the physician's gender, geographic regions and type of medical speciality (25). For instance, older physicians issue more sickness certifications, and this is commonly interpreted as a consequence of them having a closer and more long-standing relation to their patients. A recent doctoral thesis explored the conflicts between the dual roles of being the patient's advocate and a gatekeeper, and concluded that recent reforms in primary care policy had made physicians less engaged in gatekeeping practices (26). In summary, there exist only few studies on the physicians' role in the process of sick listing patients, these are of varying quality, and the above referenced studies do not specifically address disability pension award.



A recent study concludes that UK general practitioners perceive their current role in sickness certification as being in conflict with the patient-physician relationship. The authors address a need to expand our understanding of the complexity in general practitioners' gatekeeping behaviour before new policy changes are implemented, if these are to result in improvement (27).

Formally, the physician provides the medical foundation on which, along with other information, the insurance administration either awards benefits or rejects the application. As such, it is not the treating physician who has the final word in this context. However, the treating physician's medical opinion is likely to be highly weighted, and can probably in many cases be the in-effect gatekeeping function (28).

#### **1.4 Consequences of disability benefits**

As mentioned, quite many people are at some stage during their working life in touch with the benefit system. Due to their central role in certification practice, physicians in general practice spend considerable time on disability benefit related activities. Despite the many individuals who are affected by disability benefits, and the great extent of time and capacity spent on such in general practice, there is remarkably little scientific knowledge on the possible consequences of disability benefits award (29). From the heterogeneity of the recipients and the conditions they are awarded benefits for, massive variation probably exist, and both positive and negative effects are plausible.

##### **1.4.1 Societal consequences**

The societal consequences of disability benefits are major, and are one of the reasons why disability benefits continuously are debated. One obvious aspect is the public expenses from these schemes. Disability expenditure accounts for a significant proportion of Gross Domestic

Products (GDP) across OECD member countries. The average in 1999 was 2.42 % of total GDP, against 5% in Norway (1). The direct expenses in permanent disability pensions in Norway were in 2004 NOK 41 060 000 000 and account for 18 % of the total expenses to social security in Norway (30). The increase in direct expenses to permanent disability pensions from year 2000 till 2004 was 25 % (both NOK in 2004 values) (19). Early age occupational disability is thus a burden to society, both in terms of expenses from direct costs to disability pensions, but also due to lost productivity and income taxes. At the end of 2005, there were 300 877 permanent disability pensioners in Norway, and additional 18 814 on time-limited disability pension (according to revised rules for disability pension award) (31).

The general demographic distribution in most of Europe is moving towards a higher mean age. So far we have not seen any corresponding extension of upper working age limit before old age pension is awarded. More people claiming age retirement pension, combined with the observed increase in number of individuals on lasting disability benefits, translates into an pressure on our welfare systems (32).

There are also many possible positive societal consequences of disability benefits. It has been claimed that the generous benefit systems found in the Nordic countries are beneficial, as they reduce costs for other areas in society. In a recently published book, Danish authors claim that the higher level of collectivism in the Nordic countries, that also have brought on the developed welfare systems, have a positive effect on the economy of these countries. They claim that the sentiment of co-operation often found in these societies contribute towards increasing their effectiveness (33). Similarly, others have argued that a collectivistic virtue like “trust” is imperative for a prosperous economic development (34). Results from international comparative economic surveys indicate that Norway enjoy strong work-ethics, strong social cohesiveness, virtually no poverty, and a high level of trust that has secured low levels of abuse of comprehensive social programs (35). A plain example of a

possible positive effect of relatively generous welfare systems is that those who do not generate an income might be less likely to resort to crime to earn a living.

#### **1.4.2 Individual consequences**

There is evidence to suggest that there are negative health and social effects from becoming a disability benefit recipient (3). Negative factors like isolation, stigma, and loss of work-role, may all be instigated by losing contact with working life, which in turn may have negative psychological consequences for affected individuals (36, 37). Consequently, it is held that physicians should be restrictive in issuing disability benefits, not only on behalf of public economy, but also to avoid harmful individual side-effects from factors assumed associated with benefit award. To underline this argument, studies from the British household panel survey have found increased psychological distress associated with transitions between paid employment and unemployment or long term sick-leave, and also reduced psychological distress when moving from non-employed roles into formal employment (38).

Although removal from the work force is associated with health decrements, this does not necessarily imply that being at work is good for health. Gordon Waddell and Kim Burton have recently conducted a review commissioned by the UK Department for Work and Pensions to answer this question: “Is work good for your health and well-being”? (3). Their answer is an unequivocal “yes”. Provided that the workplace is safe and accommodating, the beneficial effects of work is said to outweigh the strains of work (3). A Swedish retrospective study in a cross-sectional sample, reported largely negative effects from being outside work and on long-term disability benefits (39). However, we do not know if the negative associations are caused by being left outside the work force, losing the positive aspects of work or third factors confounding the association.

A recent review on consequences of disability benefits reported an immense lack of scientific studies (29). The author further noted that when consequences of disability benefits are debated, scientific studies are seldom cited and that the current level of evidence disallowed any scientifically based conclusions (6). The 3<sup>rd</sup> pre-conference meeting on sickness absence in the European Public Health Association's (EUPHA) 2005 conference was devoted to discuss the evidence on consequences of disability benefits, and how to design studies addressing this question. The meeting concluded that the evidence for beneficial or detrimental effects of long-term disability benefits is poor, and that new methodological approaches were warranted.

It can also be argued that becoming a disability pensioner gains the individual, as it provides relief from possible work-related strains and burdens, and also relief from financial worry. There is a well-known association between stress<sup>2</sup> and disease. The causal links are not firmly established, but several hypotheses exist based on a known association between stress and changes in pituitary-adrenal and catecholamine axis activity (40). Such hypotheses have traditionally been brought forward through experimental studies on animals and humans, and to a lesser extent in ecological settings. The question then remains if financial insecurity facing work impairment is a likely source of pathological stress. For those who are active in a job, insecurity in the form of threats of job loss is found to have an adverse effect on health (41-44). What the most likely direction of causality is in this association, is a matter of debate, but there is more support for the assumption that such insecurity causes reduced health than the other way around (45). In the case of disability benefits this insecurity is supposedly instigated by disease (to be eligible for disability benefits), and by the fact that a negative health trajectory is already established. The question is whether the additional financial worry and general insecurity could add to the burden. Evidence from studies on peoples' health in

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<sup>2</sup> See Ursin & Eriksen (2004) The cognitive activation theory of stress. *PNEC* 29; 567-592, for a differentiated introduction to the various meanings of the term "stress"

relation to job insecurity from various reasons like temporary contracts, organizational downsizing and so forth, suggests that it can. Several studies confirm that financial and job insecurity is associated with negative health outcomes (46-50). The stress associated with financial insecurity may very well be increased in situations where health becomes poorer and prospects of return to work diminish. Thus, a financial guarantee in the form of benefits may reduce, or remove, one known risk factor for health problems.

### **1.4.3 Policy consequences of an increase in disability benefits**

Arguably, increases in disability benefits, either in numbers of recipients or expenditure, represents a threat for welfare schemes. The schemes are all based on the political will to allocate funds to finance those in need. At present, political sentiments are generally in favour of having a well-developed welfare system, and few counter the importance of this function in society. However, objections to its form are increasingly raised since crude point prevalence estimates now suggest that one out of four Norwegians within working age are not working, all reasons included (51). Based on such figures, it is tempting for some politicians to suggest that the current level of benefits are too generous and attract recipients from work to benefits, instead of being a protection for those who are pushed out of work by health problems. This position constitutes the attraction-model or pull-model for explaining transitions from work to disability pension award, which will be followed up at various stages in the present thesis.

In such discussions, it is important to keep in mind that a complete removal of sickness absence probably is as unlikely as a complete eradication of illness and disease. As people in all foreseeable future will have health problems, a certain level of disability is unavoidable. In complete absence of supporting benefit systems, it is likely that more people would keep going to work despite disease or illness. There is little firm knowledge on what factors predict such so-called sickness presence, nor what consequences this has (52).

There is evidence to suggest health-risk from sickness presence. Studies from the UK Whitehall sample have demonstrated that unhealthy employees who take no sickness absence have twice as high incidence of serious coronary events as those who had a moderate level of sickness absence (53). In terms of work performance, there are reasons to believe that being present while sick lowers this considerably, and that this adds to hidden costs for the employers (54-56). However, we are not aware of studies contrasting the inexplicit costs from sickness presence with those more directly observable in sickness absence (substitute wages, increased burden on remaining workers etc.) (52).

In summary, it is likely a better approach to search an optimal level of sickness absence in light of the given health panorama and labour market factors, than to exclusively aim at reducing the level as much as possible. Thus, both a decrease, stabilization and possibly even a further increase in disability benefits might be tenable. What is probably less politically acceptable in the long run, is a continued increase without adequate knowledge on why this occurs.

### **1.5 The health aspects in disability benefits**

As presented, disability benefit legislation state that benefits are to be awarded only where medically acknowledged health problems cause work impairment that exceeds 50 %<sup>3</sup> of normal capacity. In light of this clear-cut definition, there should be no need for specific research into the causes of disability benefits. If it was possible to manage benefits perfectly in line with legislation, the true causes of disability benefits would be found in the annual reports from the National Insurance Agency (NIA), where the diagnoses from medical certificates are presented. Research into causes of benefits would be no different than general research into causes of diseases and conditions, and examinations of their consequences in

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<sup>3</sup> Can be graded from 100 % down to 20 % reduced work capacity in sickness benefits

terms of invoked disability for any given job. Disability could be framed along the lines of Disability Adjusted Life Years (DALY) in the studies commissioned by the World Health Organization (WHO) (57-59). Further, prevention of disability benefits would be a matter of primary and secondary prevention of disease and tertiary preventive efforts to facilitate peoples' ability to stay at work despite illness and impairment (60).

### **1.5.1 Distribution of diagnoses in disability benefits**

Broad disability benefits are awarded for a wide range of illnesses and conditions which vary a great deal in terms of average duration. Therefore, diagnostic distribution in disability benefits varies depending on the type of benefit and also whether one focuses on incidence (new cases) or prevalence (the aggregated number of cases). In terms of sickness benefits incidence in 2004, the leading diagnoses were musculo-skeletal disorders (43.8 %), respiratory disorders (13.7 %) and mental illness (11.2 %) (61). The proportion of mental illness in this context has increased (62). Common, but milder and less chronic conditions and illnesses are more prevalent in the short term benefit spells, as they often cause temporary impairments.

The “bulk” of disability expenditure is related to longer disability benefit spells and disability pensions. Particularly the latter, as these often lasts from when they are awarded until retirement for age and transferral to age pension. In terms of diagnoses in disability pension awards, the leading group of diagnoses are still musculo-skeletal disorders (33.2 %), but mental illnesses are equally important (30.1 %)<sup>4</sup>, followed by disorders in circulatory organs (7.0 %) (table 2) (30). The present thesis focuses on long-term and permanent disability benefits. In the following presentation of relevant health aspects, the prevalence rates in disability pension will therefore comprise the numerical basis. The crude diagnostic

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<sup>4</sup> Most of these are within the depression-spectre, some 10-15 % are psychosis-related

distribution found in Norway, presented in table 2, is similar to what is found in comparable countries (63, 64).

Table 2 - Distribution of diagnoses for Disability Pension in 2004

	Per cent of new awards of disability pension	Per cent of total population of disability pensioners
Musculo-skeletal	35.8	33.2
Mental	21.5	30.1
Circulatory organs	10.2	7.0
Cancer	5.6	2.4
Injuries, poisoning, violence	3.7	4.9
Nervous system	6.4	6.5
Respiratory	3.1	2.6
Temporary lack of diagnosis	3.8	2.1
Other diagnoses comprised <sup>1</sup>	9.9	11.2

<sup>1</sup> All other diagnoses individually comprise less than 3.0 %

Following on from disability benefit legislation and the distribution of diagnoses, we can extract information on what aspects of health are of importance in the context of disability benefits. Health is a multifaceted concept. The WHO formal definition is wide and according to their definition it includes “physical, mental and social well-being” in addition to absence of disease (65). In the present context of disability benefits, health will be operationalized over four health concepts: physical conditions, mental health, somatic symptoms and impairment. In the following, the rationale for this distinction will be presented through defining the concepts, relating them to the others, and also by presenting their relevance for disability benefits.



### 1.5.2 Physical conditions

In the present thesis, the term physical conditions<sup>5</sup> refers to any specific diagnosis that is not part of the mental health spectrum, and where the symptoms presented can be related to objective findings.

Physical conditions are at the heart of medicine. In epidemiology, this is perhaps best illustrated by Eaton: *“Epidemiology is a branch of medicine, and thus the assumptions of the medical model of disease are implicit. The most important assumption is that the disease under study actually exists [...] In psychiatry this assumption is assured more tenuous than in other areas of medicine, because psychiatric diseases tend to be defined by failure to locate a physical cause”* (66). Conditions where a clear observable correlate is a present and known cause of the problem usually will have higher “rank” in the medical hierarchy, than those based on symptom reports or mental illnesses (67).

These physical conditions are of course too numerous to each being mentioned specifically, but in the context of disability benefits, tumours (both malignant and benign) and cardiovascular disease (CVD) can serve as useful examples. Besides mental illnesses and musculo-skeletal disorders, about one third of the diagnoses are best put under “physical conditions”. As the vast majority of musculo-skeletal disorders are non-specific and without any observable organic cause, we must keep in mind that when these are regarded as physical conditions (e.g. fibromyalgia), the diagnosis is based on symptoms rather than biomarkers (68).

There are several reasons as to why the importance of physical conditions seemingly is less important in the context of long-term disability benefits than in medicine in general. A first reason might be exemplified through CVD. Few studies have focused on the risk of short-term disability benefits in these serious disorders, simply because pretty much all

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<sup>5</sup> In papers I and II, the term “somatic conditions” is used, while the term “physical conditions” is used throughout this thesis. We regard them as synonyms.

patients with severe cardiovascular diseases (CVD), like stroke or coronary artery disease, receive disability benefits from sickness absence in the recovery period following the onset (69). Therefore the question is not if the condition leads to sickness absence and corresponding benefits, but rather if or when the person returns to work. The outcomes of these disorders in terms of return to work (RTW) is possibly far better than commonly perceived; two of three return to work within six months following stroke. Only one of four require adaptation of the workplace, and more than 50 % seem to retain their work over lengths of time (69). Specific studies have shown that factors like high age, low education, residential area deprivation, workplace stress, anxiety, depression and poor self-confidence lower the prospects for RTW within the first year after a myocardial infarction (70, 71). Recent studies have demonstrated that intervention aimed at changing health perceptions after myocardial infarction can improve functional outcomes (72). From these studies it seems that the prognosis in terms of RTW is significantly influenced by factors besides the isolated CVD.

Another reason why physical conditions are less dominant in benefits than in medicine in general, has to do with their epidemiology and demographic distribution. As already mentioned, in terms of return to work (RTW), the outcome of stroke appears to be much better than the common perception of prognosis in these disorders. This has to do with the fact that many of the patients with serious CVD's are elderly and beyond working age. The same is the case with cancer; the majority of cancer cases occurs in the older age cohorts (73). In addition, there is often better prognosis in the types of cancer that are more frequent in the younger cohorts such as testis-cancer among young men.

In table 2, an elevated disability pension *incidence* compared to the *prevalence* can be observed in both cancer and CVD. This is mainly due to a higher mortality-rate in these conditions than what is the case in musculo-skeletal and mental illness. Thus, although both

cancer and CVD are grave and serious conditions, they are less relevant in disability benefit *prevalence* than *incidence* due to fewer person-years<sup>6</sup> within the working age period.

### 1.5.3 Mental health

The World Mental Health Survey Consortium from 2004 states that the prevalence of mental illness is high (74). In their global survey, the inter-quartile range<sup>7</sup> of meeting the criteria for at least one DSM-IV (75) mental illness was 9.1 % and 16.9 % of the population. The prevalence in western countries is usually in the higher end of this range (76-78). It is further concluded that a substantial proportion of these mental illnesses remain untreated (74). Still, other studies suggest that treatment for mental problems has increased in the last decade (79). Such observations may be conceived as implying an increase in mental illnesses. This is however countered as most of the increased treatment seems to occur in the milder segment of the mental illness spectrum (79). Using figure 1 below as an illustration, the increase in treatment is said to occur mainly in the segments of “normal cases” or “sub-threshold cases”. This is supported through findings of a low help-seeking rate among those who score over cut off for probable clinically relevant anxiety and depression (80). Similar figures for low help-seeking rates among adolescents with mental health problems are also observed (81).

The course of mental illnesses can in many cases be chronic, with remitting and recurring episodes, and thus have serious consequences for individuals and society (82, 83). This is emphasized in the Global Burden of Disease Studies, where unipolar major depressive disorder is projected to be the second leading cause of disability world wide by the year 2020 (84). Based on these figures resulting from high prevalence, chronic course and severe consequences, it is not surprising that mental health is an important factor regarding disability benefits.

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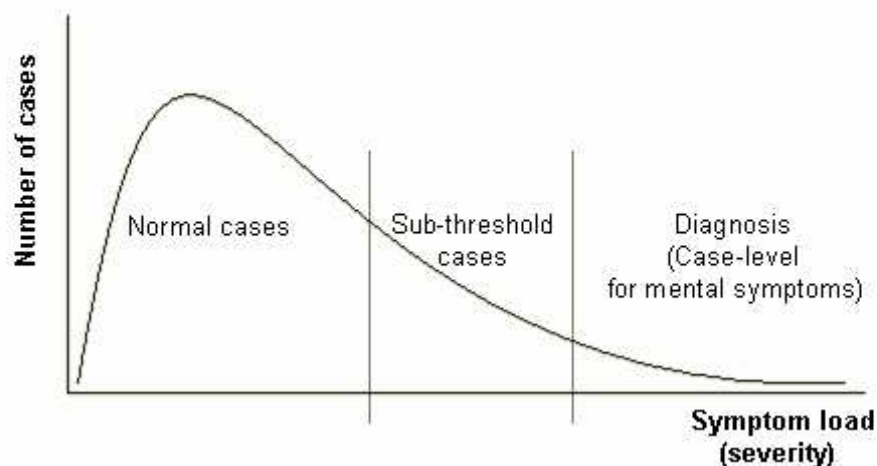
<sup>6</sup> Person-years is the sum of time observed, across all subjects in the defined group

<sup>7</sup> Inter-quartile range is the range between the first and third quartiles of a distribution, and provides an estimate after both the high and low scores are removed

There are many standardized ways to measure mental illness including open clinical interviews and multiple versions of structured interviews and symptom checklists. The results from these approaches can either be presented as continuous or categorical measures. The categorical approach is probably the best known as it separates “ill” from “well”, and forms the basis for the common diagnostic manuals DSM-IV (75) and ICD-10 (85). In relation to disability benefits, the categorical approach is important as a diagnosis is a requirement for awards.

The categorical approach has several shortcomings: First, the nature of mental health problems is in many ways better represented in dimensional models than in categorical models. The most common of mental illnesses, anxiety and depression, are best described on a continuum from low symptom loads to high symptom loads, encompassing all levels from good mental health to severe psychopathology (86). The distribution of the symptom load is not Gaussian, but has a positive skew towards the higher end of the spectrum (figure 1).

Figure 1. Distribution of symptoms of mental disorders



*Adapted from Mykletun (2006) (67)*

Supporting evidence for dimensionality is also found among the more severe mental illnesses. Although genetics are highly relevant in the aetiology of schizophrenia (87), several

new reports claim that the continuum model also applies to psychotic experiences (88-90) and delusional ideas (91). The claim is supported by the fact that the core symptoms of schizophrenia like hallucinations also occur in both healthy individuals and individuals with other mental illnesses like anxiety and depression (90). In a dimensional model, a specific diagnosis becomes applicable once certain symptoms reach a predefined level. Symptom check lists are often applied with such cut-offs, as in the case of the Hospital Anxiety and Depression Scale (HADS) (92-94). In the diagnostic manuals for mental illnesses, distinctions between sub-categories of the broader spectra are often determined by degree of severity of symptoms. Different symptoms are also relevant across several specific diagnoses, but are often weighted in different ways, e.g. how many positives from a list that are needed to qualify as an indication of the diagnosis. Through these features, the dimensional model is also partly incorporated in the categorical approaches as found in the diagnostic manuals. In the case of DSM-IV, negative consequences of symptoms are also included as a diagnostic criterion (75).

Regardless of use of a categorical or dimensional model, measurements of mental health are nearly always based on subjective reports from individuals. The search for objective correlates of mental illness has been intense, particularly in the grave mental illnesses. Various biomarkers are identified as candidates in schizophrenia, but yet there is no established pathognomic neuropsychological or structural neuroanatomic profile in this disorder (95). Differences are detected when comparing large groups of people, but are not predictable and explanatory on the individual level.

#### **1.5.4 Somatic symptoms**

A blunt understanding of symptoms is that these are signals or signs to the individual of an underlying organic failure. Symptoms are not considered to be very specific. A particular

symptom (e.g headache) is a possible symptom of several underlying physical conditions, and any health problem originating in the in the head may result in a wide range of symptoms experienced in the entire somatic system across organs. The ambiguous nature of symptoms is in part why the medical specialty of “internal medicine” at times is described as “the true art of medicine” as its diagnostics is based on a conglomerate of various symptoms that each is non-specific.

Somatic symptoms are very common (96, 97). They are so common that across the population it is more common to have one or more symptoms than being symptom-free. Most often, the symptoms remain unexplained. That is, the medical profession is not by current standards capable of identifying any biological correlate or organic failure that can explain why the symptoms are experienced. The worry and uncertainty that often accompanies symptoms lead to frequent help-seeking. Common somatic symptoms are responsible for almost half of all primary care visits, and only 10 to 15 % of such visits are found to be caused by an organic illness over a one-year period (98). Such medically unexplained physical symptoms (MUPS) are just as common in ambulatory care (99), and also in consultations on the specialist level (100). In one study, the proportion of specialist consultations where organic aetiology of symptoms was identified ranged between 10 and 25 % across symptoms (chest pain 12 %, fatigue 17 %, dizziness 19 %, headache 11 %, back pain 10 %, dyspnoea 25 %, abdominal pain 10 % and numbness 20 %) (100). For most patients, these symptoms disappear after a while. But for some, the symptoms persist and given a certain intensity they fulfil the diagnostic criteria for various forms of somatisation disorders (85). “Somatisation” has effectively two meanings: the expression of psychological illness through physical symptoms (as in somatised depression) (101), and the repeated help-seeking for multiple medical symptoms without organic disease (102). While the two concepts overlap, they are not synonymous. For the latter, the frequency of help-seeking

across specialities has led each branch of medicine to have specific labels for these unexplained symptoms. Examples are: Irritable bowel syndrome in gastroenterology, fibromyalgia in rheumatology, tension headache in neurology and temporomandibular joint disorder in odontology. Each of these syndromes is claimed to be a unique diagnosis entity with its own characteristics, and for each, there is usually an operational definition attached to it (103). Some claim that these different labels may better reflect what specialist branch they are addressed within than differences in symptom profiles (103). It is argued that between these, a) there is considerable overlap in symptoms required for a case definition, b) patients who meet the criteria for one condition often meets the criteria for others, c) patients with different syndromes share non-symptom characteristics and d) different syndromes respond to the same therapies (104). This has led Wessely and colleagues to argue that these rather should be considered one general condition, one functional syndrome (105, 106). The argument is supported through factor analysis studies where symptoms are found to be clustered and highly inter-correlated (107, 108).

Regardless of one or many labels, this or these syndromes have severe consequences (55, 105). Studies have demonstrated poorer outcomes in terms of disability among these patients than those with heart failure (109). These patients also have more emotional problems than patients with similar conditions, but where there are objective findings accompanying the symptoms (110). Patients with these types of conditions are avid help-seekers both within the established medical enterprise (111) and alternative medicine (112). The high level of help-seeking, seems to occur independent of psychiatric and medical comorbidities (113).

It is thus hardly any surprise that medically unexplained physical symptoms are relevant for disability benefits. Most disability benefits are awarded for conditions where there is no clear organic cause or the positive organic findings are not sufficient to explain the impairment (114). In a recent prospective study, we found that somatic symptoms, adjusted

for physical conditions and mental illness potentially causing these symptoms, were the most important health factor in disability pension award (115).

Many of the cases where the diagnoses are based on these symptoms are likely to be retrieved in the group of musculo-skeletal disorders. Other studies have demonstrated that symptoms of fatigue predict disability benefits awarded both for mental, musculo-skeletal, cardiovascular and “other disorders” (116). Outside the context of disability benefits, these are also quite common conditions in the general population with prevalence estimates ranging from 14 % to a high of 31 % (117). In most of these cases, no distinct diagnosis is established. When the condition is chronic, the probability of a specific diagnosis increases to between 15 % and 30 % (118, 119). However, in most of these cases again, the specific diagnosis is at best a descriptive one, indicating which area of the back or neck the problem is located (63).

Without knowledge of the underlying cause of the problem, the degree of severity essentially depends on the patient’s experience (120-123). Thus, it is reasonable to claim that in many disability benefit cases, treating physicians and case managers alike are directly dependent upon symptoms and symptom presentations in decisions regarding benefits for musculo-skeletal disorders (68).

### **1.5.5 Impairment**

Legislation on disability benefit award requires impairment of normal work function due to health decrements. It is also required that there is a causal relationship where the health problem is found to be the cause of the impairment. While research efforts into the aetiology of disease and how to treat them is massive, the opposite is the case for impairment. Quoting from page 41 in a recent review on the causes and consequences of disability benefits:

*“Traditionally, impaired work ability has been perceived as such an obvious consequence of disease that special explanatory models have been unnecessary”* (124). In relation to benefits,



such a mechanistic view might have been more valid in an industrial society where manual work dominated. The association between disease and work ability becomes much more complex when working life is dominated by service and trade, and also the disease panorama in the population of working age is dominated by poor mental health and stress-related disorders.

There is no standardized way to measure impairment, and it is argued that we need more research on how types of disease affect working ability (124). Through a recent reform in Norway, the emphasis on evaluations and monitoring of changes in function<sup>8</sup> has been increased (125). Such evaluations are thought to promote better identifications of the deviations between the patients' physical, psychological and social resources and the demands in work, leisure and private affairs. The effects of this reform remain to be seen.

How evaluations of impairment are performed in questions concerning benefit awards has also been reviewed. Again, the evidence found is too scattered to allow any conclusions (23). Evaluations of impairment is probably a major threat in patient-physician relations, and gatekeeping behaviour by stating that impairment is not present, is potentially a very overt step away from patient advocacy from the patients perspective (126).

### **1.5.6 Challenges for the health criterion in disability benefit award**

As mentioned, disability benefits are according to legislation exclusively available on medical grounds, and as such every disability benefit recipient has a medical diagnosis that warrants the award. Despite this, there is a conundrum that poses a major challenge for the simplified understanding of disability benefits where illness, injury or disease causes impairment incompatible with continued work: The increase in disability expenditure and the increasing rate of the work force on disability benefits does not correspond well with the general

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<sup>8</sup> To promote a focus on resources, the term function is used in the reform. In the present thesis, impairment is used as the main term and is also meant to cover "reduced function"

improvements seen in key health indicators (1, 2, 127, 128). These indicators of improvements are often higher life expectancy and less child mortality, both outcomes of little direct relevance for disability benefits. But in a similar fashion, there is little evidence to suggest an increase in the true prevalence of mental illnesses and musculo-skeletal disorders that compose the diagnostic bulk of benefits (79, 120, 121, 129, 130). Also, moving beyond diagnoses, a recent publication have indicated that the increase in sickness absence in the last decade cannot be explained by an increase in health complaints (130).

The number of eligible persons has an impact on both incidence and prevalence in the various benefit schemes. There has been a steady decline in unemployment in Norway the last four years. An inverse relationship between unemployment and sickness absence has been observed, and this is usually explained by an increase of people with marginal work-capacity are included in the work force when the economy flourishes. Accordingly, many of these will need disability benefits as they have an elevated risk of being ill (131). Although this assumed association intuitively makes sense, empirical tests have failed to support it in full (132). Also, the recent fluctuations in the unemployment rate correspond very little with the relatively stable increase in disability pension observed the last decade. Thus, although unemployment rates probably have some relevance for the level of sickness absence, this is not likely to explain the steady increase in disability pensions.

In accordance with the requirements, every disability pension award is accompanied by one or two diagnoses that are the formal medical cause of the impairment. The precision of these diagnoses has been questioned, and accordingly the assumption that diagnoses can explain the reduced work function entirely.

Aggregations of diagnoses for which disability pensions are awarded are used to document current health challenges and as a basis for planning health services. Therefore erroneous figures may pose a problem. If misclassification was random, this problem would

be minor. However, it is argued that mental illness might be underestimated in disability pension award (67, 133). The argument is supported through a series of empirical studies: Mental health problems contribute to increased duration and incidence of disability benefits regardless of what diagnosis warranted the award (134), and also predict early retirement (135). However, as much of disability benefits are awarded for mental illnesses, it is only reasonable that mental illness does predict both sickness absence and more enduring benefit spells. In a recent Norwegian study, it was found that anxiety and depression were strong predictors of disability pension over a four year follow-up period. The novelty in this study was that anxiety and depression predicted disability pension award in cases where no mental illness is mentioned as a diagnosis warranting the award (115). The effects of anxiety and depression remained after adjustment for physical conditions and somatic symptoms. This suggests that anxiety and depression of a clinically relevant level do have effects on disability pension award without this being fully acknowledged in the diagnoses reported in applications for disability pension award.

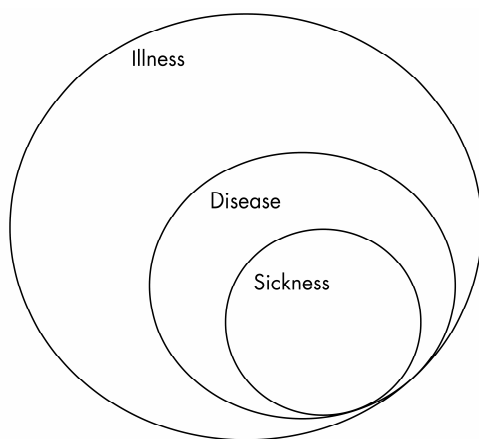
Using a similar approach, further studies have found that insomnia is an independent risk factor for later disability pension award (136). This is not in any way reflected in the diagnostic distribution in official statistics as awards for insomnia diagnosis are virtually non-existent. In sum, the findings indicate that the diagnostic distribution as portrayed through official statistics may err to the side of underestimating the true impact of mental illness upon disability benefits awards.

Several studies have shown that factors other than health are important independent predictors of disability pension. As high age is associated with increased morbidity, an association between higher age and disability pension award is not surprising. However, the effect of age remains after control for physical conditions and somatic symptoms (115). Also, studies have shown that among laid off workers after factory closure there is an increased risk

of disability pension in the afflicted geographical area (137). Yet other studies have demonstrated that social factors like low education and low socio-economic status are important predictors of disability pension, especially among those of younger age (138, 139). It is however unclear to what extent the latter findings are best explained by poorer health among lower social strata, or by higher economic incentives that also are suggested as a risk factor for disability benefits (140). Regardless of explanation, findings that demonstrate risk factors for disability benefits besides health factors could indicate that somehow, non-medical problems are transformed into individual illness<sup>9</sup>.

Figure 2 provides an illustration of how the concepts of health are thought to relate to each other. This model is also in line with a simplistic understanding how health and disability benefits relates to each other (141). The model suggests there is a rather large pool of illness<sup>10</sup> in the population. Some of this illness is due to diagnosed disease, and in some of these cases, this result in sufficient impairment to warrant sickness absence.

Figure 2 – Theoretical model of the relation between illness, disease and sickness



*Adapted from Wikman et.al (2005) (142)*

However, when the model is tested in a recent study by Wikman and co-authors, the results do not match the predictions. As illustrated in figure 3, there are many who are

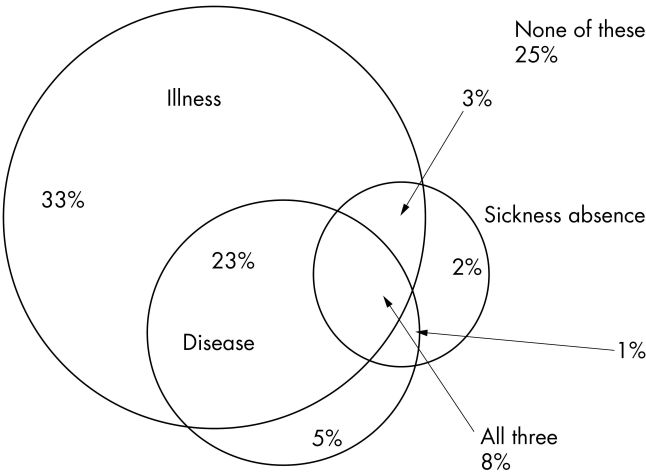
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<sup>9</sup> This is in line with the term “medicalization” which will be discussed later

<sup>10</sup> Illness is defined by Wikman et.al (2005) as “the ill health the person identifies themselves with, often based on self reported mental or physical symptoms”

sickness absent but do not report medical problems. There are also many who have diseases and illness, but are not sickness absent. The authors call for a more precise use of terms in expressions of health, and more caution in using these as interchangeable alternatives (142). The results further suggest that understanding impairment as an obvious consequence of disease might at best be too simplistic.

Figure 3 – Observed relation between illness, disease and sickness absence



*Adapted from Wikman et.al (2005) (142)*

In the arguments presented, the relevance of social factors and the less than perfect association between health problems and disability benefits are evident. This suggests that explanatory models beyond health are of relevance in the understanding of the causes and consequences of disability benefits. In the following, such models are presented.

**1.6 Theoretical frameworks on disability benefits beyond health**

**1.6.1 Push model**

The push model explains disability benefit award as a consequence of factors beyond the individual’s control. Push factors include deteriorated health from work place exposure, work

place changes that make chronic conditions a hindrance to employment, macro economic factors, and discrimination of e.g. elderly workers or women. Thus, the push model is perfectly compatible with health decrements causing the inability to work, especially where occupational risk factors are the causes of the medical problems.

The associations between occupation and morbidity are well established: Mental disorders vary across occupational groups (143, 144) and the combination of high demands and low control in the workplace is associated with mental illness (145). In relation to disability benefits, UK studies have demonstrated that support from colleagues and supervisors at work reduces risk of short term sickness absence due to mental illness (146, 147). Following on from this finding, preliminary findings from ongoing research suggests independent effects of perceived high demands and low control at the workplace and long-term sickness absence (148). Further, increases in disability benefits are observed after factory closings (137) and organizational downsizing (149). Such economically derived push factors can be consequences of how labour is organized, where demands for profit, effectiveness, and change may exclude less healthy individuals from the labour market. There is some support for the hypothesis that disability benefits in such cases are used for early retirement (150). This process of moving structural problems of the labour market and society onto individuals is described as *medicalization*. In the context of disability benefits, the term implies that individuals are made redundant from a job and in cases of low employability, seeking refuge in the sick-role remains the only viable option to maintain financial security (4). Individuals will then be forced to either present new symptoms or experience an accentuation of already existing health problems. Alternatively, the situational factors may in itself be a symptom eliciting agent or a cause of disease. To the extent that these processes are forced upon the individual, and not the result of a rational choice, such processes are in line with the “push” perspective.

Disability benefits are more common among lower socio-economic strata (138). Social inequalities in health are as prominent in Norway as in other European countries, and have been fairly stable over time (151). Relative community deprivation seems to be associated with a higher incidence of disability pension award, and this contributes to marginalization of people living in less affluent areas, which in turn widens socioeconomic inequalities in the population (139). Medical determinants alone neither explain the dramatic variations nor the overall increased incidence rates of disability pension in the last two decades in Norway (152). Thus it is unknown how much of the increased prevalence of disability benefits in lower socio-economic strata actually is caused by worse health.

Beyond socio-economic inequalities, disability pension award also increases with age, female gender and being single (153). A secondary finding in a recent publication is that the effect of age on disability pension award is surprisingly strong after accounting for health (115). This can be seen as an indication of disability benefits being used to tackle redundancy of older employees, contrary to political intentions and current regulations in disability benefits.

### **1.6.2 Pull model**

The pull model (or attraction model) hypothesizes that individuals largely choose disability pension over continued work after rationally considering relative gains and losses in continued work and disability benefits (154). The model focuses often on economic advantages and disadvantages in the two alternatives (67). Whereas most research on push factors is conducted within medicine and social sciences, the pull model is more common in economy, illustrated by Duesenberry (1960): "Economics is all about how people make choices; sociology is all about how people don't have any choice to make" (155).

In this perspective the importance of health is presumed to be marginal (155), and given that the model is empirically valid, the obvious intervention is to reduce the level of benefits to reduce their attractiveness. There is some empirical support for the pull model (155, 156), and it has had major impact on policy making. For example, a Norwegian Public Report recommended 20 % reduction in wage compensation with the purpose of reducing the overall sick-leave, and similar interventions have also been discussed in relation to disability pension (125).

Economic incentives can be defined as the ratio between ones economical situation if provided by benefits divided by the economic situation as an employee. As most disability schemes are based on a minimum basic amount plus a fraction of lifetime earnings, low income groups will have a higher *incentive* for disability pension (157). However, it follows from the socio-economic gradient in health that these groups also are more at risk for health problems (138, 139, 151, 152, 158). Health may thus act as an obvious confounder in any association found between economic incentives and disability benefits. To our awareness, there are yet no studies taking this into account, but preliminary findings from an ongoing study (presented at the 13<sup>th</sup> EUPHA-conference) suggests that the effects of economic incentives upon disability pension award are relatively independent of health (140).

The lack of scientific studies taking both economic factors and health into account is yet another example of how science has come short in providing evidence for decision making on a policy level (11, 159). In a review of disability benefit research very few studies examining effects of pull factors were reported (160). The authors state that in public debate, the prevalence and increase in disability benefits are often explained in terms of changes in attitudes towards benefits, suggesting a “moral hazard” in the population. Few scientific studies target issues related to attitudes and such "absence culture" (11). This might reflect divergent political views in academic medicine and economics causing a gap too wide to



bridge. The ideal of patient advocacy is a core value in most aspects of health care and health education, and it can be argued that statements towards pull-theories are politically incorrect within this field.

### **1.6.3 Social roles in disability benefits**

“Roles” are sets of connected behaviours, rights and obligations as conceptualised by actors in a social situation. It is mostly defined in terms of expected behaviours in a given individual social status and social position. In his 1951 “Social Systems”, Parsons established the term “Sick role” as a particular set of rights and obligations that follow from illness (161). Parson’s description has been called “*a concept that overshadows all others in the field of medical sociology*” (162). The rights that follow from acquiring the sick role are that the patient is exempt from normal role demands, is not deemed responsible for falling ill, and cannot cure him- or herself. On the side of obligations, the patient must see the illness as undesirable and must want to get well from the illness (163, 164). The desire to get well is expected to be expressed in behavioural terms through seeking competent help.

The contents and specific definitions of the terms in Parson’s “sick roles” are continuously debated (164). A common criticism is that his roles and obligations are far better suited to describe features of acute illness than chronic conditions. In face of a chronic condition, the patient cannot “get well” in the normal sense, and can neither be expected to seek competent help to be cured where no such is available. The perception of a chronic disease must then be changed from something “undesirable” to “something that must be lived with” (165). The Parsonian patient role concept is thus said to neglect the “illness iceberg” where chronic conditions overshadow the acute in terms of person-years (164). Further, Parson’s description assumes that the individual finds illness undesirable. As opposed to this, several situations where a patient might want to seek protection in the sick role has been

suggested (6): a) For some, the sick role is their main identity and behaviour related to illness provides attention. b) Anyone, at times, may welcome illness as a provider of a needed break from demands, and the sick role legitimises a higher level of passiveness than would be normally accepted. c) In face of failure, for any reason, disease may be used as an excuse. d) The sick role can be taken as an escape in situations of opposing demands.

In relation to disability benefits, the discussion on sick roles is relevant in several ways. In relation to shorter spells of illness, sickness benefits are in accordance with the rights, obligations and expected behaviour of the sick role. The benefit recipient is freed from normal role obligations (work), he/she has sought competent help and has been awarded a certificate from a physician (6) and the very idea of time limited sickness benefit award suggests that the aim is for the patient to get well.

Along the lines of the criticism that the concept is less well suited to chronic conditions, the obligation to “get well” is being breached when a permanent disability pension is awarded. Such an award may be seen as an institutionalised manifestation of the chronicity of the patient’s condition.

### **1.7 Aim of the studies**

A current lack of sufficient knowledge about causes and consequences of disability benefits has been addressed (11). As presented in the introduction, mental illnesses have been given some attention as risk factors and associates of disability benefits in the existing literature. Studies are however too few to allow firm conclusions in reviews, and also too few and diverse to allow meta-analysis (64). There are also few studies examining mental health factors in relation to physical conditions.

Through using population based data from large health surveys linked to national registries of benefits, we studied factors involved in disability benefits with a particular focus on mental health and impairment.

In the first paper, the aim was to examine differences in impairments between people who are employed and people who receive disability benefits. We assumed that benefit recipients would report more impairment than those who are working, and if that assumption was met, we wanted to examine which health factors that could explain these impairments. We employed a broad concept of health including physical conditions, mental and somatic symptoms and also included socio-demographic factors and variables on health behaviour.

In the second paper, we wanted to further analyse risk factors for disability pension. Previous studies have identified that both depression and insomnia are independent and underestimated predictors for this outcome. Given the known close association between insomnia and depression, we wanted to examine their relative effects on disability pension award. A second aim was to estimate population attributable fractions for insomnia, depression and comorbid insomnia and depression to examine their relative importance in terms of public health impact. Additional aims were to examine interaction effects of gender and age on this outcome.

In the third paper we aimed to compare health status between disability pension recipients at stages before, during and after disability pension award. We further aimed to examine trends across these strata. Literature on related topics suggests that both positive and negative changes in health are plausible over the course of a disability pension process.

## **2 Materials and methods**

All three studies employ data material that is a combination of population based health surveys and data on disability benefits from official registries. Data sets from the two sources were merged using the 11-digit national person identification number. Possibilities for merging of data sources such as these are nearly exclusive to the Scandinavian countries. Few other countries have established a system of personal identity numbers. Where such exist, it is often not politically possible to use them for such purposes due to concerns about privacy and surveillance. To ensure confidentiality in our data merging process, identification numbers were not made accessible to researchers, but handled by Statistics Norway only, who carried out the merging of the data sets, after approval from the Norwegian Data Inspectorate. The possibility of future linkages to registries and other data sources was explicitly stated in the informed consent form signed by all participants of the health surveys.

### **2.1 *The Hordaland Health Study (HUSK)***

The Hordaland Health Study (HUSK) was an epidemiological research project carried out from November 1997 till June 1999 (appendix II). The survey was carried out in collaboration between the National (Norwegian) Health Screening Service and the University of Bergen. The source population was all inhabitants of Hordaland County in western Norway who were born in the years 1953-57, 1950-51 and 1925-27. The two latter cohorts were included for specific purposes outside the aim of the present study, and will not be described in any further detail. Those born 1953-57, thus aged 40-47 at the time of the data collection, counted 29 400 individuals. A total of 18 581 (8 598 men and 9 983 women) answered the first questionnaire that was received by mail and brought to the clinical examinations. The overall participation rate was 63 %, lower for men (57 %) than for women (70 %).

Following completion of the clinical examinations, a second questionnaire was distributed, and participants were instructed to complete this in private and return it by mail. This second questionnaire was returned by 85.4 % of the males and 88.6 of the females, and thus yielded a total return rate of 87.1 % of those who came to the clinical examinations. Further exclusion and missing responses are specifically described in each article as the inclusion criteria and handling of missing reflects the chosen designs.

## **2.2 The Health Study of Nord-Trøndelag County (HUNT)**

The first HUNT study was carried out in the years 1984-86 (appendix II). The second wave of the HUNT studies (HUNT 2) was carried out from August 15<sup>th</sup> 1995 till June 18<sup>th</sup> 1997, and is the empirical basis material for paper II in the present thesis<sup>11</sup>. The study is among the most comprehensive health surveys available, covering a broad range of mental and somatic health issues, both through focusing on specific diagnoses and on symptoms. The source population was all participants aged 20-89 in Nord-Trøndelag County, a county relatively stable and ethnically homogenous with less than 3% non-Caucasians (166). A total of 92 936 were eligible for participation in the study, and 66 140 (71.2 %) did participate in one or more parts of the study. The participation rate was somewhat higher for females than males, and lower among the younger age cohorts (20-29 year olds), the latter frequently due to difficulties in tracking individuals in education, military services, extended vacations and temporary residency abroad. A 2.5 % random sample of the non-participants were approached by mail and telephone for participation in a non-responder study (166). Among individuals within working age, common answers to questions concerning their non-attendance were lack of time, emigration, busy at work, forgetfulness or no particular reason. “Health problems” or “being followed up by own physician” were more common reasons for non-attendance in the

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<sup>11</sup> The data collection for the third wave of the HUNT study (HUNT-3) is currently in progress

older strata (167). Results from other population studies have shown that non-participants in health surveys have higher psychiatric morbidity (168). This aspect was not particularly addressed in the HUNT-2 non-responder study, but is likely to be a characteristic of non-attendees. In an article in press, a close to four times higher mortality incidence was found among non-participants compared to those who participated, suggesting at least some health selection in participation (169).

### **2.3 FD-Trygd**

FD-Trygd (Forløpsdata-Trygd) is a comprehensive database running from October 1992, that contains data gathered for research purposes in topics related to social insurance and social policy (170). It covers the entire Norwegian population, and each individual is identified by a unique national identity number. Given approval from stakeholders<sup>12</sup>, these data can be used for any analysis or linked to any other survey as long as numbers are large enough to disallow identification of individuals, for instance through rare demographic constellations. The registry includes all relevant information used in the case-managing process to estimate awards and eligibility for the various schemes. This relates to all parts of the Norwegian benefit system on an individual level, and includes information on assets, income and taxes and if relevant, the corresponding figures for spouses. For health related benefits, the diagnosis that warranted the benefit award is also included. The structure of the data allow establishment of aggregated “flow-charts” in cases where recipients are involved in more than one part of the total social security scheme.

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<sup>12</sup> Informed consent from participants in the health survey, approval from Regional Committees on research ethics, approval from the Norwegian Data Inspectorate and also approval from those who govern the various health surveys

## **2.4 Registry on Disability Pension in the National Insurance Administration**

In article 2, data from the HUNT-2 study were merged with data on disability pension from the National Insurance Administration (NIA). This merging was done prior to the release of the previously described FD-trygd, which is more comprehensive in terms of available information. Due to bureaucratic delay, however, it was not possible to employ data from FD-trygd merged to HUNT-II within the time frame of this project. The registry on disability pensions contains information on date of award, proportion of disability (50-100 % disabled), and up to two diagnosis from ICD-9 (until 1998)/ICD-10 (171) (1999 and onwards) that warranted the disability pension. The information on diagnosis was extracted from physicians' certificates, while date and degree of disability awarded were from the insurance administration. Multiple events per individual are common, as many first enter the disability pension scheme through a graded disability. However, the vast majority eventually end up with a 100 % disability pension and less than ten percent ever return to work after being awarded a disability pension (30). The provided dates of pension award facilitates identification of subjects who were awarded a disability pension before participation in the health survey, and during the predefined "wash out period"<sup>13</sup> lasting 18 months after participation.

## **2.5 Scales and measurements in the studies**

### **2.5.1 Hospital Anxiety and Depression Scale**

The Hospital Anxiety and Depression Scale (HADS) was used in all three papers. It is a self-report questionnaire comprising fourteen items, whereof seven measure core symptoms of anxiety (HADS-A) and the remaining seven are on core symptoms of depression (HADS-D) (Appendix 1). A four-category Likert-scale was used. Psychometric studies on the scale have

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<sup>13</sup> The term "wash-out" period describe an introduced lag between exposure and observation of outcomes to reduce risk of reverse causality

revealed two-factor solutions in the HUNT study sub-samples defined by clinical characteristics, age and gender (94). The scale was developed for use in a somatic hospital setting (hence the name). To avoid identifying false positive cases in a context where most subjects would have somatic illness, vegetative symptoms of anxiety and depression were excluded (92).

In terms of specific diagnoses, the items are similar to symptoms of major depressive disorder and generalised anxiety disorder. As is the case for many symptom based inventories, diagnostic levels are identified as exceeding a certain cut-off level. The established cut-off score, equal to or above 8, is found to be a good criterion of caseness in a recent review of 31 articles using this scale (93). In more specific studies of case-finding compared to diagnoses made by general practice physicians, the authors claim the HADS demonstrate similar, and possibly better case-finding properties compared to physicians (172).

### **2.5.2 SF-12**

The Short Form-12 (SF-12) (173) is a shorter version of SF-36 (174). The scale is a generic measure of functional health and well-being (175). The measure was developed to better capture these outcome aspects in medical care (174). The SF-12 was developed to allow inclusion in larger population surveys such as the HUSK. Through a weighted summation procedure, two subscales commonly labelled “perceived physical health” and “perceived mental health” can be generated. The use of these subscales and their psychometric properties are documented (173). The measurement has been standardized according to US norm data (173) and standardized with a mean score of 50 and standard deviation 10. All results are presented as un-standardized regression coefficients for group differences. Missing values on single items were replaced by estimates based on linear regression equations. This procedure was relevant for 1 069 participants, of which 831 had missing value substituted on one item



only. The chosen procedure slightly reduces standard errors of estimated, which may erroneously increase the probability of obtaining statistical significance in analyses.

In papers I and III, the SF-12 is employed as measures of perceived physical and mental health. In the conceptual models, however, we have used the terms “functional limitation” in paper I and “impairment” in paper III. We regard these terms as synonyms, but the term “impairment” is used throughout this thesis. Both terms deviate somewhat from the original wording in the introduction of the SF-scales. In the papers, we have done so to better contextualise the use of this measure in light of the aims of the study. We believe this is justifiable on the following grounds: The original SF-36 was also arranged to provide two measure summaries; physical component summary (PCS) and mental component summary (MCS). The SF-12 (see appendix) was constructed by isolating the twelve items that best explained the total variance in MCS and PCS of all items in the SF-36. Of the six items comprising the PCS in SF-12, two measure “physical functioning”, two measure “physical role function”, and the last two enquire on “bodily pain” and “general health”. In the case of MCS, one item measure “social functioning”, two are on “emotional role functioning”, two measure “mental health”, and the last measures “vitality”. In sum, the majority of these items directly measure aspects of functioning. The term “limitations” due to various health problems is used in the original article describing the measure (174). The SF-12 is previously used by others to capture functional disability and impairment in large European epidemiological surveys (176, 177).

### **2.5.3 Somatic diagnosis**

Somatic diagnoses were measured somewhat differently in the two health surveys used in the present dissertation.

The HUNT study included a list of diagnoses, which the participants were asked to report either through the index question worded “do you have, or have you had...”, or “Has a physician ever told you that you have ...”. The list of possible diagnoses included: Asthma, angina pectoris, stroke, myocardial infarction, diabetes, goitre, hypo- and hyper-thyroid function, other diseases in the thyroid gland, fibromyalgia, osteoporosis, arthritis, rheumatism, ankylosing spondylitis, myocardial infarction, cancer, epilepsy, blood-pressure (being treated or monitored), and one item open for any other illness.

In HUSK, the questions were phrased as “Do you have, or have you had...”, and the list of diagnoses was somewhat shorter and comprised: coronary infarction, stroke, diabetes, asthma, multiple sclerosis, chronic bronchitis, osteoporosis, and fibromyalgia. In addition, in this survey, participants were asked if they had taken any medication the previous day, and in that case, for which condition. The responses were examined by a team of physicians, and diagnoses were appointed according to the medications’ purpose as described in WHO’s Anatomical Therapeutic Chemical classifications (ATC) (178).

These types of self-report of physical conditions have not been subject to the same rigorous testing as is the case for mental health inventories, where examination of psychometric properties has a long tradition. An illustration of possible problems in this context can be given through a study on the validity of self-reporting cancer employing HUNT data. Self-reported cancer was checked against data from the Cancer Registry of Norway (CRN), where all new cases with cancer are reported. Reporting of cases to the registry is mandatory for all hospital departments and histopathological laboratories according to legal regulations from 1953 (179). A total of 479 (1 %) of the HUNT-II participants gave a positive answer to the index question of “do you have or have you had cancer?” without there being a corresponding CRN registration. Furthermore, a total of 20 % of CNR-registered patients did not report their diagnosis through self-report (179).

#### **2.5.4 Somatic symptoms**

In HUSK a list of symptoms from in the ICD-10 research criteria for F45 Somatoform Disorders was included. The list includes symptoms that may be experienced from all major organ groups and systems. We do not use the list of questions as a proxy measure of the diagnosis of somatoform disorders as we do not have information regarding the duration criterion nor help-seeking behaviour in response to the experience of the symptoms.

Information on both is needed to make the diagnosis in a clinical setting. It can be argued that this scale can reflect somatisation in analyses where the effect of specific physical conditions is adjusted for.

Furthermore, specific items on muscle pain were included. Musculo-skeletal disorders are a major diagnostic group in disability benefit statistics. We therefore constructed a measure of severity of pain in muscles and/or joints. As an introductory question, participants were asked whether they had been troubled with muscle pain and/or stiffness in muscles or joints continuously for over three months during the last year. If positive, they were asked to indicate in which of ten suggested joints or body areas these problems had been experienced. The list of joints and body areas included: neck, shoulders, elbows, wrists/hands, upper back, lower back, hips, knees, ankles/feet. We constructed a count of these muscle groups or joints, and it is used as a continuous, unidimensional scale. It is assumed in the analyses that increasing numbers of inflicted areas capture increasing severity of musculo-skeletal problems.

In the HUNT study, somatic symptoms were measured slightly differently. From several items, we computed a count variable that reflects the sum of organ systems from where symptoms are reported. The following organ systems were covered: gastrointestinal (nausea, heartburn, diarrhea, and constipation), musculoskeletal (neck, shoulder, elbow, hand,

breast, back [three areas], hip, knee, and ankle pain), headache, migraine, problems with hearing and sight, heart palpitations, and respiratory problems. This variable was constructed in line with previous papers based on the same data material (115, 136).

### **2.5.6 Sleep problems and Insomnia**

Insomnia is defined as a subjective experience of non-restorative sleep, either due to problems falling asleep or early awakening, such that it interferes with normal functioning (180). There are thus no objective tests required to make the diagnosis of insomnia, and it is usually done based on a clinical interview (181). This is in line with the diagnostic criteria for insomnia in the commonly used diagnostic manuals (75, 85).

In paper II, we used two items on problems with sleep onset and sleep maintenance as a proxy for insomnia. Both items were to be answered, based on their sleep experience the last month, on a four point ordinal scale encompassing the alternatives: “never”, “sometimes”, “often” and “almost every night”. Responses of “often” or “almost every night” on either items indicated possible insomnia. This operationalization was consistent with a previous publication from the same data material (115).

In papers I and III, we used one item to measure sleep-problems. It was phrased: “How often do you suffer from sleeplessness?” Responses were to be given on a four point ordinal scale ranging from “never, or a few times a year”, “once or twice a month”, “about once a week” and “more than once a week”. In terms of face validity, the wording of the item corresponds well with a subjective experience of insomnia as required in the definition. However, due to the deviation from the items employed in HUNT, and as no other studies have established this as a valid measure of insomnia, we label it as “sleep-problems”.

### **2.5.7 Variables on demographics and health behaviour**

In both surveys, information on age and gender was provided by Statistics Norway. Other variables on demographic characteristics and health behaviour were collected by self-report, and were in some cases measured in different ways in the HUSK and the HUNT studies.

In HUNT-2, education was measured as self-reported highest level of education on a three point ordinal scale ranging from compulsory school to university level education (80). An index for socioeconomic status according to the Erikson Goldthorpe Portocareros (EGP) scheme was computed (182, 183). Health-related behaviour measures included daily cigarette smoking, consumption of too much alcohol according to CAGE standards (184), and being physically active for one or more hours the previous week. These were measured through self-report and operationalized in accordance with previous publications on the same data material (115). Involvement in night work or shift work was also measured by one dichotomous self report item: “Do you do shift work, work at night or on call?”

In HUSK, self reported annual household income was asked for and coded in three categories from no income to more than NOK 500 000 (approximately € 60 000). Level of education was reported in four categories from less than seven years of schooling up to at least 4 years of higher education in college/university. Marital status was self-reported and dichotomized as being single or not. Self reported weekly consumption of alcohol units was entered as a continuous variable, as was body mass index (BMI), calculated from body weight by squared height from the clinical examinations.

### **2.5.8 Ethical approval and data clearance**

The study protocol for HUSK was approved by the Regional Committee for Medical Research Ethics, Western Norway. The HUNT study was approved by the National Data Inspectorate

and the Board of Research Ethics in Health Region IV of Norway. In both studies, written informed consent was obtained from all subjects included in the studies.

The merging of the health surveys and official registries was approved by the National Insurance Agency and The Norwegian Data Inspectorate.

### 3 Design, analysis and results

#### 3.6.1 Paper I

##### *Employment status and perceived health in the Hordaland Health Study (HUSK)*

The first aim of the study was to examine crude differences in perceived physical and mental health between employed, unemployed, and recipients of disability benefits. The second aim was to examine how much of the hypothesised differences in perceived health could be explained from physical conditions, somatic symptoms and mental health.

Health measurements were obtained from the previously described Hordaland Health Study (HUSK) linked to FD-Trygd where work- and benefit status is registered. The 14 946 participants aged 40-47 were screened for impairment by using the subscales perceived physical and mental health from the Short Form-12. In addition we measured intensity of somatic symptoms, symptoms of anxiety and depression, numbers of physical conditions and number of conditions treated with medication. The information on work or benefit status was defined in line with the cross-sectional design of the study, meaning that the variable comprise the status each participant had the day of showing up at the health study. We comprised three separate groups from the information on work and benefit status: a) “Disability Benefits” comprise those who according to FD-trygd data received either disability pension, rehabilitation benefits or sickness benefits (over 16 days duration), b) “Unemployed” comprised those who according to FD-trygd received unemployment benefits, and c) “Employed” comprised those who reported full or part-time paid work, full time domestic work or shift work while not receiving any benefits according to FD-trygd data. Those who did not respond to any of the work-related variables in the health survey nor received any benefits were excluded from the study. The different types of benefits were

grouped together in “disability benefits” as the differences between them proved to be trivial<sup>14</sup> (appendix I).

We tested for group differences in demographics using chi-square and independent samples t-tests. In terms of demographic characteristics the groups of unemployed and disability benefit recipients were very similar and had lower levels of education, lower income, were more often single and females in contrast to the group of employed.

On the first aim, we found large, significant differences: Between the 13 156 employed and the 1 351 disability benefit recipients, the lower scores for the disability benefit recipients was 1.86 pooled standard deviations for perceived physical health and 0.74 for perceived mental health (185). The pooled standard deviations were weighted for number of participants in each cell, thus in effect size terminology these results are in accordance with Hedges  $\hat{g}$  (186).

On the second aim, we examined how much of the differences could be explained by physical conditions, mental health, and symptoms as well as by socio-demographic variables. Variables were entered in a hierarchical multivariate regression model as well as univariate regression models to examine their cumulated and individual role in the differences in impairment between the groups. For perceived mental health, adjustments for health variables explained about 2/3 of the differences between the employed and disability benefit recipients. As seen in the univariate models, this was mainly due to the variables anxiety and depression, and to a somewhat lesser extent, somatic symptoms. In the case of perceived physical health, adjustments for all health variables (and also socio-demographic factors) explained less than half of the difference in impairment. In the univariate analysis it was shown that the variables on somatic symptoms and pain distribution were the by far most important explanatory variables.

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<sup>14</sup> Results from paper I are therefore occasionally discussed in relation to disability pension only, despite that the specific analyses also included those on rehabilitation and long-term sickness benefits



### **3.6.2 Paper II**

#### *A comparison of insomnia and depression as predictors of disability pension*

The aim of the study was to compare insomnia and depression as predictors of disability pension over a four year follow-up. Second, we wanted to study effect moderation in insomnia and depression from age and gender.

We gathered information on exposures and covariates from the HUNT-2 study, and linked this with the NIA registry on disability pensions to identify the outcome of interest. The study was conducted using a historical cohort design (66). Previously, we have studied the impact of anxiety and depression (115) and insomnia (136) as risk factors for disability pension. Both studies found strong effects, which led us to conduct the present study directly comparing insomnia and depression. Variables on insomnia and depression were operationalized in accordance with these previous studies (115, 136). The variables were further combined to one variable indicating no disorder, insomnia alone, depression alone and both insomnia and depression.

The outcome was award of disability pension between 18 to 48 months after date of participation in the health study. The “wash-out” period of 18 months is instated to reduce bias from a plausible elevated reporting of the symptoms from stress associated with becoming disability pensioned (see paper III for a further discussion of these topics). Physical conditions and symptoms, anxiety, health behaviour, socio-demographic variables comprised confounders of the associations. Participants (N=37 308) within working age (20-66) who did not already claim disability pension were included in the study. We employed logistic regression models to predict the outcome from the exposure variables, and to further adjust the results for covariates of interest. Consistent with a conservative approach, we

conceptualize these covariates as confounders meaning that they are adjusted for in the statistical analyses.

In the crude analysis, both insomnia and depression were strong predictors of disability pension. Of the participants, 3 000 (8.0 %) were defined as having insomnia alone (of these 68.6 % had no additional somatic diagnosis), 2 138 (5.7 %) had depression only, and 800 (2.1 %) were defined as having comorbid insomnia and depression. In total, 915 (2.5 %) of the participants were awarded disability pension during the follow-up period (table 1). Those with depression or insomnia shared the baseline characteristics of higher age, lower education, and lower socio-economic status compared to the reference group. Reported adverse health behaviours (smoking, high alcohol consumption, and physical inactivity) were high in both insomnia and depression as compared to the reference group. This tendency was stronger for depression than for insomnia. In contrast, somatic diseases were more common in insomnia than in depression.

Of the participants with either insomnia or depression, approximately one in twenty received a disability pension over the subsequent four years, excluding the 18 months immediately following the health survey (5.1 and 4.6 % respectively). The presence of both conditions doubled the likelihood of later disability pensioning within the follow-up to 9.5 %. Both disorders predicted disability pension award during the follow-up period with unadjusted odds ratios of 2.81 (2.35-3.38) for insomnia alone, 2.52 (2.02-3.13) for depression alone and 5.50 (4.28-7.06) for both combined. In a model adjusted for socio-economic status, education, physical conditions and health behaviour, both insomnia and depression alone predicted disability pension whilst comorbid insomnia and depression doubled this risk. In the case of insomnia, most of the attenuation was due to including somatic diagnosis in the model, while health behaviour, education, and socio-economic status had some additional adjustment in the case of depression (see table 2 in paper II). In a final model, we included adjustment for all

covariates, adding anxiety, somatic symptoms and shift/night work. As both anxiety and somatic symptoms may be a derivative of insomnia or depression, this model is likely to be over-adjusted, and the estimates in the final model should thus be regarded as conservative estimates of the exposures' predictive values for disability pension. Despite this, the relative prediction from insomnia and depression remained: Insomnia remained a significant predictor at an odds ratio of 1.47 (1.21-1.79) while depression was borderline non significant at an odds ratio of 1.20 (0.94-1.53). Regarding the main aim of the study, the effect of insomnia on disability pension award exceeded that of depression regardless of degree of adjustments.

There were no statistically significant interaction effects between insomnia and depression in prediction of disability pension. On the other hand, there was a statistically significant interaction between exposure and age; the effects were stronger for those under the age of 45 than over 45 in all groups: insomnia (2.93 (1.90-4.51) vs. 1.77 (1.43-2.17)), depression (2.95 (1.82-4.99) vs. 1.52 (1.18-1.96)) and comorbid insomnia and depression (8.64 (5.36-13.90) vs. 2.65 (1.94-3.62)). Entering the interaction terms (insomnia x age, depression x age) in the logistic regression increased explained variance in the model significantly and also proved to be a significant covariate (insomnia: step chi-sq; 19.70, df; 1,  $p < .001$ , depression: step chi-sq; 21.33, df; 1,  $p < .001$ ). Gender did not moderate any of the associations. Based on the estimates in the model adjusted for socio-economic status, education, physical conditions and health behaviour, and the prevalence estimates from the sample, the population attributable fraction from insomnia alone (4.0%) was larger than that from depression (2.5%). That from depression was again larger than that from comorbid insomnia and depression (1.5%). Of those with only insomnia that went on to an award of disability pension, more than half (51.0 % (43.1-58.9)) ultimately received a musculo-skeletal diagnosis. Only 15.7 % (9.9-21.4) of insomniacs were awarded a disability pension for a mental diagnosis in contrast to 29.6 % (20.6-38.6) of those with depression.

### 3.6.3 Paper III

*Health status before, during and after disability pension award. The Hordaland Health Study (HUSK)*

The aim of the third paper was to compare health status across strata defined by temporal proximity before and after disability pension award.

To examine this, we used the same data material as in paper I, but with a different design.

Physical conditions, somatic and mental symptoms as well as mental and physical perceived health were measured in the population based Hordaland Health Study (HUSK) in Western Norway 1997-99. These data were linked to registry data on disability pensions for the period 1993-2004. There have not been major reforms in the criteria for disability pension award in this period. Based on this, we assumed that those participants who are pensioned off in the period of interest were comparable. For all who received a disability pension within seven years before to seven years after they participated in the HUSK, we calculated a variable on the individual time lag between these two events. Based on this temporal distance, we constructed six groups with different time lags: those participating in the HUSK 3-7, 1-3 and 0-1 years before and the corresponding time-spans for those who participated in the HUSK after their disability pension award. Across these individuals, we were then provided with a constructed set of observations of health where disability pension award is a common event occurring in the middle of these observations. To examine the trend across these observations, we employed an approach inspired by a time-series design (187) and compared the health status of disability pensioners at different time periods (strata) from seven years before to seven years after the event of disability pension award.

From January 1992 to December 2004, 1 087 (5.9 %) of the participants were awarded a disability pension at a mean age of 44.2. Those awarded disability pension were slightly older, more often female, and less educated than the remaining sample (all  $p < 0.001$ ). The six strata of individuals awarded disability pension before and after the health screening were not statistically different (all  $p > 0.091$ ) with regard to age, gender and educational level (table 1, right part). More important, the participation rate was different among the different strata ( $p < 0.01$ ). The highest participation rate was found among those who were invited to the health survey years prior to disability pensioned award (54.6 %), while the lowest was found among those invited closer to the time of disability pension award (40.5 %). This finding will be elaborated upon in the discussion as it has implications for the interpretation of the results.

Those awarded disability pension were in general more ill than the remaining sample, both before and after disability pension award. Largest group differences were found for impairment and symptoms (z-score differences within range 0.58 and 1.43, all  $p < .001$ ), but were also found for physical conditions (range 0.40 to 0.47, both  $p < 001$ ). The higher level of health problems in those awarded disability pension was present from seven years before to seven year after disability pension award (as demonstrated in figure 1–3 in paper III).

When comparing the trend across the strata, an increasing level of somatic and mental symptoms was reported in the strata closer to time of the disability pension award, which gradually declined in the strata after the award. This inverse U-shaped trend over these stages in the disability pension award process was statistically significant for all symptoms (all  $p < 0.01$ ). The level of symptoms 3-7 years before was at the same level 3-7 years after disability pension award for all symptom scores ( $p > 0.05$ ), the exception being sleep-problems which was more than a half standard deviation higher in the latter strata ( $p < .001$ ).

A similar non-linear trend across the disability pension process was also found for impairment, however with a more marked reduction in the group 0-1 year after disability

pension award ( $p < 0.001$ ). The level of physical impairment was also increased in the strata 3-7 years after disability pension award compared to 3-7 years before ( $p < 0.001$ ).

No similar non-linear associations were found for physical conditions, neither in the case of somatic diagnoses nor prescribed medication. There was, however, a tendency of more pathology reported after disability pension award compared to before, although this was significant for prescribed medication only ( $p < 0.05$ ).

## **4 Discussion**

### **4.1 *Main results***

This thesis presents three main results. First, those who receive disability benefits do report far more physical impairment than those who are working, but only half of this difference can be ascribed to reported symptoms and disease. Second, insomnia does predict disability pension award just as strongly as depression, and given its greater prevalence, it is possibly a more important factor than depression en route to work-related disability. Third, those awarded disability pension report health problems already 3-7 years prior to the award. Those who are closer to the time of the disability pension award, report more health problems, a trend which is reversed in the period after the award.

### **4.2 *Methodological strengths***

All three papers have common features in terms of being secondary analysis of epidemiological data merged with registries. However, the chosen designs, use of variables, and statistical analyses are different across all three papers. In the following, the main strengths and limitations of the studies will be presented. A specific summation of the particular strengths and limitations for each paper is found in the “strengths and limitations” section in the discussion of each of the attached papers.

Paper II employs a historical cohort design. As this is a rather conventional design in epidemiology (66), it will be given less attention in the present discussion. In the case of papers I and III, there are specific design challenges that will be discussed in greater depth than possible within the accepted word-counts in the journals where the papers are aimed for publication.

The main strengths across all three papers arise from the source material from representative health surveys based on the general population. In both the HUSK and the HUNT-II, the general participation rates were acceptable for studies of this size. All three papers focus on associations between health variables and disability benefits status. Most publications on disability benefits rely on sampling from a population of benefits recipients. Such approaches carry with them an inherent risk of strategic answers from the respondents, that is, participants answering consistent with their benefit status. This problem is reduced in the designs chosen for this thesis, as the participants have no instrumental incentive that should induce positive or negative response bias. In design terminology, the health screening might be described as a double-blind process where neither participants nor administrators were aware of specific research hypothesis related to our use of the data at the time of the health screening. Several of the health measures are well-known inventories where the psychometric properties are well documented.

Information about benefit status was obtained from national registries. These are complete on a national level, and also highly reliable. The only source of attrition is from mortality or emigration. This is relevant for the designs in paper II and III where information on benefits awarded several years after participation in the health study is used. The information in these registries is also independent of exposure status as reflected in the health measurements in the surveys. The quality of these registries is well documented (170, 188).

### **4.3 *Methodological limitations***

The most important limitations of the employed designs are related to residual confounding and selection bias from non-participation in the surveys. It will also be discussed to what extent variable operationalization and choice of statistical analyses may strengthen or weaken validity of the results.



The issue of residual confounding applies to all three papers, but will be addressed specifically for paper I later on. Information on physical and mental conditions and symptoms in the base-line screening both in HUSK and HUNT-II is self-reported. The two surveys differ somewhat; the HUNT-II included a relatively exhaustive measure of physician diagnosed physical conditions<sup>15</sup>, and a less complete check-list on somatic symptoms. The HUSK included a rich list of somatic symptoms and specific items on the location of muscle pain. The checklist on physician diagnosed physical conditions is shorter than that included in the HUNT-II study, but some of this shortcoming is amended through inclusion of an item measuring prescribed medication.

In paper II, residual confounding is relevant as we adjust the crude effects of insomnia and depression for simultaneous physical conditions. If we have left out important conditions or symptoms that were present prior to the health survey, and also is likely to cause either insomnia or depression, our estimates of the impact of insomnia and depression could be confounded and overestimated.

In paper III the issue of residual confounding is less important. The main objective of the paper is to examine differences between the strata in those symptoms and conditions that in fact are included. Thus, conditions or symptoms that are left out would only be of major relevance if they were more prone to change during processes in disability pension awards.

This issue of residual confounding resulting from problems of reliability and variables not covered also applies to other confounding variables included, e.g. health related behaviour, biological health-related measures, and variables on socio-demographics.

In paper II we register outcomes until 48 months after exposure. This could be seen as a situation where proportional hazards models are needed. We did not use such models (as in Cox-regression) for three main reasons. First, disability pension award was less frequent

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<sup>15</sup> Physician diagnosed in the sense that the items ask for “diagnoses that your physicians have told you that you have”

within the available follow-up period than what is recommended for the use of Cox-regression. Second, the date of disability pension award was only available in years. Third, in our previous papers on the same data and outcome, we have compared the results from logistic regression and proportional hazard, and found no differences. In line with the principle of parsimony in statistical analysis, we have chosen to use models that ease dissemination of findings.

#### **4.3.1 Residual confounding in paper I**

In paper I, residual confounding relates to our ability to explain the differences in perceived mental and physical health through physical conditions and symptoms, which is the second aim of the study. In the following this will be elaborated upon.

This study included two main sources for the measure of physical conditions; a closed list of seven diagnoses, and also an item enquiring about medication taken last night and what condition this was taken for. It can certainly be held that a list of seven diagnoses by no means covers the plethora of possible health problems completely, but the item on medication amends some of this shortcoming. Misclassification on these variables is more likely to result in an under-reporting than an over-reporting (179). When we use these variables to adjust for morbidity, it can thus be argued that the adjustment procedure does not sufficiently account for the participants' health problems. This could lead us to over-estimate the “medically unexplained” proportion of impairment among those receiving disability benefits in the second aim of paper I.

Furthermore, impairment may not be caused by just having a condition, but rather how severe it is. This is not measured directly, since only a dichotomous measure has been used. Severity of individual health problems is a multifaceted concept. To approach this, we have applied two sources of information: a) Counts of diagnoses under the assumption that

increasing numbers are likely to reflect more severe health problems, and b) symptom counts unspecific to diagnoses. The latter reflect general symptoms associated with a wide range of disorders, and are employed under the assumption that severity of most conditions will be expressed through symptoms.

It can be argued that if conditions do have an impact in terms of impairment, this will often be due to symptoms that follow from it (189). Thus, by also controlling the group differences for symptoms that cover all major organ systems and areas where these symptoms are experienced, we are able to cover some variation in severity, despite not covering all possible diagnoses and their severity specifically. In this context, it can be added that also in clinical settings, presence of symptoms presented by subjective reports is imperative in diagnostics.

One should further bear in mind that according to official statistics, the vast majority (approximately 2/3) of benefits are due to mental and musculo-skeletal disorders (table 1) (30). Thus, to be able to adjust for relevant health information, items reflecting musculo-skeletal and mental disorders and their severity are essential. In mental health epidemiology, self-rating of symptoms is a very common way of measuring both presence and severity of disorders (190). In this study, the inventory includes 7 core symptoms of anxiety and 7 on depression. Each of these 14 provide four possible answers on frequency to reflect variations in symptom severity (92). In the analysis, the variables are included as continuous measures in order to keep a maximal amount of variance, and for perceived mental health, these variables explained about half of the difference between the groups. Even if a case-finding approach is not used in this paper, the same inventory has been shown to be a better case-finder than general practitioners' diagnostics (172). The instruments' psychometric properties, including increasing symptom count as a measure of case severity, are also well documented (93, 94).

In the specific case of musculo-skeletal disorders, two of the 17 items on somatic symptoms included in the variable, were on frequency of musculo-skeletal symptoms. Along with the rest of the 17 items, these were entered as continuous variables (measured on a five point ordinal scale), allowing for variation in degree of severity. To further adjust for condition severity, we also measured the number of muscle groups and joints where symptoms and pain is experienced. Among those with muscle pain, the standard deviation on number of inflicted areas were 2.2 (mean 3.4). This variance in spread should reflect some important aspects of varying severity of conditions.

Still, there is the possibility that the treating physician can identify severity that is not captured by any of the variables included in the study. However, since few objectively observable symptoms are found in the chronic conditions that compose the majority of cases, severity assessments may often be based upon the patients' subjective reports of impairment. To the extent this is the case, it is indeed in accordance with our interpretation of the results saying that patients' health perceptions are important in evaluations of disability.

In sum, considering the nature of the most important diagnoses in disability benefit awards, we have included continuous measures that are likely to capture dimensions of condition severity.

#### **4.3.2 Bias from health selection**

An important issue with paper III is its relatively unusual design and to what extent the results are influenced by health selection. The participation rate was lower among the disability pension recipients compared to the general participation rate. There is no specific information on health characteristics of disability pension recipients who do not participate in health studies. Specific studies on non-participants in general have however been performed within

the frame of the HUNT studies, but we assume the results also are relevant for HUSK-participants and non-participating disability pensioners alike.

Reasons for non-attendance in HUNT-2 were studied in a random sample (2%, N=685) of non-attendants (167). The most important reasons for non-attending in the age group 20–69 were lack of time or moved away (54%), while in those aged 70 years or more immobilizing disease (21%) and being followed up by their own physician (28%) were reported to be important reasons. From US studies we know that non-participants have higher psychiatric morbidity than the general population (168). Results from a paper in press in *Psychosomatic Medicine* using the HUNT-II data, demonstrate that non-participants have an increased mortality ratio compared to participants; over an average of 4.4 years follow up, 15 % of the non-participants died compared to an overall 4 % among the participants (169). Applying these results to the HUSK-study should suggest that the most common reason for non-participation in the general population was lack of time or migration. Health factors, as in being followed up by physician/hospital or causing immobilization, was reported as a cause by 14.2 % of those aged 20-44, and 21.9 % among those in the age group 45-69 years old (166). The result of a healthy-participant bias is restriction of variance in both exposure and outcome, and in interpretation this increases the likelihood of underestimating true associations between exposures and outcomes in papers I and II.

In papers I and III, a lower participation rate was indeed found among those who have been awarded disability pension prior to invitation to the health surveys. As disability pensioners in general have poorer health (191), it could be suggested that non-participation due to health problems could be more prevalent and serve to explain the larger non-participation rate among this subgroup.

If our sample is biased from health selection, it affects the results in paper III in several ways. First, we would have a sample of disability pensioners who as a group have less

health problems than the true pool of disability pensioners. This would affect the estimated differences between disability pensioners and those who do not receive a disability pension. This is a minor problem as these differences are large and significant anyway, and also since the absolute differences compared to “normals” is less important in this study. A more important concern however, is the difference in participation rate across the strata under study in paper III. This varied from a high 54.6 % to a low of 40.5 %. If there is a linear association between poor health and probability of participation in health surveys, we could rightly suggest that the strata with lower participation rate would be more biased towards positive health selection than the groups with higher participation rates. Thus, although there would be an overall tendency of underestimation of health problems, this would be more so in those strata where fewer participate. The lowest participation rates in the study were found in the strata close to time of disability pension award. Relating this to the findings as portrayed in figures 1, 2 and 3 in paper III, this would mean that the observed significant non-linear trajectories should be more accentuated and increase the relative differences. It is thus argued that if no health selection had taken place, we would observe larger differences between the strata than those demonstrated in paper III.

#### **4.3.3 Variable operationalization and handling of missing values**

In papers I and III, dimensional approaches are used across all measures. In paper II, a categorical approach is employed. Measurement error is an inherent limitation in any quantitative approach. In these data, such error is likely to be random, but will nevertheless contribute to an underestimation of true associations in statistical analyses (190, 192). However, bias can not be excluded. Error from missing values imputation is relevant in the present thesis. Under the assumption of missing at random (193), substitution of missing responses of single items on the HADS inventory was carried out across all three papers. The

procedures used was in line with previously published procedures (194), where as maximum of two missing values on each sub-scale are replaced with that individual's mean on the valid items. The psychometric consequences of this procedure are tested and found recommendable (94).

Imputation of single values was also carried out in relation to the SF-12. In the SF-12 the alternative answers range from two to six categories. Computation of the component summaries (PCS and MCS) therefore follows a weighting procedure. Missing substitution procedures must reflect this and cannot be performed along the lines of the HADS procedure. Instead, we estimated single values from the participant's valid responses and the linear regression coefficient predicting the score for that particular item based on scores from complete responses. This procedure was accepted by the reviewers, but could be further improved by also adding an error-term to maintain variance of the measure (195).

Missing not at random implies that there are specific reasons as to why a particular item was left unanswered. An example of this is that missing can be a consequence of denial. Such an understanding could explain that many cases of cancer are not reported in health surveys (179). Also, specific items like those on anxiety (HADS-A) may by themselves be anxiety provoking for anxiety patients, and as a consequence lead to selective missing values. When employing categorical measures such as in paper II, this and other types of measurement error might imply misclassification in symptom-loads around case-level, resulting in arbitrary classifications (67, 196).

There are also problems using a dimensional approach in analysis. First, it is commonly argued that symptom rating scales for mental health are ordinal rather than arithmetic, meaning that the true difference between two equal intervals on a scale depends on this interval being in the high or the low end of the scale. For example, in human perception of temperature, the difference between -15 and -10 degrees Celcius might be experienced as

more extreme than the difference between 20-25 degrees. Moreover, the associations between exposure and outcome might not be linear, and when using statistics that are based on a linear approach, important features of the associations may be lost.

Our use of sumscores, such as in count variables on symptoms and conditions, give rise to other statistical issues. This approach is consistent with formative measurement models for the exposures rather than analyses of latent variables, which are consistent with reflexive measurement models (67). It is perhaps more accurate to analyse depression and insomnia assuming reflexive measurement models, but as the outcome was operationalized as a dichotomous measure in line with the previous papers it succeeds (115, 136), available software has until recently been limited. The main consequence of employing regression analyses of simple (or weighted) sumscores instead of structural equation modelling based on latent variable approaches, is an underestimation of the true effects of the exposures on the outcomes of interest. It is, however, debated whether reflexive measurement models are appropriate for analyzing measures of mental disorders (197). The consequence of not using reflexive models will mainly lead to underestimation of effect and yield more conservative estimates.

### **4.3 *Impairment from health problems***

In Norway and elsewhere, legislation requires both a health problem and work impairment to qualify for disability benefits. In addition there are requirements regarding causality from health problems to impairment. The latter causal association has largely been regarded as obvious and has not been subject to scientific enquiries (124). Regarding the first requirement, some studies have suggested that many of those who receive disability benefits do not report impairment and would like to get a job (1). Others have found that quite many disability pensioners rate their health as good (198). Further, a Swedish population based study has



suggested that common assumptions about the overlap between concepts of disease, illness and sickness absence are debatable (142).

Paper I is an attempt to elucidate the associations between health concepts; physical conditions, mental health, symptoms, and impairments in disability benefit recipients. First, when examining differences in impairment (perceived health in SF-12) between employed and disability benefit recipients, we found considerable differences. Second, we analysed what aspects of health could explain this difference (corresponding to the legislative requirement of a causal association). We found that measures of anxiety and depression explained most of the difference in mental impairment, while all included health variables explained less than half of the differences in physical impairment between the employed and the disability benefit recipients.

The first result in this study is relatively “straightforward”. The finding is in line with both legislation and reasonable hypothesis in this field; those who receive disability benefits are by definition supposed to have significantly poorer health than those who work. The incentive-free context of health measures underlines this difference. Several studies have found that unemployment also is associated with health problems (199), and studies addressing causality suggest that becoming unemployed leads to health decrements (48, 200-202). The unemployed in the study shared demographic characteristics with the disability benefit recipients. However, they reported only marginally more impairment than the employed, and this entire difference was explained by other health problems. This further supports that the impairment measure is sensitive for the aspects of impairment experienced by those on disability benefits.

The second result, on our inability to explain differences in impairment with conditions, symptoms and other covariates, was more surprising and could reflect inconsistencies with legislation. The less than perfect association between disease and

impairment has been addressed by others. Referring to a study on the “structure of health status” (203), the authors of a textbook on perceptions of health and illness question the validity of the “biological or medical model” in disability: “*However, using structural equation modelling, they demonstrate that impairments, rather than diseases, are the major determinants of disability (functional limitation)*” (141).

A final issue relevant for this result in paper I, is to what extent it can be due to the dynamic nature of many symptoms and effectiveness of treatment. Some of those in the group of disability benefit recipients were awarded their benefit years ago. As presented, the majority of symptoms are not chronic (98, 204). As help-seeking most often is associated with a heightened level of physical symptoms (204), it is plausible that patients also are more likely to apply for benefits when the symptom loads are elevated compared to their individual baseline. This could be described in terms of regression towards the mean (205), where patients are likely to seek treatment (and also benefits) when the symptom load is high. Unless the symptoms are prodromes or results of escalating disease, the symptoms could be reduced either by passing of time/natural course, or by effective treatment. As benefits are provided, relief from work stress or other ailments may have lead to symptom reduction, as discussed in paper III. As a consequence, we might have measured disability benefit recipients’ symptoms in a remitting phase. Whatever health problem that caused the symptoms in the first place, and that led the patient into status as a disability benefit recipient, might be treated or cured when we later measure their health. In paper III, we found that physical health impairment remained significantly elevated 3-7 years post the award compared to 3-7 years before the award. Thus, since we measured the health of some participants several years after the benefit awarded, we may not capture their health problems and symptom severity, while the impairment could remain and be observed in our study.

As a result, we may underestimate how much of the difference in perceived health in paper I is due to symptoms and conditions. However, the argument is valid only if perceived health does not improve parallel to symptom reduction. The findings in paper III may suggest that also impairment is reduced after the award, but this seems to happen faster than with symptoms, and with less reduction over the following years. Cognitive processes may contribute to increase symptoms presentation and lower perceived health among benefit recipients to match their present benefit status (this will be further explored in the discussion on “sick roles”). Such changes may cause a lag between symptom relief and reinstated function or perceived health, a notion supported by findings among unemployed (206). On the other hand, we also know that self-ratings of health are reflections of mental and physical health status (207), but its reactivity and to what extent changes in self-rated health parallels changes in symptoms and diseases are not known.

The results suggest that participants’ experience of impairment may be an aspect of health that to some extent is independent of other health measures. If this is the case, this indicates a need to focus on non-disease oriented contributing factors in disability benefit award. In rehabilitation efforts that are aiming at return to work, focus on the patients’ perceived health will then be a valuable asset in addition to rehabilitative efforts directed at symptom relief.

#### **4.4 Health status across the disability pension process**

A pre-conference meeting on sickness absence research prior to the 13<sup>th</sup> conference for the European Public Health association (EUPHA) was devoted to discuss the evidence for possible consequences of disability benefit award. The conclusion of the meeting was that evidence was scarce, but that negative effects are plausible. There is obviously an association between poor health and disability benefits, but the main question is if there is an additional

effect of being awarded a benefit in itself. The observations in paper III contributes to the empirical evidence base by examining if there are differences in health status at different stages of the disability pension process. We found that those who are asked about their health status closer to the time of the award, reported poorer health. After the award, the recipients seem to report less impairment and less somatic and mental symptoms as time since the award increases.

Keeping the limitations of this study in mind (as presented in the discussion of limitations), the findings may have implications for our understanding of how health status might change over the course of disability pension. First, it demonstrates that those who later go on to be awarded a disability pension, report higher levels of symptoms and impairment already from 3-7 years before the award. On this aggregate level, this observation counters the assumption that disability benefits by and large are caused by sudden illness. It is most important to keep in mind that both accidents and sudden grave illness invoking severe lasting disability obviously does occur, but as debated in the introduction, such conditions are possibly less important in the context of disability benefits than in general health care.

The observed trends across the disability pension process may have several explanations. One is that health problems among those who not yet have become disability pensioned increases gradually, until a level where work disability is a fact. Recipience of a disability pension award implies removal from work. In cases where work place factors in effect are harmful, removal from these may have a positive effect on health, reflected in improved health status among the groups asked after their award. Where work place factors are less relevant, it is still possible that time to rest and continued treatment beyond the time frame available in time-limited benefits, might contribute to improve the health status some after the disability pension is awarded.

Some issues go against this set of explanations. First, as already discussed, the lower health status several years prior to the award suggests these health problems are long-standing. Second, in most cases, the participants have been through time-limited sickness benefits, rehabilitation (20). In addition to the included bouts of treatment, these periods imply time away from possible harmful factors at work and often vocational training and/or relocation.

Another explanation for the observed trends across the groups of disability pension recipients in paper III, is that symptoms and impairment is reactive to the process of the disability pension award. As concluded in the EUPHA-meeting, and also the mentioned recent review, there are few studies available to balance such an assumption against. In one cross-sectional study long-term disability benefit recipients were asked about changes in their health status as a consequence of becoming a recipient (39). The authors found that there were effects from becoming a benefit recipient, and that these on average were negative. They were most pronounced in terms of reduced sleep quality, reduced subjective well-being and negative psycho-social outcomes. These results should however be read with caution as there are several shortcomings with the design: The participants are approached as a function of their status as benefit recipients, and bias from selective responses to appear in congruence of their benefit status is presumable. Also, the design cannot exclude retrospective bias in either direction (208).

Increased mortality is found among disability benefit recipients, even after attempted adjustments for illness (209, 210). This has led some to suggest that there are health threatening aspects involved among those who receive disability benefits. It is not necessarily so that the increased mortality is caused by the condition the benefit was awarded for. Benefit recipiency is associated with lower socio-economic status (SES) (152). Lower SES is a risk factor for a range of negative health outcomes (211). It is demonstrated that recipients of non-

health related social security benefits report worse health than disability pensioners, and preliminary findings from the same authors suggest this also goes for mortality rates (212). Yet other studies have demonstrated increased mortality among the unemployed (213). In sum, although there are many indications of worse health among disability pensioners, we do not know how much of this is related to person or social variables or to effects exerted from the process of disability pension award.

However, there exists literature on related topics that can be used to shed some light on the observations in paper III. We found that participants approached around the time of the award, reported more health problems than those approached several years before or after the award. The first part of the results, which could mean that health problems increase towards time of the award, is in line with how other forms of economic factors affects health. Several studies conclude that in cases where patients receive financial compensation from their health problems, treatment is still effective, but less so than in cases where no financial compensation is provided. This has been observed in meta-studies on treatment for chronic pain (214), in prognosis after closed-head injury (215) and after surgery (216). When considering these results, it is important to note the authors' warning about the possible influence from publication biases here. They do, however, hold it unlikely that such bias could entirely produce the findings. In addition to the negative associations between prognosis and financial compensation, the studies found that the outcomes were markedly worse in cases where the litigation processes on awarding or settling the compensation were ongoing at the time of the health outcome measurement. This suggests that health can be reactive to ongoing processes regarding economy, and such processes might also be applicable to the observations in our paper.

An important question is if the poorer outcomes associated with financial compensation are due to deliberate malingering. A recent review suggest that malingering

does occur in the context of chronic pain, but the qualities of the reviewed studies does not allow any conclusive statements on its prevalence (217, 218). Others have claimed that there is little support of malingering being a frequent problem in these contexts (219). In absence of persuasive scientific findings on the presence of malingering, it might be pertinent to examine better supported explanations. The studies identifying associations between poorer medical outcomes and financial compensations all focus on psychological factors as important. As an example, patients who have received a financial compensation based on pain, diminishing nociception might leave the individual in a state of cognitive dissonance. Such dissonance may according to theory exacerbate nociception in an attempt to resolve the dissonance through a continuous experience of pain (214).

Also, in paper III, significantly more sleep-problems, prescribed medication, and physical impairment were reported 3-7 years after disability pension compared 3-7 years before. This is consistent with a notion where disability pension award induces a health risk. The findings from Floderus and co-authors on long-term sick-leave suggest the same (39). Interestingly, they specifically mention reduced sleep-quality and psychosocial functioning. These measures probably reflect similar factors as our measures on sleep-problems and impairment, and thus supports that negative consequences may be expressed through sleep and function. Finally, in line with our discussion of possible under-reporting of health problems in the strata with higher non-attendance, significant increases could be plausible for other outcomes as well.

#### **4.5 Underestimation of mental illness in disability benefits**

It is argued that mental health may be an underestimated factor in disability pension award (133). A central argument is that anxiety and depression at clinically relevant levels, predict disability pensions awarded without any mentioning of mental diagnosis in official records

(115). Similarly, other studies have found depression to be a relevant risk factor for disability benefits regardless of which diagnoses this is awarded for (134, 220). Another previous study examined insomnia in disability pension award and found independent effects on disability pension award also from this exposure (136). The strong effect from insomnia was surprising considering that it hardly ever is mentioned in official tabulations of which diagnoses disability pension is awarded for (221). Therefore, any result indicating that insomnia is a relevant factor for disability pension award suggests that its contribution is underestimated in official diagnostics. This is at least true to the extent we believe that official tabulations of disability benefit diagnoses are a reflection of the causes of the reported disability.

#### **4.5.2 Under-treatment of mental illness**

If there really is an underestimation of mental illness in disability pension award, as discussed in the previous section, how does this come about? Several studies have demonstrated that mental illnesses are underrecognized in primary health care, and interventions aiming to rectify this are by and large ineffective (222). This might again lead to under-treatment of mental illnesses in general practice, which is suggested in several studies (74, 80). In this context it is however important to be reminded that symptoms reported over a pre-defined cut-off qualifying for a diagnosis is not equivalent with being in need of treatment. Although population based surveys will tend to identify an overrepresentation of chronic cases, many of those identified will have a transient episode with a natural remitting course (223).

There are however studies that indicate a less than optimal treatment coverage in the context of disability pensioning. It is a general policy requirement that adequate treatment has been attempted before long-term and permanent disability benefits are awarded. In Finland, it has been found that the vast majority (87 %) of those pensioned off from major depression had been prescribed an antidepressant before being pensioned (224). The study does not



address compliance to this treatment regime. Only 39 % had received sequential trials of medication, 9 % had received psychotherapy of any modality, and 4 % had attempted Electro-Convulsive Therapy (ECT) before being awarded disability pension (224). These figures do not say anything about the quality of the treatment offered. In a Norwegian study in progress, 25 % of those who were awarded disability pension officially for a mental illness reported not having received any treatment for any mental health problem. This figure was increased to about half (51 %) if one also consider those where a mental illness contributed to the disability as a secondary diagnosis (225). The latter study is based on self-report of treatment, and underreporting cannot be excluded. Some might have received medication without specific knowledge about what symptoms are being targeted. However, treatment aiming at preventing permanent work disability is probably less likely to be effective if the patient is unaware of its purpose.

In summary, under-treatment of mental illnesses (including insomnia) is possible in primary care. This might be due to under-recognition of cases among general practitioners (172). It is also plausible that some patients will not accept a psychiatric diagnose, even if the physician identifies that as the primary cause of symptoms. Another argument that adds to the problem of under-treatment is that milder cases of depression account for more days off work than major depression. This is simply a derivate of the skewed distribution in mental health; there are so many more of such sub-threshold cases that they through sheer numbers outweigh their less direct risk of disability (226). In a public health perspective this is potentially harmful as many sub-threshold cases would not develop into full-blown cases given appropriate intervention at an earlier stage (227). A relevant finding in this context is that the physicians are far better at diagnosing mental illness when using a dimensional approach; diagnostic precision increases in a dose-response pattern with increasing severity of symptom load (228). Thus, sub-threshold levels of depression might be more prone to remain

undetected and untreated, but may yet be a major contributor to work disability. We are not aware of studies examining possible under-treatment in time-limited disability benefits.

#### **4.6 *Insomnia in disability benefits***

As discussed in the previous chapter, the independent effect of insomnia on disability pension award is one argument supporting an underestimation of mental illness in this outcome (133, 136). The effect of insomnia upon disability pension award was surprisingly strong. This led us to explore this further. The first approach, in paper II, was to compare it directly against depression, since depression is the most important single diagnosis for disability pension. We also wanted to explore some of the possible mechanisms in the association, by running interaction analysis for insomnia and depression comorbidity, age and gender. This study focuses particularly on insomnia and disability pension, and general disability benefits will be less relevant in the following.

In paper II, we found that insomnia alone predicted disability pension during follow-up as strongly as depression. Nevertheless, insomnia is not considered a sufficient cause for disability pension award, and consequently does not figure in official lists of diagnosis of disability pension causes. This serves as an example of the current view of insomnia in health care, where it is largely seen as a consequence of other conditions and health problems. The aetiology of insomnia includes influence of predisposing traits, precipitating events, and perpetuating conditions (180). Acute insomnia is usually precipitated by other illness, but usually also remits when the adverse event or condition alleviates. However, some continue to experience sleep problems long after the evoking factors have passed (229). This exemplifies two central aspects of insomnia; it is often related to other conditions, but can also be or become a primary factor (230). It is debated how we should approach insomnia in comorbid cases; are we better off understanding it as a derivative of that disorder or if it should be

conceptualized as a matter of its own (231). Emerging evidence suggests that in many cases the prognosis is improved if insomnia is treated separately or integrated in treatment regimens for the co-morbid condition (232, 233). Our result that insomnia remains an independent predictor after adjustment for physical conditions suggests that there indeed are independent effects of insomnia. As seen in paper II, among those with insomnia that later are awarded disability pensions, only about 15 % do so from a mental diagnosis. This could support the notion that successful treatment for insomnia may prevent disability pensioning for other co-occurring conditions.

Negative consequences of insomnia are repeatedly found in terms of cognitive and intellectual performance (234, 235). Insomnia holds a strong association to depression. Although there is no consensus regarding their causal relationship, there is evidence to show that successful management of insomnia in comorbid cases can alleviate depression (236). Insomnia is associated with significant reduction in quality of life (237), and also coping abilities (238). In light of these known associations, it is not surprising that there also is work disability and societal consequences associated with insomnia (180). The present result of insomnia as a risk factor for disability pension is in line with other work showing cross-sectional associations between poor sleep and lower work capacity (239). In terms of costs, a US study from 1995 estimated the annual direct medical costs of insomnia to be US\$13.9 billion (240). When other studies including costs from sleep-related accidents and lost productivity, the estimate increased to US\$92–107 billion, which emphasizes the large societal costs from insomnia (241). Substantial societal costs from insomnia have also been demonstrated in European studies (242-244). The high population attributable fractions (PAF) of disability pension awards attributable to insomnia found in this study, is yet another indication of the major societal consequences of insomnia.

In paper III, one set of the interpretations of the observations suggests that sleep-problems might be increased by features entailing the process of disability pension award. In paper II, we use a wash-out period of 18 months. If the heightened report of sleep-problems in the period leading up to the disability pension award seen in paper III indeed is instigated by features in the disability pensioning process, the wash-out period might be too short to completely remove reverse causality from the outcome to exposure. Regardless of causality, sleep was an important covariate in paper I, where it had an attenuating effect on the poorer perceived physical health larger than that of depression in the univariate analysis.

The present and the other scattered studies do suggest that sleep has been an underestimated factor in work disability. This might be due to the prevalent view of insomnia as a secondary to any other identified health problem, which causes it to be a residual and often not targeted specifically in treatment. In terms of treatment as usual, such efforts are anyway often sub-optimal and seldom takes in Cognitive-Behavioural Therapy (CBT) approaches that may provide better short and long term results (245).

#### **4.7 *Socio-economic gradients and disability benefits***

There is a massive literature on the pervasive association between belonging to the lower socio-economic classes, and more health problems, and higher mortality (246). Although the research efforts to understand what drives these associations have increased in the later decades, the phenomenon in itself is not new (247). The difference between the industrialized and the developing countries in terms of mortality has long been known. There is now also an emerging focus on the need to consider differentials in mental health as well (248). This is supported by projections made in the global burden of disease studies, where major depression is estimated to be a leading cause of disability worldwide, second only to ischemic heart disease (84). Such differentials are however not only relevant in comparisons between

parts of the world, but large and stable socio-economic differences are also found within Norway (151).

The socio-economic gradient in health is certainly also reflected in disability benefits. We know from previous studies that disability pensioning is far more prevalent in the lower socio-economic strata (138, 158). Relative community deprivation is associated with a higher incidence of disability pension award (152). The causal mechanisms in this association are, however, less clear. According to Krokstad and co-authors, increased morbidity is an important, but not sufficient explanation. Medical determinants cannot alone explain the increase in disability pension award over the last decades, nor the variation in incidence over this period (139, 249).

Despite the indisputable association between socio-economic deprivation and elevated levels of health problems, it is still not certain that the entire elevation of disability benefit prevalence in the lower SES is exclusively caused by increased health problems. In the present thesis, SES is measured and used as a confounding factor in papers I and II. In these papers, adjustment for SES did not attenuate much of the association between health and disability benefits. In the case of paper II, this is particularly relevant as it employed the same dataset and variables used by Krokstad and co-workers to demonstrate strong effects on disability pension award from SES (138, 139, 250). In paper I from the HUSK study, adjusting for SES in the final model had no additional attenuating effect on the differences in perceived health between disability benefit recipients and the employed.

These results indicate that both health and SES are important factors in disability pension award. However, their co-existence does not necessarily translate to a causal association along the lines of the socio-economic inequalities in health.

#### **4.8 Gender issues**

Disability benefits are more common among women (30). While most studies on disability benefits account for gender, for instance as a confounder in analyses, few studies have attempted to fully analyse the possible mechanisms that are involved in the clear association between gender and disability benefits (153).

There are several potential explanations for the elevated prevalence of disability benefits in women. Both of the most major diagnoses in disability benefit award, mental illness and musculo-skeletal disorders, are more prevalent in women (251, 252). Women report more symptoms (97), and also an increased spread of the experienced symptoms across several body regions (252). A higher level of disability benefits might be a reasonable consequence of the high level of health problems in women. In a parsimonious model in a recent paper, we predicted disability pension from all included variables, including gender. The crude effect of being female was initially significant, but not after adjustment for all covariates (115). We do not know which of the included factors explained the attenuation.

Factors beyond health have been examined to understand the high level of disability benefits among women. A central topic in this discussion is the term “double-burden” suggesting that women experience more strain due to domestic roles in addition to work. The alternative position suggests positive health effects from “role-enhancement” (253). Some exposure is practically exclusive for women, like pregnancy related illnesses. This should however largely cause shorter-term absences and be less relevant in terms of disability pension award. Many women are also more likely than men to stay home with sick children. Women more often act as a single parent; in Norway, 16 % of children lived with the mother as a single parent, compared to 2 % with fathers in the year 2000 (254). How single parenting influences health is not clear, but some studies suggest that single parenting is associated with

poorer health (255). All these factors could contribute to explaining the higher use of disability benefits among women, but the evidence is inconclusive (153, 253).

The present thesis is no exception to the rule that gender most often has been treated as a confounding factor. In paper I, we adjusted the results in the first step of the model and crude results are not displayed. Thus, besides confirming that disability benefits are more common in women at the descriptive level, gender was not an issue. In paper II, the models are also adjusted for gender in the first step. We did, however, examine effect moderation from gender in the associations between disability pension award and depression as well as insomnia. No such interaction was found. To our awareness, gender is seldom found to be an effect modifier in population studies on health and benefits, or other health outcomes.

#### **4.9 *The effect of age in disability benefits***

In a similar vein as gender, age is also a most relevant factor in disability benefit award, but its effect is insufficiently explored in research (153). From demographic descriptions of disability benefit recipients, we know that awards increase in the older working-age strata (20). As increasing age also is related to increased health problems and morbidity, health decrements leading to work incapacity is an obvious explanation for this trend. However, in the same parsimonious model in the study described in the previous chapter on gender issues, age is a surprisingly strong risk factor for disability pension after adjustment for all other variables, including multiple aspects of health (115). The odds-ratio for disability pension during follow-up was as high as 11.6 for the age group 60-67 compared to those 20-39 years old in the complete model. This effect was by far the strongest of all included, and suggests that age is an important risk factor for disability pension award beyond that from their increased propensity for illness.

The importance of age is also demonstrated in paper II of this thesis, where significant effect moderation was found in both [age x depression] and [age x insomnia] interactions. The results indicate that insomnia and depression are stronger predictors of disability pension award in those younger than 45 years of age. In terms of the results of the other studies, the restricted age span does not elucidate the effects of age any further. However, the results are important as the study focus on an age cohort (40-47) where disability benefit award is relatively high (20). Furthermore, the persons in this age cohort potentially have a number of years ahead of them in the working-age span. Measured in person-years, those awarded disability pension at this age, are thus very important for the total disability pension expenditure. In terms of individual consequences, this age group will also be affected by possible adverse effects of disability pension over many years.

#### ***4.10 Results in relation to push and pull models***

Any form of involuntary expulsion from the labour market is consistent with the push model. In contrast, the pull model in its crudest form defies the relevance of health in disability benefits altogether, and suggests that disability benefits are sought by rational consumers. In the latter perspective, health is only relevant as defining the behaviour or state the person must attain to gain access to benefits. Such a dichotomous presentation of these two paradigms is probably best seen as a caricature of their opposing basic views. In practice, ideas from both perspectives are seen as relevant in the understanding of disability benefits. There is also the possibility that the two are empirically valid simultaneously, or work in sequence. The present thesis was not designed to study pull-factors, and it was therefore unlikely that we would make observations in strong support of it.

The results in the present thesis lean towards supporting push-models for many reasons. First, we have found that health factors are associated with disability benefits. In



paper I the disability benefit recipients reported much poorer perceived health than the employed. Also, the difference was almost the same compared to the unemployed, although these groups were similar in demographic characteristics. In pull model terminology, this increased reporting of poor health could be instrumental. However, the health information was gathered in a context separate from the questions of benefits. This suggests that the poorer perceived health can be taken at “face value”. In the second aim of the study we found that about half of the impairment could be explained by other included health variables. One interpretation of this finding is that impairment is partly a separate concept in health, though with a strong relevance for disability pension award. Even the unexplained impairment in those on disability pension is no indication of support for the pull-model as participants in the study should have nothing to gain by “faking ill” in their reporting of health and impairment.

In paper II, we found strong independent effects of both insomnia and depression, particularly among the younger. This is also in line with the push model, as any involuntary factor removing the person from work is in accordance with the model. Studies have shown that suffering in insomnia and particularly depression, is comparable with the negative psychosocial and disabling effect of chronic physical conditions (234, 256-258). As the symptoms were reported without incentives for faking healthy or ill, the main results in the second paper are in support of the push model.

The results in paper III might at first sight seem more ambiguous regarding whether they support the push or the pull model. The first result that more health problems are present several years before the award again supports push models. However, the increased reporting of symptoms towards the time of disability pension award, followed by a lower reported level in those who already have received a disability pension, could be interpreted as deliberate malingering to gain access to benefits in line with pull model predictions. However, since the respondents should have no incitement for faking healthy or ill, this again weakens

interpretations in line with the pull model. It is more likely that the process is indeed a period with great uncertainty that have a negative effect on participants' experience of their own health. The following discussion on sick-roles suggests how such processes can be internalized and increase symptoms.

#### **4.11 Sick roles and disability benefits**

Norway has a higher prevalence of recipients of long-term disability benefits than most other countries we compare ourselves with (1). In light of our otherwise relatively high participation rate in the work force (13), this might simply mean that the government provides for a greater number of people, and perhaps not necessarily that our relatively generous benefit levels draw more people into benefit award, as suggested by the pull theory predictions.

In the introduction, we have presented indications of improved general health in the working age spectrum, as well as an increase number of people on disability pension awards. We have also presented the case that other factors besides health may "push" people out of the work force. The main and commonly available route out of the work force and into permanent income security, goes through health, and ends up in disability pension. In the cases where the push factor is something other than health, illness will still in many cases be the only possible entrance to permanent income security. This might particularly be the case in rural areas, where other feasible jobs are few.

All these factors added up, suggest that we possibly encapsulate some individuals, whose earning ability is somehow reduced, in a disease oriented scheme without there being a health problem of the corresponding magnitude. This dilemma in disability policy has previously been addressed in Westin's mixed-methods study on redundant workers after a factory closure in a rural area (4). After the closure, a number of the participants had

increased symptoms severity and ended up as disability pensioners after their maximal unemployment period expired. The author states that (pg. 53): *“The really intriguing question is how these symptoms and behaviours might have expressed themselves subsequent to job-loss if economic compensation had not been conditional on disease, injury or inborn defects; the medical condition of the disability pension”* (4).

None of our studies were particularly designed to study such processes. Some of our results may however be illustrative. As discussed in relation to paper I, there is the possibility that we may fail to adjust differences in impairment for all physical conditions and symptoms, as these may be reduced since the time of benefit award. The remaining reported impairment *could* then for some be a result of sick roles requirements that follow with disability benefit receipt. Such an interpretation would imply that the sick role in itself can maintain or even increase symptoms and illness. The observations in paper III, with a noticeable lower report of impairment in the group shortly after the award, and the relatively modest differences after this might indicate that sick roles following the award maintain experienced impairment.

The concept of sick-roles also has relevance for our discussion on underestimation of mental health in this context. In sick-role terminology, the patient must be perceived as having a legitimate medical condition beyond their control. Such perceptions are arguable harder to obtain in many mental illnesses, compared to physical symptoms (56). Stigma is associated with mental illness (259), and many individuals may truly doubt that mental illnesses is beyond personal control (56). Also, many patients may have preferences for physical symptoms over mental illnesses. The association between mood disorders and physical symptoms is generally accepted (260, 261). In sum, even when the impairment is linked to a mental illness, the sick role may be based more on physical symptoms that again have a direct pathophysiological relationship with the mental illness (261). This may cause

neglect of mental illnesses where physical symptom presentation dominates despite that these symptoms may not be the true cause of impairment (55).

#### **4.12 *International relevance of the results***

As described in the introduction, countries arrange their disability benefit schemes in various ways (1). This complicates comparisons of country-specific research on these topics. The studies in the present thesis have all been performed on Norwegian data. Norway has one of the highest levels of disability expenditure around. This could reflect differences in health characteristics of those who are awarded benefits, and/or that less grave conditions are accepted as sufficient causes of impairment. Alternatively, it may reflect a greater propensity to incorporate societal problems in medical schemes. In any case, this would influence the validity of making generalizations of these results to other nations. Generalization across nations is more or less problematic in most health issues, and possibly in particular topics relevant for public health. Many exposures important one place are near irrelevant elsewhere when comparing countries and geographical and political regions. Nevertheless, this issue is probably more important in the context of benefits than many other fields, as these may be understood as social constructs governed by national policies.

Studies originating from the Scandinavian countries on these topics are nevertheless being published in international journals. And likewise, studies on social security from other countries are submitted and published in Scandinavian journals. As for the direct generalizations, this must be done with caution as in any finding from another context. But as commented in the introduction, all nations seem to face the challenges with increasing disability benefit without having readily available solutions. More studies along the lines of the recent review in *Scandinavian Journal of Public Health* (5) and the efforts from OECD (1, 10), might be called for to examine similarities and differences more closely.

### **4.13 Evidence for interventions**

The main finding of the present thesis is that mental health and perceived health are important factors in disability benefit award. In turn, these health measures are malleable from the process of becoming a disability pension recipient.

The findings are relevant for some recently suggested interventions. Paper II suggests that we could gain from improving recognition and treatment in insomnia (180). This is in line with the arguments we have presented in the section discussing a possible under-treatment of mental illness (220, 262). However, we know that improved treatment does not necessarily reach those in need. This is due to capacity problems in health care, but also patient factors and help-seeking behaviour, described as “filters on the pathway to medical care” (263). A recent UK initiative has suggested to radically change this, and to develop low-threshold centres for CBT-based therapy for common mental disorders (83). It is argued that this mass-scale boost in treatment will lead to economical gain for the state treasury, partly as it is projected to lower long-term disability expenditure from mental illness (264).

The latter intervention is supported from our findings in paper I. If impairment exist independently, without being caused by symptoms or conditions, an increased access to interventions along the lines of CBT, might prove beneficial for return to work. Focus on health perceptions is embedded in such approaches.

As stated previously, the observations presented in paper III are derived through a study design that restricts causal conclusions. Hence, these results should not be used as evidence for interventions alone. One of the proposed explanations for the observations is that the disability pension process in itself has an impact on health status. If valid, this interpretation challenge aspects of a recent reform in Norwegian disability policy, where disability pensions also are awarded on a time-limited basis. If the period leading up to such

re-evaluations translates to an increase in symptoms and impairment, it is imperative to find ways to conduct such evaluations without causing an increase in symptoms in this group. This is important out of concern for the wellbeing of the recipients, but also to prove effective in achieving a greater rate of return to work.

Finally, as long as health is a relevant factor, preventive efforts targeting the most central aspects of health in this context should give some effect. In the vast majority of cases, there is a history of longer and shorter sickness absences prior to permanent work disability. In prevention terms, this could be seen as a possibility to identify indications of secondary prevention (60). This implies improving efforts directed towards those at increased risk. There are obviously such interventions already existing, but further improvements and better precision as to what health aspects should be focused on, for whom, and when, might be needed.

#### **4.14 Need for research**

Echoing the closing chapter in the recent systematic review of the literature on sickness absence; more and better research is needed on most aspects of sickness absence and the corresponding disability benefits (11). The field of research is described as immature in terms of methods, theory and concepts (6). Many more topics need scientific attention to increase our understanding of this complex phenomenon. The present thesis has been inspired by this review and we have attempted to employ innovative designs and combinations of data sources to broaden our understanding of disability benefits.

In further studies, causes of disability benefits should better elucidated in different populations. From the present discussion, we are in imminent need for more knowledge on specific risk factors among the younger age cohorts to better tailor interventions in this group. We further need more knowledge on how social and medical factors interact in disability

benefit award. For example, we have seen that both socio-economic and medical factors are important, but possibly through independent trajectories. In such and other studies, the role of impairment should be included. Further studies on possible causes and consequences of disability pension award addressing other relevant outcomes like social inclusion, stigma and health behaviour, are needed. Consequences of disability benefits should also be studied in designs where the effects of non-participation can be captured. However, many such designs would need experiments which raise a number of ethical dilemmas and practical difficulties.

To address these and other topics, we need to employ complementary research methodologies. This includes analytical epidemiologic studies on population based health surveys and use of natural experiments, for instance when exposures change as a consequence of policy reforms. Also, we need international comparison studies, both to get a better grip on where to, and which, results can be generalized, but also as differences in policy can provide information on how these interact with a given health panorama. There are also a number of questions that probably are best addressed through qualitative studies, for instance further investigations on the relevance of sick-roles and identity in disability benefits.

Finally, we need theoretical refinement in this field of research. The present thesis has focused on mental health and impairment. Health psychology is a growing field attracting increasing interest. It is very broad in its focus; nearly every branch of psychology is relevant and is seen as applicable to nearly every aspect of the health enterprise (265). Thus, an in-depth presentation of this field was deemed outside the scope of this thesis, and is therefore not provided. Nevertheless, perspectives from health psychology are likely to contain relevant theory on the relation between compensation systems and medical outcomes and could prove to be one valuable asset to our understanding of disability benefits.





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