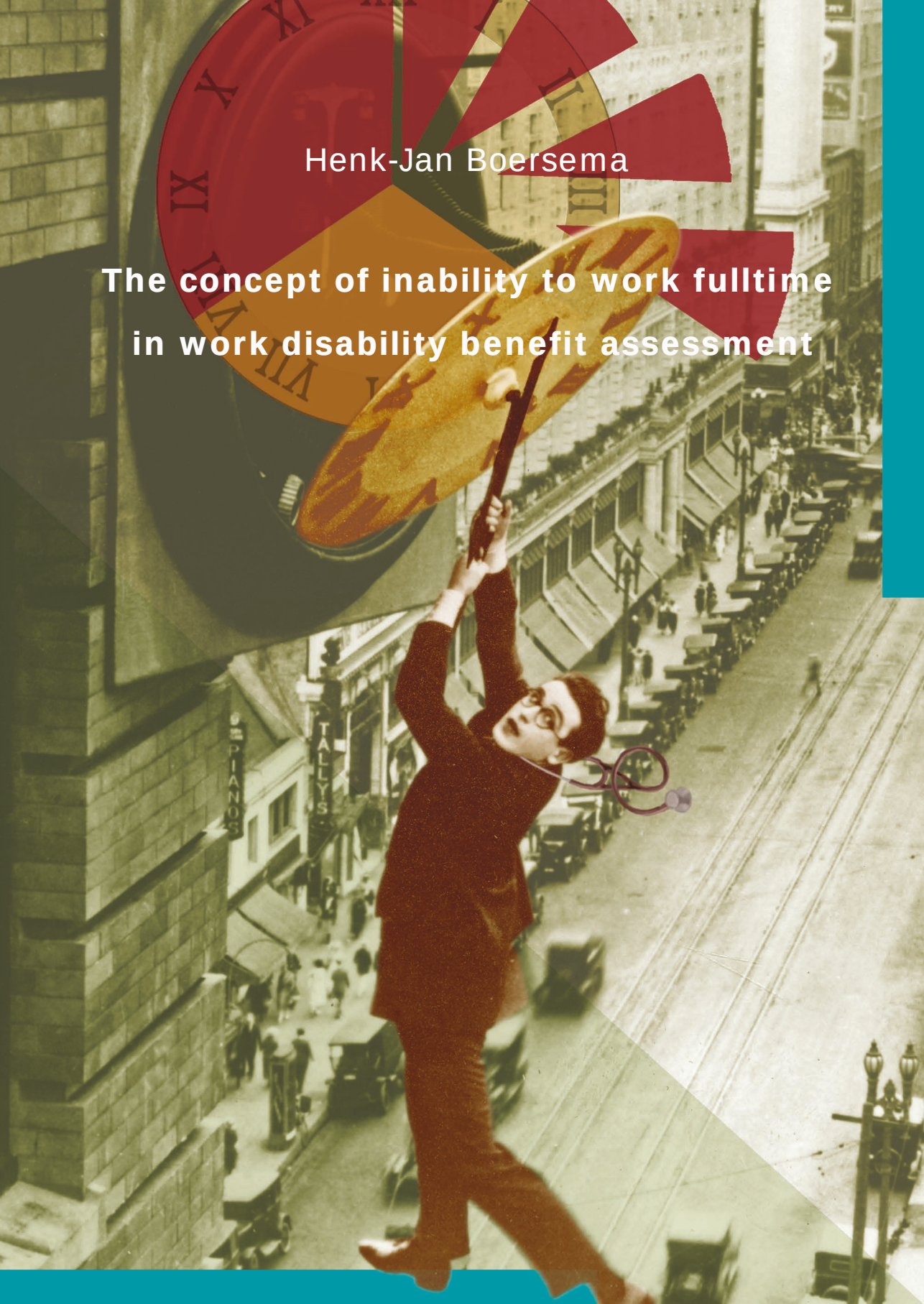

Henk-Jan Boersema

The concept of inability to work fulltime in work disability benefit assessment

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Colophon

This research was conducted within the Research Institute SHARE of the Graduate School of Medical Sciences, University Medical Center Groningen, University of Groningen and under auspices of the research program Public Health Research(PHR), at the Department of Health Sciences, Community and Occupational Medicine. This department participates in the Dutch Research Center for Insurance Medicine (KCVG), along with the Department of Public and Occupational Health, VUmc Amsterdam, the Department of Public and Occupational Health, AMC Amsterdam, and the Dutch Institute for Employee Benefits Schemes (UWV).
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1

General introduction

GENERAL INTRODUCTION

Case study

The central construct of this thesis is the 'Inability to Work Fulltime', assessed as part of the work disability benefit assessment. To illustrate the meaning of this construct I present a case from practice.

A worker has been sick-listed from his work for almost two years, has not fully returned to his work, and applies at the social security institute for work disability benefits. He experiences serious problems in starting activities and taking initiative, is continuously tired, and needs to rest during the day. He has been diagnosed with a depressive episode and is undergoing psychiatric treatment. An insurance physician from the social security institute assesses the physical and mental impairments that limit his capacity to work. An important aspect of this assessment is the inability to work fulltime. The question for the insurance physician is how many hours per day and week this worker is able to work, and whether he is able to sustain working activities for normal fulltime working hours. The insurance physician knows that depressed people often suffer a lack of interest and drive, sleeping disturbances and fatigue, as well as mood disturbances, all of which interfere with normal daily functioning and make it unlikely that the depressed sick-listed worker will be able to work fulltime. However, it is complicated to estimate the number of hours this person can work. When the insurance physician consults the Dutch professional guideline, he finds insufficient information to support him in the decision-making process for this specific case. Consequently, he bases his decision on his own expertise and the available information. He hopes that he can make the right decision, knowing that the outcome of the assessment may have significant personal, social, and financial consequences for the employee.

This case illustrates the importance and relevance of the assessment of inability to work fulltime, as well as the complexity of the construct. With the studies in this thesis, we aim to expand the knowledge regarding the concept inability to work fulltime, and how to apply this knowledge when assessing work disability benefits. In the following sections we describe the background and context of the study, and explain the research gaps and challenges related to the concept inability to work fulltime. Finally, we present our objectives and an overview of the thesis.

Background

Being able to work is central to quality of life, and is associated with multifaceted psychological, social, and economic benefits. Many countries recognize the importance of work, and strive to have their citizens participating fully in society, as besides financial necessity, work participation

also establishes identity and structure in everyday life [1-4]. This focus on work is reflected by the way current social security systems support people to stay at or return to (any) work, even partially or with adjustments [1, 5]. Over the last few decades, many industrialized countries have reformed their disability insurance programs to encourage work participation by long-term sick-listed employees who have residual work capacity (1). This shift in focus generally reflects the underlying idea that being able to work is a key to regaining health, economic self-sufficiency, and social standing [3, 6].

Although work participation is encouraged, people with chronic diseases have been found to have lower employment rates than people without chronic diseases. OECD reported in 2010 that employment rates of people with disabilities were low compared to those of people without disabilities. For example, in that period for all 27 OECD countries, employment rates were respectively 43% for workers with chronic diseases versus 75% without chronic diseases [1]. Moreover, in 2010 in the Netherlands nearly 25% of persons with chronic diseases worked 12 hours per week or more, compared with 67% of the total work force [7]. Persons with chronic diseases not only work less often [8], but on average they also work 9 hours per week less compared to the total work force [7].

Inability to Work Fulltime

Inability to work fulltime literally means that a person cannot sustain working activities for normal fulltime working hours. Although this sounds clear, for physicians who have to decide whether a specific worker with a somatic or mental health condition is able to work fulltime is not easy. It depends on several factors, including non-medical ones. The ability of a person to be active in day-to-day working life is an important aspect of functioning at the level of the whole human being. The International Classification of Functioning and Health (ICF-model) describes functioning at three levels: body functions and structures, activities, and participation [9]. The factors influencing functioning are divided into three categories: health condition, personal factors, and environmental factors. Inability to work fulltime can be seen as a restriction in participation, an inability to work fulltime at any occupation, due to a combination of health-, personal-, and environmental factors.

Being unable to work fulltime can have both a negative and, surprisingly, a positive impact on a person's functioning in daily life (including work). For example, when people who are no longer able to work fulltime cannot fully re-integrate into their fulltime jobs, this can lead to involuntary loss of their jobs and (partial) work disability benefits. The employer may experience loss of productivity and expertise and face the extra costs of replacement. Society is also burdened with the extra costs of unemployment or work disability benefits. Nevertheless, in spite of the negative impact of being unable to

work fulltime, being assessed with an inability to work fulltime and thus no longer obliged to pursue fulltime work participation, may also have a positive impact. It may release workers from the pressure of (looking for) a job with more working hours than they can cope with. Moreover, employers suffer less economic damage if workers are sick-listed for fewer than fulltime working hours, especially in a situation where there are many part-time positions available in the labour market and part-time employment is generally accepted as in the Netherlands [10].

A reduction of working hours may be helpful for people returning to or staying in the labour market. A Dutch study indicated that people unable to work fulltime nevertheless often have favorable work characteristics, such as a higher education and experience in previous employment [11]. These advantages make it easier for them to get a part-time job. In addition, a recent review described that changes in work times (and flexibility in time scheduling as work accommodation), had strong positive associations with return to work among workers on long-term sick leave and assessed with residual work capacity [12]. This may indicate that confirming sick-listed employees' inability to work fulltime could positively affect their return to work. It could also allow them to continue to work part-time, while protected from income loss by disability benefits. However, research on this topic is lacking.

Assessment of Inability to Work Fulltime

In the Netherlands, the work disability benefit assessment is performed by insurance physicians from the Dutch Social Security Institute: the Institute for Employee Benefits Schemes (UWV) under the Work and Income Act (WIA) [13]. To assess the work disability benefit, these physicians use a (semi-) structured interview to gather information on the applicant's medical-, work-, and social situation, as well as his/her functioning. They also use other sources, such as treating- and occupational health physicians. In 2013, for example, 57.811 first assessments took place. Of these, 15.6% resulted in partial disability and 41.9% in full disability; 42.6% of the applications were rejected [14]. Assessment includes a ruling about an applicant's (in)ability to work fulltime, reported as the number of hours he/she can work per day, graded in steps of 2 hours.

In 2000 the professional guideline (in Dutch: '*Standaard verminderde arbeidsduur*') was designed to support and guide insurance physicians when assessing inability to work fulltime and to improve the reliability and validity of these assessments [15]. However, due to a lack of scientific evidence, the professional guideline is based only on the expertise of these physicians. A group of insurance and occupational health physicians supervised the development of the guideline and reached consensus on three specific indications of inability to work fulltime: 1. a lack of energy consistent with

the diagnosis, 2. reduced availability for work due to necessary treatment, and 3. an indication that an increased number of working hours will impair a person's functioning in private life and exacerbate his/her disease symptoms. In addition, these physicians concluded that combining data from the assessment interview with additional data – such as from tests like exercise tests and Functional Capacity Evaluations, findings from significant others, and information about the subject's personal and social situation – is necessary for adequate assessment of the inability to work fulltime.

Although this professional guideline may support physicians in their assessments, it is not an evidence-based practice guideline, as is mentioned above. In an opinion article in 2011, W.C. Otto, insurance physician, policy officer, and member of the guideline development group, summarized the views and problems experienced with assessment of inability to work fulltime, and reported that insurance physicians found it difficult to perform such assessments. Problems included questions regarding the number of working hours that should be considered normal, and whether non-medical factors should also be taken into account [16]. In 2001, in a study on inter- and intra-assessor reliability, Spanjer reported among insurance physicians a large spread in outcomes of assessments [17]. In another study, Spanjer et al. described inadequate agreement among physicians concerning how to assess the number of hours a patient could function per day [18]. He concluded that '*despite the existence of a Dutch Guidelines for Hours Limitations available for insurance physicians, there remains too much scope for subjective interpretation'*. This indicates that physicians need to have a more precise understanding of what the concept entails, as well as insight into other, related, factors.

Providing more evidence on this topic may help insurance physicians in their assessments, and also be beneficial for workers with disabling health conditions, as well as occupational health physicians, employers, and other stakeholders involved in the field of work disability.

Objective and research questions

The overall aim of this thesis is therefore to explore, conceptualize and operationalize inability to work fulltime in the context of work disability benefit assessments. More research into the concept of inability to work fulltime can help to bridge an important knowledge gap in insurance medicine and provide stepping stones toward establishing clear evidence regarding inability to work fulltime.

This overall aim has been broken down into three research questions:

1. What does the concept inability to work fulltime entail, and how can this be measured?
2. What is the prevalence of inability to work fulltime and what are associated socio-demographic and disease-related factors?
3. What is the association between inability to work fulltime and having paid employment one year after the work disability benefit assessment?

Setting

The studies for this thesis were conducted within the Dutch social security system. Because a social security system strongly affects work disability benefits, it is important to understand the context in which the assessments are conducted. In the Netherlands, long-term sick-listed workers with a limited work capacity due to chronic disease may apply for work disability benefits to compensate for income loss after two years of sickness absence. During the first two years of sickness absence, employers are obliged to continue wage payment to their workers. They also share the responsibility to help their sick-listed workers to reintegrate. These employees can apply for work disability benefits at UWV, the Dutch Social Security Institute: the Institute for Employee Benefit Schemes. They may receive work disability benefits for a disease or handicap due either to occupational or non-occupational causes. An insurance physician and a labour expert together assess the (remaining) work capacity and eligibility for work disability benefits. The work disability benefit assessment includes a medical assessment of functional limitations by an insurance physician, and an assessment of earning capacity by a labour expert. Individuals may have either a full work disability or a partial work disability [19]. Those in the latter group have residual work capacity: they are considered able to continue working after the assessment, either partially or with work adjustments. These workers are encouraged to continue in paid (part-time) employment with their current employer, or enroll in a new, more appropriate, (part-time) job with their current-, or a new, employer. The income for the original work before sick leave is compared with the income for the work they can perform according to their residual work capacity. The amount of income loss determines the amount of the work disability benefit, with a threshold of 35% loss of income. For an income loss of less than 35%, no financial compensation is provided. UWV stores data from all work disability benefit assessments, including the outcome inability to work fulltime, and data on the work status of the entire Dutch population, in separate registers. These data are thus an important source of information for research.

Outline of the thesis

This first chapter (Chapter 1) is a general introduction, describing the societal background of the concept of inability to work fulltime, placing this concept in the setting of work disability benefits, and laying out the research gaps and aims of the thesis. Chapter 2 presents the findings of an interview study involving perspectives of both patients and physicians, to provide a conceptualization and operationalization of the concept inability to work fulltime as well as an inventory of assessment methods. Chapter 3 presents findings from a survey across experts from 19 countries, through the European Union of Medicine in Assurance and Social Security (EUMASS), to explore the characteristics and the assessment of inability to work fulltime across European countries. Chapter 4 presents descriptive data on various aspects of (the assessment of) inability to work fulltime. It also provides information about the prevalence and degree of inability to work fulltime in the Netherlands, and describes relevant socio-demographic and disease-related factors. For this study we used a cross-sectional register-based cohort of applicants for long-term work disability benefits, according to the Work and Income Act (WIA) [13]. Chapters 5 and 6 explore the prevalence, and associations with our subject, in applicants diagnosed with cancer (Chapter 5) and mental health problems (Chapter 6), using the same cohort. Again, using the same cohort, Chapter 7 presents results of a study to explore the association of inability to work fulltime with having paid employment one year after the assessment, using follow-up register data on work participation. Chapter 8, the general discussion, presents an overview of the main findings and discusses the results. It also provides implications for policy and practice, and recommendations for future research.

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2

Exploring the concept inability to work fulltime in the context of work disability assessments: a qualitative study

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ABSTRACT

Background: In many countries inability to work fulltime is recognized as an important concept in work disability assessments. However, consensus is lacking regarding the concept and how it should be assessed. This study seeks to conceptualize and operationalize the concept of inability to work fulltime, and includes perspectives of both patients and physicians. Research questions involve identifying: 1. key elements, 2. measurable indicators, and 3. valid methods for assessing indicators of inability to work fulltime.

Methods: We used a qualitative study with a thematic content analysis design to conceptualize inability to work fulltime, based on nineteen semi-structured interviews conducted among insurance and occupational health physicians, and representatives of patient organizations.

Results: Inability to work fulltime is conceptualized as a complex concept which is strongly individually determined and variable due to time and underlying disease. Key dimensions of inability to work fulltime included besides the disease itself, also personal factors like psychological and lifestyle factors, as well as environmental factors related to the work situation and social context. Fatigue, cognitive impairments, and restrictions in functioning in- and outside work were reported as important measurable indicators. A combined use of self-assessment, assessment interviews, and testing, and assessment in the actual (work) setting was identified for assessing these indicators.

Conclusion: Taking into account the complex and variable nature of inability to work fulltime, we found it advisable to use multiple methods and multiple time points for the assessment. Results of this study provide starting points for further research on the operationalization of inability to work fulltime in a work disability context.

INTRODUCTION

Social security systems generally distinguish two main aims of work disability assessment: to decide about eligibility for disability benefits, and to determine what people are still able to do regarding work [1]. Included in work disability assessment is evaluation of whether a person is (un)able to work fulltime, i.e., whether or not employment participation is partially limited due to a health problem. As being able to work is vital for a person's economic self-sufficiency and social standing, valid assessment is of great importance.

In many European countries, inability to work fulltime is recognized as an important concept in work disability assessments [2]; the concept includes the restricted number of hours per day or week a claimant is able to work due to a chronic disease and/or other accepted causes. A previous study comparing 16 European countries showed that a majority of them included assessment of inability to work fulltime (or restricted work endurance) as part of the work disability assessment [2]. If a person is not able to work fulltime it can be described as an inability to work fulltime. Across countries, the definition of fulltime ranged from 35 to 42 h per week [2]. Both physical and mental disorders are accepted causes of inability to work fulltime, with the most often mentioned causes being musculoskeletal diseases, mental disorders, and diseases of the circulatory system. Limited research indicates that in most countries a general deficit in energy was the most frequent indication for granting a limited work endurance [2].

The few existing studies that assess the hours a person is able to work demonstrate confusion regarding the meaning of the concept inability to work fulltime [2, 3]. First, in different countries the concept is assessed differently [2]; various methods are used to aid in assessment, the most common being clinical tests, functional capacity evaluations, and psychological tests. Second, high inter-doctor disagreements have been found on the outcome of assessing inability to work fulltime, questioning the credibility of the current assessment procedures [4–6]. In a previous study we found that, although 10 out of 13 countries use formal rules to assess inability to work, in the Netherlands only a professional guideline is used [2]. This guideline [7] describes the ability to work fulltime as the ability to work at least eight hours per day. The inconsistencies found between countries and physicians may be due to the lack of evidence-based guidelines, and of reliable and valid methods for assessing a person's (in)ability to work fulltime, but are first and foremost due to the lack of a comprehensive conceptualization and operationalization of the concept.

Conceptualization involves formulation of clear and concise definitions: identifying the key elements, using characteristics (non-measurable key elements) and dimensions (measurable key elements). Conceptualization is followed by operationalization: making an abstract concept measurable by

describing its dimensions and translating these into measurable indicators [8]. Effective conceptualizing and operationalization of the concept inability to work fulltime will thus shed light on its key elements and measurable indicators. This insight can then be used to develop methods for its assessment.

This study seeks insight regarding conceptualization and operationalization of the concept of inability to work fulltime, based, among other things, on the perspectives of both patients and physicians. To assess the concept effectively, we also want to explore its dimensions and indicators. Our specific research questions are: 1) What are the key elements (characteristics and dimensions) of inability to work fulltime?; 2) What are measurable indicators of inability to work fulltime?; and 3) Which methods can be used to assess the measurable indicators of inability to work fulltime?

METHODS

Study design

For our study, we used qualitative interviews to explore the concept of inability to work fulltime. Qualitative research is useful for understanding complex issues, explaining people's beliefs and behaviours, and identifying social or cultural norms [9]. To evaluate the collected data we used thematic analysis, applying elements of both phenomenology and the grounded theory approach to content analysis to conceptualize and operationalize the concept.

Dutch law required no ethical approval for this study, as participants were not subject to any intervention. All participants provided informed consent to record the interviews and publish the results, given that data were anonymized and untraceable to individuals. Participation in the study was voluntary, and participants received no incentive for participation.

Participants

We explored the concept inability to work fulltime from the perspectives of both the patient and the physician in order to triangulate points of view from these two main stakeholders.

We invited physicians in staff and/or management positions in insurance and occupational medicine and in both public and private disability insurance, preferably with practical experience and with adequate knowledge of work disability assessment at scientific or staff levels. For the patients' perspective, we invited representatives, expert staff members of patient organizations in the Netherlands, to participate. Patient organizations provide information, offer fellow sufferers contact, promote interests, organize activities, and support groups of specific patients not only with healthcare issues but also regarding social and employment participation. A patient organization is often established for and by patients. We purposively sampled patient representatives to include the major disease groups related to work disability

(mental problems, neoplasms, and respiratory, nervous, and urogenital diseases), and to examine their experiences with the (in)ability to work fulltime. The researchers invited physicians from their own professional networks, and contacted most patient representatives through the websites of their organizations, or their professional networks. The authors approached participants by email and telephone to describe their own role, as well as the aim and context of the study.

Data collection, interview content and procedure

Between January and September of 2014, we conducted semi-structured interviews using open-ended questions. We developed an interview guide with topics and open-ended questions to aid the interviewers and to ensure comparability of the interviews, thereby increasing reliability. We tested this script with three insurance physicians, recruited from the researcher's own network. Based on these try-out interviews the interview guide was fine-tuned, using more open questions. We chose to interview physicians and patient representatives to acquire data on (the assessment of) inability to work fulltime from the perspective of the key participants in the disability assessment interview.

The final interview guide addressed the following major topics: 1) the concept of inability to work fulltime and its characteristics; 2) dimensions of inability to work fulltime; 3) indicators for measuring the dimensions of inability to work fulltime (signs and symptoms of the concept and its dimensions); and 4) methods to assess indicators of inability to work fulltime. Subtopics included: what is 'normal ability to work fulltime', or the maximum number of hours a person can work; disease specific aspects related to variability of inability to work fulltime; the best method to assess indicators of inability to work fulltime; and experience with assessing inability to work fulltime. To explore these topics more deeply, we asked further clarifying questions. Of the 19 interviews, 18 were conducted by two interviewers (HJB and senior researcher and insurance physician BC or research assistant JS [*more information about the research team members can be found under Acknowledgements]);* one interview was conducted by the first author only (HJB). We conducted all interviews in the participants' first language (Dutch), during single sessions of 45–90 min; all were audio-recorded. We made no additional field notes. We interviewed most participants at their own preferred locations, and two by telephone; no other persons were present during the interviews. We transcribed all interviews verbatim. We did not present transcriptions to the participants for their comments, but presented and discussed our interpretations of the data at professional meetings with researchers, professionals, and policymakers in the field of work and health.

Data analysis

The first author verified all transcripts. We used thematic analysis to analyse the collected data [10]. We used an inductive approach to analyse the data, starting with line-by-line coding of the transcripts, using Atlas-ti (version 7.5.18) computer software. During this open coding process, we developed an initial list with codes. All data were coded by the main researcher, HJB, and two members of the research team (BC and FA), and codes were ultimately grouped and combined into subthemes in an iterative manner. We held weekly meetings to discuss disagreements in the coding and grouping processes, until reaching consensus. The last stage consisted of discussions among members of the research team (HJB, BC, FA, SB, PR, TH) until consensus was reached on the final themes. Data saturation was not the aim of this study, as we wanted to explore themes among representatives from major disease groups. All members of the research team work at the University Medical Center Groningen and are affiliated with the Research Center for Insurance Medicine. The first author, HJB, is an insurance physician and PhD candidate; FA has a background in work and organizational psychology; TH and SB have backgrounds in health sciences; and PR has a background in health sciences and occupational physiotherapy. FA, PR and SB have PhDs in the domain of work and health research, and are experienced in conducting qualitative research. Additionally, BC, who played an important role in analyzing the data, was an insurance physician and a senior researcher at the Research Center for Insurance Medicine, with a PhD in work and health. The mixed backgrounds of the team members enriched the analysis by introducing different perspectives. Analyses were influenced by the first author's experience in conducting actual work disability assessments, and his extensive knowledge on the topic inability to work fulltime.

We summarized and searched the texts underlying the themes and codes to find quotes that best illustrate the views and experiences of the interviewees. Quotes from interviewees were selected by two authors (HJB, FA), translated into English by a professional translator, and discussed with all co-authors. To indicate the diversity of opinions while maintaining anonymity, we indicate quotes from physicians with Ph1-Ph10, and from patient representatives with Pa1-Pa9.

In the final iteration, we formed a conceptualization based on emerging themes describing the key elements. We used these key elements to operationalize the concept into relevant characteristics, dimensions and measurable indicators, and inventory methods for assessing these indicators. Although the interview guide contained no questions regarding the International Classification of Functioning, Disability and Health (ICF) [11], we were able to identify and categorize responses to this framework. Other sources of categorization were national guidelines on prescribing adequate,

and/or reducing, working hours [7, 12]. Within the research team we discussed characteristics, dimensions and indicators to compose an overview of the concept inability to work fulltime.

RESULTS

Participant characteristics

We initially invited 33 persons (13 physicians and 20 patient representatives) for interviews, 19 of whom (ten physicians and nine representatives of patient organizations) agreed to participate. Reasons for refraining from participation varied: lack of time, illness, insufficient expertise, or the topic or interview did not fit with the scope of the organization.

In our final group, seven out of ten physicians were insurance physicians: four working in public disability insurance (Ph1–4), and three working in private disability insurance (Ph5–7). Three participants were occupational health physicians (Ph8–10). Nine physicians were male, and five had obtained a PhD-degree. The nine staff members from patient organizations represented patients with five disabling chronic diseases (mental and behavioral conditions (n = 3) Pa1–3, diseases of the nervous system (n = 3) Pa4–6, genitourinary system disorders (n = 1) Pa7, neoplasms (n = 1) Pa8, and diseases of the respiratory system (n = 1) Pa9). All subjects had received higher education, most at university level; six were female. All worked as project manager, (senior) staff member, or advisor.

Main findings

Overall, findings from the two stakeholder groups corresponded, with only a slight difference in point of view on inability to work fulltime. In the interviews, discussion of the key elements (dimensions and characteristics), the measurable indicators, and the related assessment methods was intertwined. An overview of the terminology and main findings is presented in Table 1. Patient representatives tended to describe the inability to work fulltime from a more holistic perspective, while physicians, and especially insurance physicians, used a more narrow bio-medical perspective.

Table 1 Conceptualization and operationalization of the concept 'inability to work full time'

Conceptualization (identifying key elements)
Characteristics
Inability to work normal working hours
Variability of inability to work fulltime: - due to time - due to underlying disease
Dimensions
Disease and personal factors (i.e. psychological and lifestyle factors)
Environmental factors (i.e. work-related and social factors, and norms)
Operationalization (measurable indicators)
Indicators
Fatigue
Cognitive impairments
Restrictions in functioning in- and outside work
Assessment methods
Self-assessment
Assessment interviews
Functional testing
Assessment in the actual work setting

Conceptualization of inability to work fulltime

Characteristics of inability to work fulltime

Most participants found inability to work fulltime a complex concept to operationalize. It describes the inability of a person to work normal working hours, i.e. not able to work a normal number of hours per day and per week. Important characteristics of inability to work fulltime are that it is strongly individually determined and is variable. One patient representative stated when asked; "*What do you consider a normal work-time capacity?*"*:* "*that, of course, varies from person to person*" Pa8). A physician stated: "*the work capacity, that is different for each person*" (Ph7). Additionally, two aspects were described characterizing the variable nature of inability to work fulltime: variability due to time, and variability due to the underlying disease.

Variability due to time. Inability to work fulltime varies over time due to many different factors. As one physician stated: "*We are not machines. We are influenced by all sorts of things happening in and outside ourselves over time. That varies all the time*" (Ph3). Another physician stated: "*When you're talking about work ability in terms of a social norm, I think it varies over time. Nowadays we expect other things from people than twenty years ago*" (Ph1).

Both physicians and patient representatives mentioned that with age, people have a reduced capacity to bear physical and cognitive strain, need more recovery time, and are less resilient. However, physicians also described a learning curve over time, involving the development of more (cognitive) skills that may compensate for this reduced physical capacity; as one physician stated: "*The physical capacities may decline somewhat over the years, but you can make up for that with things like increased skills*" (Ph7).

Variability due to underlying disease. Participants mentioned that variation in severity and complaints, the effect of treatment and training, and personal and external factors may affect a person's ability to work fulltime. The type of disease was often mentioned as a variable factor related to, and a potential indicator of, the impaired ability to perform working activities; examples were severe heart failure and chronic renal insufficiency. However, they stressed that not only having the disease (the diagnosis) itself causes inability to work fulltime, but also the course of the disease. Physicians remarked, "*Even some people with depression are able to work*" (Ph1), and "*We all know that a well-known feature of all kinds of depressive disorders is that they fluctuate*" (Ph3). Additionally, most participants mentioned treatment and rehabilitation as factors influencing the number of hours a person can work. For example, cancer treatments and time-consuming kidney dialyses were mentioned as significant barriers to being able to work fulltime. However, cancer rehabilitation, sports, cognitive training, and stepwise functional recovery were mentioned as factors that positively influence inability to work fulltime, regardless of the person's diagnosis. A physician stated: "*Well, work ability varies with the clinical picture, the health condition, whether the condition is active, and whether there are treatment options now or in the future*" (Ph2).

Dimensions of inability to work fulltime

Disease and personal factors. Besides the type of disease, several personal factors were mentioned as key dimensions of the inability to work fulltime. Physicians reported further psychological factors, such as a person's (in)ability to cope, as well as motivations and orientation in life, as important aspects that influence the number of hours a person can work. Patient representatives mentioned an improved lifestyle (e.g., smoking cessation, more exercise), positive orientation and goals in life, the choice to work self-employed, having self-confidence, and coping with the disease to be of influence. One physician said: "*Some people just get hung up on it; others don't*" (Ph3). One patient representative stated: "*Some people just want to achieve a higher ability to work because it has to do with certain personal life goals*" (Pa9).

Environmental factors. As environmental factors, physicians mentioned work-related factors (e.g., workload, work content, work autonomy, commuting time) and workplace factors (e.g., facilities, noise, light, climate). Patient representatives added organizational policies and practices, social support, job control and job fit, conflicts at work, discrimination, and re-organization as factors associated with the ability to work fulltime. One physician said, "*The moment you create more possibilities at work, people have the ability to make a positive contribution to work, even at higher ages*" (Ph9). A patient representative said, "*All circumstances at work, and whether or not you are satisfied with them, play a very important role in your work capacity*" (Pa2). Regarding social factors, we found that workers' social situations can impact the number of hours they are able to work. A person's household, family obligations, family concerns, problems and worries, may negatively influence the ability to work a certain number of hours per day or per week. However, family support can also have a positive effect. A physician said, "*When you have big problems in your private life, you can be physically able to work, but your true ability to work and your productivity will be lower as long as these issues are not resolved*" (Ph9). A patient representative said, "*When you have a good partner, good support and feel well, you are better able to cope with your limitations*" (Pa6).

Further, most participants stated that societal norms strongly influence what is generally considered to be normal. Both physicians and patient representatives considered fulltime working as normal, but the number of hours per day and per week may differ, depending on societal norms. These norms can be based on legal and collective arrangements between employers and employees regarding working conditions, on policies within companies, and on insights within social groups. A physician said, "*What is expected of a worker is based on legal or social norms. Apparently, a Dutch fulltime employee is legally required to work 40 or 38 hours, depending on the labor agreement, or fewer hours, depending on the employment contract. But that doesn't say anything about his physical ability*" (Ph5). A patient representative said, "*I think that most people are able to work between 30 to 40/50 hours (per week), but it strongly depends on where you come from and on your upbringing*" (Pa3). Participants generally agreed that every person has his or her own maximum of hours that he/she can work, and stated that it is impossible to prescribe a universal maximum of working hours. A patient representative stated, "*I think the maximum amount is very personal and very much dependent on the sort of work you do. I don't think there is an upper limit that applies to everyone*" (Pa8). Physicians stated that the maximal number of hours a person can work per day or per week may differ from person to person, ranging from 9 to 12 h per day and from 55 to 80 h per week. According to the physicians, the upper limit is influenced not only

by health status, but also by personal factors (physiology, coping abilities, motivation, training), and environmental factors (individual workload, safety requirements, home situation). Frequently exceeding one's maximum may lead to long-term health complaints and negative health effects, indicating a need to recover from physical and mental work efforts for a shorter or longer period of time. A physician stated, "*Research shows that people make more mistakes, get tired and have more problems concentrating if they work longer than nine consecutive hours without a break*" (Ph9). A patient representative said, "*In earlier days, and nowadays in some countries, people worked from sunrise to sunset, and then went to sleep. That's exhausting, and that's why these people didn't get very old*" (Pa3).

Operationalization of inability to work fulltime into measurable indicators

Indicators of inability to work fulltime

We found three relevant measurable indicators to assess inability to work fulltime: fatigue, cognitive impairments, and problems in functioning in- and outside work. Patient representatives of patients with somatic diseases mentioned more physical indicators ("*slow recovery*", "*specific disease-related complaints like pain and dyspnea*") while those representing patients with mental disease mentioned more cognitive indicators ("*execution of complex tasks*", "*overview of situations*", "*coping with emotions*", and "*environmental stimuli*").

Fatigue. Fatigue was reported as an important indicator of inability to work fulltime. Patient representatives stated that people with inability to work fulltime "*lack the energy*" (Pa8, Pa1, Pa7), and "*run into all kinds of barriers*" (Pa8, Pa4). Physicians stated that these people "*feel unable to work the whole day*" (Ph8), that "*they can't accomplish anything anymore after six hours of work*" (Ph8).

Cognitive impairments. Physicians stated that people with inability to work fulltime "*can't cope any longer*" (with a full day's work) (Ph5), that they "*need more time to understand things*" (Ph2). Participants also mentioned that people with inability to work fulltime have problems with cognitive and complex tasks, stating that they "*forget*" (Pa7), "*make mistakes*" (Ph1, Ph2, Ph4, Ph10), "*have no overview*" (Pa4, Pa2, Pa3), and "*have fewer problem-solving abilities*" (Pa5). Some also mentioned emotional complaints as indicators of inability to work fulltime, such as "*irritability*" (Pa4, Pa5), "*less able to cope with conflicts*" (Pa4), and "*mental decompensation*" (Pa5).

Restrictions in functioning in- and outside work. Most participants reported that people who cannot work fulltime have problems with functioning both in- and outside work. They emphasized the importance of having sufficient time to recover from work, and balancing work with other activities like household tasks, self-care, and social activities.

For example "*doing less*" (Ph6), "*needing a power nap*" (Ph9), "*being unable to do anything in the evening hours after work*" (Ph3), "*not being able to get out of bed*" (Ph7), "*going to sleep during the day*" (Pa4, Pa3), "*[making] mistakes in their work*" (Ph9), "*function[ing] less well at work when they continue to work longer*" (Ph2), "*[being unable to] visit friends anymore in the evening*" (Pa7), and "*not [being] able to go out anymore or do sports*" (Pa4).

Assessment methods of inability to work fulltime

Quantifying the number of hours per day a person can work is seen as an enormous challenge. As one physician indicated, "*It is relatively easy to determine that someone is unable to work fulltime, but when it comes to assessing the level of inability to work fulltime we are just swimming*" (Ph4).

After we explored how best to assess the indicators of inability to work fulltime four methods emerged: **self-assessment, assessment interviews, functional testing** (e.g., Functional Capacity Evaluation (FCE), psychological tests and ergometry [e.g., exertion test and VO2max-determination]), **and assessment in the actual work setting**. Although there was no consensus about a single best method, most participants found it insufficient to use only one instrument.

Self-assessment methods alone were not regarded as a suitable measure. Patient representatives pointed out that "*people with certain disorders, like depression*, *may have trouble realizing their own limitations*" (Pa1). Physicians also stated that a client's own estimation of functional impairments, activity limitations, and participation restrictions may need to be complemented with additional information, such as that provided by a semi-structured assessment interview.

Although most physicians considered an assessment interview to be an important method, especially in combination with other methods, patient representatives found such interviews invalid. They considered the method too simplistic; as one patient representative (Pa3) stated, "*the simple conversation at the social security institute doesn't work*". They declared that the assessment interview should also include "*examples of functioning and daily activities, information from treating physicians, and checking for inconsistencies*" (Ph5), *as well as* "*recovery after exertion, the personality of the client, and the psychosocial situation*" (Pa7), and could be supplemented with "*speaking with people next to clients, like significant others, employers or mentors*" (Pa3), and gathering "*information about what happened before, in the first two years of sick leave*" (Pa4).

Most participants (both physicians and patient representatives) mentioned the value of clinical tests, separately or in combination with other methods, as methods for assessing indicators of inability to work fulltime, such as fatigue and cognitive problems, and not just inability to work fulltime in itself. As a physician explained, "*Testing with neuropsychological assessment and ergometry (exertion-tests and VO2max-determination) contributes to the assessment of inability to work fulltime, but is not the final answer*" (Ph6); this applies especially to certain disorders or conditions like traumatic brain injury, and heart and lung diseases.

Both physicians and patient representatives regarded trial placements and observation at work as appropriate ways to discover the extent of a person's capacity to work. This trial and error setting makes it possible to test and observe indicators of inability to work fulltime. As a patient representative stated, "*Observe if someone makes mistakes or takes rest during trial placement*" (Pa5). Participants indicated a need for repeated observations and long-term follow-up, suggesting periods from six weeks to three months.

DISCUSSION

In this study we aimed to conceptualize and operationalize the concept inability to work fulltime by interviewing physicians and patient representatives and analyzing their answers. Our results show that inability to work fulltime describes the inability to work normal working hours and is considered a complex concept to operationalize, as it is strongly individually determined and variable. The underlying disease and changes in the situation over time make the concept variable. Moreover, we found that key dimensions of inability to work fulltime included not only the disease itself, but also personal factors like lifestyle and psychological components, as well as environmental factors related to the work situation and conceptions regarding what constitutes a 'normal' number of working hours. Fatigue, cognitive impairments, and restrictions in functioning in- and outside work were reported as important measurable indicators of inability to work fulltime. To assess this inability, participants regarded assessment interviews, testing, and evaluation in the actual work setting as the most suitable methods for measuring indicators, and expressed a preference for their combined use. They also mentioned the importance of repeated assessment, given the longitudinal and variable nature of inability to work fulltime. Self-assessment methods alone were not considered suitable. In all, the results of this study provide insight into the key elements (characteristics and dimensions) of inability to work fulltime, some important measurable indicators, and methods that can be used for assessment. Our results thus contribute to more evidence-based work disability assessments.

Our findings indicate that the inability of workers to work fulltime, due to disabling chronic health conditions and/or other causes, should be treated as a complex set of personal and environmental factors, and is variable. This aligns with the conclusions of other research in this area, that the inability to work fulltime has a complex character. This underlines the complexities of work disability assessments in general [13, 14]. Measuring of complex concepts often requires multiple measures and methods. Our results correspond with the ICF-model and the dimensions of the biopsychosocial model currently applied in most work disability settings, and confirm that using solely a medical perspective is too narrow [15].

Operationalization of the concept inability to work fulltime revealed a broad perspective involving the disease, personal factors, and environmental factors, and emphasized the importance of the context of the individual. In this context, his/her career is significantly influenced by societal norms, cultural aspects, and policies regarding accepted norms for working fulltime [16, 17]. Although in this study, we did not further explore this normative aspect, for further assessing and operationalizing inability to work fulltime it is vital to take this aspect into account. For example, in a more individualistic culture [18] like the Netherlands, the government has recently been advised to allow workers autonomy in determining the number of hours they work in order to maintain their work-life balance [19].

The reported measurable indicators of inability to work fulltime can be used as signals to assess the number of hours a person is able to work. They are crucial starting points to help assessors to unravel the question of reduced ability to work fulltime. However, some indicators are not necessarily only preconditions of an inability to work fulltime, as they can also be described as generic and frequently occurring expressions of disease. For example, although fatigue can be caused by a disease or treatment, and be a reason to stop working or reduce tasks, it can also be a response to working too many hours or having too great a workload. Our results are in line with the Dutch guideline [7], which mentions fatigue and cognitive impairments as aspects requiring special attention because they may be related to loss of energy and increased need for recovery.

Several validated self-report instruments are available to measure the reported indicators, such as questionnaires on fatigue or energy deficits [20, 21], pain [22], cognitive impairments [23], and functioning [24–26]. Data from these questionnaires can be supplemented with more objective measurements, as from tests like the Psychomotor Vigilance Test [27]; ActiGraph [28]; observation, for example during work and daily life [29] – combined with an assessment interview (as it was mentioned that self-assessment alone was not sufficient, because of the uncertainty regarding the use of this approach alone). This conclusion is in line with that of previous

research, which raised some questions about the validity of self-reported disability measures for quantifying actual function in work disability settings [13, 30–32]. When used in combination, the above-mentioned measures can help to estimate and quantify the role of the specified indicators and strengthen the credibility of assessment outcomes. Additionally, as participants also mentioned, information from significant others like treating physicians, partners, employers, and occupational health physicians, as well as information based on previous assessments and re-integration during the period of sick leave, could be used. This is also in line with the Dutch guideline, which advises combining data from the assessment interview with additional data from tests like exercise tests and FCE, findings from significant others, and information about the subject's personal and social situation in order to assess the inability to work fulltime [7]. Rugulies [13] discussed the advantages and disadvantages of using, among others, self-administered questionnaires and observer-based assessments, and also advised using a combination of methods. Repeated assessment should also be considered, given the longitudinal and variable aspects/dimensions of inability to work fulltime.

Further research is needed to evaluate the measurement properties of the different assessment methods and their combinations.

Strengths and limitations

To our knowledge, this is the first study to follow a multi-perspective approach to conceptualize and operationalize the concept inability to work fulltime as part of disability assessment. It is promising both physicians and patient representatives made similar observations. In addition, the study included a wide variety of physicians and patient representatives, thereby providing broader insights into the characteristics, dimensions, indicators and methods of assessing inability to work fulltime.

This study also has some limitations. First of all, the study included only representatives of patient organizations. Although some of them are patients themselves, it is their job to lobby for the interests of their organizations; including a wider variety of patients might have produced different data. Further, the physicians were more often male, and representatives of patient organizations were more often female, but we expect that this did not influence our study results, as congruent findings were found from both perspectives. A second limitation may be some educational bias, as our participants had all received higher education; we may thus have missed relevant responses from people with less education regarding inability to work fulltime. This may reduce the generalizability of our study findings. Finally, our interviews took place in 2014; nevertheless, we are convinced that our data are still valid, as the practice of assessment of inability to work fulltime has not changed since that time.

Practical implications

Although our exploratory work cannot deliver a totally clear definition and operationalization of inability to work fulltime, it clearly indicates areas worthy of future research and practice. The complex nature of inability to work fulltime requires comprehensive assessment methods, combining subjective and objective measures, to allow for a grasp of the multiple indicators related to the concept. This conclusion corresponds with findings in previous research on measuring complex concepts [8, 13, 14], and newly developed assessment measures in work disability settings [33]. Internal and external factors make a person's inability to work fulltime variable, and therefore difficult to assess, especially at a single time point. To address such fluctuations, when assessing work disability we recommend measuring repeatedly, and over longer periods of time.

CONCLUSION

Inability to work fulltime is considered a complex concept to operationalize. It is strongly individually determined and variable, and depends not only on disease and personal factors, but also on environmental factors. We found three important measurable indicators: fatigue, cognitive impairments, and restrictions in functioning in- and outside work. To assess inability to work fulltime, participants mentioned assessment interviews, testing, and assessment in the actual work setting as the most suitable methods, and expressed a preference for the use of combined methods; they regarded self-assessment methods alone as inadequate. Taking into account the complexity of inability to work fulltime, and its possible variation, we would thus recommend using multiple methods, and at multiple time points. The results of this study provide starting points for further research on the operationalization of inability to work fulltime in the work disability context, and contribute to more credible work disability assessments.

ABBREVIATIONS

ICF: International Classification of Functioning, Disability and Health; FCE: Functional Capacity Evaluation

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3

The assessment of work endurance in disability evaluations across European countries

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ABSTRACT

Purpose: Chronic disease is often associated with a reduced energy level, which limits the capacity to work fulltime. This study aims to investigate whether the construct work endurance is part of disability assessment in European countries and what assessment procedures are used. We defined work endurance as the ability to sustain working activities for a number of hours per day and per week.

Materials and methods: We conducted a survey using two self-constructed questionnaires. We addressed 35 experts from 19 countries through the European Union of Medicine in Assurance and Social Security (EUMASS). We gathered descriptive data on various aspects of (the assessment of) work endurance.

Results: Experts from 16 countries responded. In most countries work endurance is assessed. We found few professional guidelines specific for the assessment of work endurance. Both somatic and mental diseases may cause limited work endurance. Methods to assess work endurance vary, objective methods rating as most suitable. Almost half of the countries report controversies on the assessment of work endurance.

Conclusions: Work endurance is recognised and assessed as an aspect of work disability assessment in Europe. However, controversies exist and evidence-based guidelines, including reliable and valid methods to assess work endurance, are lacking.

INTRODUCTION

Recent updates of the global burden of disease studies by the World Health Organization show that in the general population chronic diseases account for 76.6% of years lost to disability [1,2]. In the workforce across European countries the proportion of employed persons reporting chronic diseases has increased from 19.3% in 2010 to 20.8% in 2014 [3,4]. In 2011, 19% of persons aged 15–64 years in Europe reported to have some physical and/or mental activity limitation at work, in 38% of cases caused by chronic disease [5].

Apart from specific disease symptoms and health complaints, chronic disease is likely to be associated with reduced physical and mental energy level and activity limitations, eventually limiting work performance in general and the ability to work fulltime in particular [3,6,7]. Almost 25% of persons with chronic health problems work part-time compared with 14% of those without disability [8]. On average they work fewer hours than the general population and they more often work part-time compared to healthy workers due to differences in fatigue and emotional exhaustion [9–11].

The International Classification of Functioning, Disability and Health (ICF) is a useful framework to map associations between chronic disease and physical and/or mental activity limitation at work [12]. The ICF defines disability as an umbrella term for impairments in body functions and structures, limitations of activities, and restrictions of participation. Reduced physical and mental energy level are classified in the ICF-domain Body functions and structures with the term (impairments in) Energy level. Also classified in that domain is the physical ability to sustain activities with the term General physical endurance. The construct Inability to work full time is not specifically classified in the ICF. In our study, energy deficits include both reduced physical and mental energy levels. This is in accordance to the disability assessment procedures in social security setting, and also to the definition of Philips (2015) [13] i.e. “the psychophysiological condition needed for physical activity or mental processing over time in and out of the actual workplace.”

Reduction of working hours is a frequently applied work accommodation for workers with a chronic disease having difficulty to work fulltime, improving the match between work demands and work capacity [14,15]. In a sample of individuals with a chronic disease eligible for a rehabilitation program, the most preferred and realised work accommodations included fewer working hours [16]. In a population of employees with a chronic disease, the need for adjusting working times was reported by 6.2% of all employees, and by 11.0% of those with mental disorders [14]. In a representative sample of workers with various chronic somatic diseases, reduced working hours were most frequently mentioned as work adjustment in 5.8% of cases. In that study 58.8% reported problems at work related to physical endurance and weariness [17]. In a study among working cancer survivors, the most

common adjustment was reducing the number of work hours per week [18]. In a review exploring work-related problems in multiple sclerosis, higher disease duration was found to be a determinant of reduction in number of hours worked per week [19].

In the Netherlands, to compensate for income loss, long-term sick listed workers with a limited ability to work due to chronic disease, may apply for disability benefit. The ability to work, including the number of hours per day and per week the claimant is able to work, is evaluated by insurance physicians (IPs) from the Dutch Social Security Institute (SSI). In the Dutch social security system, a limitation of working hours due to chronic disease usually results in partial disability. In this paper we introduce the term Work Endurance, i.e. the physical and mental ability of a person to sustain working activities in hours per day and hours per week. A professional guideline has been introduced recently to support Dutch IPs in their assessment of the number of hours a claimant is able to work per day and per week [20]. This expert-based guideline includes three indications to consider a claimant's work endurance as being limited: general energy deficit, reduced availability for work due to medical treatment and prevention of future health deterioration. Despite the availability of this guideline Dutch IPs experience difficulties in assessing possible limitation of working hours among disability benefit claimants, e.g. regarding the number of working hours considered to be normal and whether psychosocial factors should be taken into account [21]. A Dutch study showed that 48% of disability benefit claimants were assessed by IPs using the guideline as having a limitation of working hours and granted partial disability benefit [22]. Another Dutch study among IPs showed large inter-doctor variation in limitation of working hours as disability assessment outcome [23].

In western countries the evaluation of work disability is typically performed by medical examiners who report their findings to social insurance [24,25]. It is known that in different countries different elements are included in the assessment of disability benefits [8,24] and it is unknown if the ability to work a number of hours per day and per week is assessed in all countries. Scientific publications on assessing work endurance in social insurance in European countries and information about whether the assessment of work endurance is part of the assessment of disability benefit are lacking. For international comparison more research about the assessment of work endurance as an important aspect of disability assessment in European countries is warranted [24,26].

We studied if and how in European countries work endurance is assessed as part of the overall disability benefit assessment. Our main question is: "Is work endurance assessed as part of the application of disability benefit?". If yes: "Are professional evidence-based guidelines for the assessment of work

endurance available?"; "What causes are considered to be acceptable for limited work endurance?"; "By which methods is work endurance measured?"; "Do controversies on the assessment of work endurance exist?"

MATERIALS AND METHODS

Study setting and participants

We invited experts from 19 European countries: Belgium, Croatia, Czech Republic, Finland, France, Germany, Ireland, Italy, the Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Sweden, Switzerland and the United Kingdom (UK). We identified experts through the secretariat of the European Union of Medicine in Assurance and Social Security (EUMASS), a network of national associations of insurance medicine in 19 European countries [27]. EUMASS aims to offer a platform to exchange experiences within the field of insurance medicine between various insurance-related organizations in Europe, mainly focusing on public social security. Each national association is represented in the EUMASS council by up to two staff medical advisor(s), i.e. experts in disability assessment, and may nominate one deputy for each representative. We invited all council members, 35 experts, representing the 19 countries. In the total group of EUMASS expert representatives, the number of eligible respondents per country ranged from one to three. As we invited the total group of 35 eligible EUMASS representatives we were not able to expand the sample by additional members.

Design and procedures

We invited the participants to fill in two self-constructed surveys consecutively from June 2014 through April 2015. The language of the survey administration was English for all countries.

The questionnaire used in the first survey was independently pilot-tested for readability and usability by four practicing insurance physicians and the questionnaire in the second survey by three researchers with expertise in disability assessment. In the first survey experts received a link to a web-based questionnaire with items on the assessment of work endurance. A second questionnaire was sent by email directly to 17 participants in the first survey from 13 countries who had volunteered for the second survey. In both surveys a first and second reminder was sent after four and eight weeks, respectively. Participants from the same country whose answers were not unanimous, were approached separately by email with a request to clarify.

Under Dutch law approval of this study by the Medical Ethical Board of the University Medical Centre Groningen was not necessary.

Measures

In the first survey questionnaire data were gathered on country, profession and expertise of participants. This questionnaire focused on various general aspects of work endurance and its assessment with eight items: the number of working hours per day and per week that is considered normal, the assessment of work endurance as part of the overall disability assessment, the professional assessing work endurance, rules or guidelines that are used, accepted cause(s) for limited work endurance, methods by which work endurance is assessed and any controversies on the assessment of work endurance.

The second survey questionnaire with 12 additional items aimed to provide more detail on work endurance and how it is assessed. It gathered information on the evaluation of the maximum duration to sustain specific activities, the general evaluation of the maximum duration to work in suitable work, specific diseases associated with limited work endurance, causes for limited work endurance and methods suitable to assess work endurance. Suitability was rated on a scale 0–10 (0 = totally unsuitable; 10 = very suitable). Health conditions listed in the second survey questionnaire were grouped according to the International Classification of Disease, 10th edition (ICD-10) [28]. For the first and second questionnaire, see the supplementary S1 Table.

Data analyses

Data from the first survey round were collected using Unipark software and automatically transferred in SPPS. Data from the second survey round were collected by e-mail and manually added to the SPSS file by the first author (HJB). Data were analysed with IBM SPSS version 22.0 for Windows. Simple frequency statistics and cross tabulations were used. We checked for inconsistencies in respondents in those countries with two or three representatives. If inconsistencies were found, we contacted the representatives and tried to reach consensus. If no consensus could be reached we included the positive answer in the analysis. In those countries with only one representative or respondent it was impossible to check for inconsistencies. If participants filled in a range instead of an absolute number, the mean was taken as value.

RESULTS

Participants and response rate

In the first survey data were obtained from 24 of the 35 (response rate 68.6%) potential responders and from 16 of the 19 (84.2%) countries. From seven countries more than one expert responded. Ireland, Portugal, Serbia did not respond. Twenty-four participants filled in the first questionnaire: 13 insurance

physicians, six medical advisors, one researcher, one assessment doctor, one medical assessor, one occupational physician and one general practitioner. Eighteen (75%) of these conduct disability assessments in practice. Six were involved in another way, such as medical advice, education, management and organisation and policy making. Seventeen experts from 13 countries were approached in the second survey. Twelve experts (response rate 70.6%) from ten countries (76.9%) responded. From two countries more than one expert responded. Belgium, Finland, Italy, Slovakia, Switzerland and the United Kingdom did not respond. Thus, full data were obtained from 10 countries, provided by 11 participants.

Number of standard working hours

The range in standard full time working hours per day across countries was from 7.5 (Belgium, Finland, Norway, UK) to 8.3 (Switzerland). The range in standard full time working hours per week was from 35.0 (France) to 42.0 (Switzerland).

Assessment of work endurance

The assessment of work endurance is part of the disability assessment in 13 of 16 countries. In two of these 13 countries answers to this item were inconsistent. Work endurance is assessed by an insurance or occupational physician. In one country the answer to this item was inconsistent. Formal rules for the assessment of work endurance as part of regulations for work disability assessment in general are used in ten countries. Only in the Netherlands a professional guideline specific for the assessment of work endurance is in use. In four countries the assessment of work endurance includes the evaluation of the maximum duration a person is able to sustain specific activities without interruption, such as walking, standing or sitting. The assessment of work endurance includes the evaluation of the maximum duration a person is able to work in suitable work in five countries. In one country answers were inconsistent on both of these items. For detailed information per country, see Table 1.

Causes of limited work endurance

Physical and mental disorders are accepted causes of limited work endurance in all countries. Diseases most mentioned as frequently being associated with limited work endurance are diseases of the musculoskeletal system and connective tissue, mental disorders and diseases of the circulatory system. In seven countries answers to this item were inconsistent (not in table).
Psychosocial factors are accepted causes in ten countries, health complaints in eight countries and environmental factors in five countries.

Indications to limit work endurance

General energy deficit is reported to be an indication to limit work endurance by eight countries. In one country the answer to this item was inconsistent. In six countries reduced availability for work due to medical treatment is an indication to limit work endurance. In seven countries prevention of future health is an indication to limit work endurance. In two countries answers to this item were inconsistent, see Table 2.

Diseases most mentioned as causes of limited work endurance through general energy deficit are musculoskeletal diseases and mental disorders. Neoplasms and mental disorders are most mentioned as causes of limited work endurance through reduced availability due to medical treatment. Musculoskeletal diseases and mental disorders are most mentioned as causes of limited work endurance through prevention of further health deterioration (not in table).

METHODS TO ASSESS WORK ENDURANCE

Clinical test, functional capacity evaluation and psychological test are the most used methods to assess work endurance, see Table 3. Participants from four countries provided inconsistent answers to this item. In all countries different combinations of the listed methods are mentioned as most suitable to assess work endurance.

Clinical tests include flexibility tests of joints, cardiovascular and respiratory functional diagnostics, functional capacity evaluation, ergometry, clinical examination, visual field test, imaging like X-ray, MRI and ultrasound, electromyography, endoscopy, laboratory test, audiometry and electro-encephalography. Other tests include tests on cognitive function, psychological tests, semi-structured interviews, self-report questionnaire and psychiatric evaluation.

Ergometry and functional capacity evaluation rate highest with both 8.3 points (on a scale 0–10) as being the most suitable method to assess work endurance, see Table 3.

Semi-structured interview and self-report questionnaire rate lowest with 6.4 and 4.4 points respectively.

Controversies on the assessment of work endurance

Controversies are reported on the assessment of work endurance in 10 countries. Nine of these countries provided short descriptions of controversies, see Table 4.

Table 1 The assessment of Work Endurance in European countries (n=16)

	BE	HR	CZ	FI	FR	DE	IT	NO	PL	RO	SK	SL	SE	CH	NL	UK
Assessment of work endurance part of the assessment of work ability	+/-	+/-	+	-	+	+	+	+	-	+	+	+	+	+	+	-
Assessment of WE by insurance physician	+	+	+/-	na	+	+	+	+	na	+	+	+	-	+	+	na
Formal rules and/or guidelines	-	-	+	-	+	+	-	+	+	+	+	+	+	-	+	-
Assessment of WE includes specific activities	mis	-	-	na	-	-	mis	-	na	+/-	mis	+	+	mis	+	na
Assessment of WE includes generic evaluation	mis	-	-	na	-	+	mis	+	na	+/-	mis	+	+	mis	+	na

+ = yes; - = no; +/- = inconsistent ; mis = missing answer; na = not applicable BE=Belgium; HR=Croatia; CZ=Czech Republic; FI=Finland; FR=France; DE=Germany; IT=Italy; NO=Norway; PL=Poland; RO=Romania; SK=Slovakia; SL=Slovenia; SE=Sweden; CH=Switzerland; NL=Netherlands; UK= United Kingdom

Table 2 Indications to limit work endurance in European countries (n=13)

Indications	BE	HR	CZ	FR	DE	NO	PL	RO	SK	SL	SE	NL	UK	Total n
General energy deficit	mis	+	+	-	+	+	mis	+/-	mis	+	+	+	mis	8
Reduced availability due to medical treatment	mis	+	-	+	+	-	mis	+	mis	-	+	+	mis	6
Prevention of future health deterioration	mis	+	+	-	+	+	mis	+/-	mis	-	+/-	+	mis	7
Other aspects	mis	-	+	-	-	+	mis	+	mis	-	+	-	mis	4

+ = yes; - = no; +/- = inconsistent; mis = missing answer. BE=Belgium; HR=Croatia; CZ=Czech Republic; FR=France; DE=Germany; NO=Norway; PL=Poland; RO=Romania; SK=Slovakia; SL=Slovenia; SE=Sweden; NL=Netherlands; UK= United Kingdom

Table 3 Methods (and expert suitability rating: 0-10) used to assess work endurance in European countries (n=13)

Method	BE	HR	CZ	FR	DE	IT	NO	RO	SK	SL	SE	CH	NL	Mean rating
Semi structured Interview	-	+ (9)	+/- (7)	- (5)	- (5)	-	+	- (7)	+	+/- (5)	+ (5)	+	+ (8)	6.4
Ergometry	-	- (10)	+/- (9)	-	+ (7)	-	+	+ (10)	+	+ (10)	+ (8)	+	- (4)	8.3
Functional Capacity Evaluation	+	- (10)	+/- (10)	- (8)	+ (9)	+	+	+ (9)	+	+ (7)	+ (8)	+	- (5)	8.3
Psychological test	-	+ (10)	+/- (8)	- (2)	+ (6)	-	+	+ (8.5)	+	+ (8)	+ (8)	+	+/- (7)	7.2
Clinical test	-	+ (10)	+ (10)	+ (7)	+ (5)	-	+	+ (8.5)	+	+ (9)	+/- (8)	+	+/- (7)	8.1
Test in rehabilitation center	-	+ (9)	- (8)	- (9)	+ (9)	-	+	- (6.5)	-	+ (6)	+/- (8)	+	- (7)	7.8
Self-report questionnaire	-	- (8)	- (5)	- (1)	- (3)	-	+	- (2)	-	+ (3)	+ (5)	+	+/- (8)	4.4

+ = yes; - = no; +/- = inconsistent; BE=Belgium; HR=Croatia; CZ=Czech Republic; FI=Finland; FR=France; DE=Germany; IT= Italy; NO=Norway; PL=Poland; RO=Romania; SK=Slovakia; SL=Slovenia; SE=Sweden; CH=Switzerland; NL=Netherlands; UK= United Kingdom.

Table 4 Controversies on the assessment of work endurance in European countries (n=9)

Country	Description of controversy [a]
Belgium	In fact there is no debate at all about that topic! More and more accents on reintegration measures.
Croatia	Such a controversy is basically a consequence of nonexistence of formal rules and professional guidelines for the assessment of work endurance in Croatia.
Norway	It is discussed if partial sick leave during the sickness absence period has beneficial effects on the duration of sick leave, and how beneficial it is for patient and employer.
Romania	At present, the approach is considered to be too medical; the current difficult socio-economic conditions make very difficult an appropriate socio-professional evaluation (missing the possibilities of intervention, agencies, etc.).
Slovakia	Controversy between findings and information from patients.
Slovenia	There should be possibility for oldest people to choose working part time - for example 6 or 4 hours not only 8 hours.
Sweden	The latest test (AFU) is still a pilot project to be reported to the department. The reference system, representing the demands of the job market, has been criticized by the unions.
Switzerland	Diverging opinions as to what is a legitimate reason to be off work, both in politics and in law enforcement as in the medical profession. Different schools of sick leave & any doctor can write somebody off work.
Netherlands	Claims are much higher and more frequent then would be expected, especially in litigation. Other restrictions versus restricted work endurance: outcome can be different.

[a] Descriptions are verbatim; only obvious spelling mistakes are corrected.

DISCUSSION

Our results show that work endurance is assessed as part of the overall disability assessment in a majority of countries. Work endurance is considered to be normal, if a person is able to work fulltime, ranging from 35 to 42 hours per week across countries. Limited work endurance can be described as the inability to work full time. In almost all cases work endurance is conducted by a medical examiner specialised in insurance medicine. In all countries both physical and mental disorders are accepted causes of limited work endurance. Most mentioned accepted causes are musculoskeletal diseases, mental disorders and diseases of the circulatory system. Health complaints, psychosocial and environmental factors are additionally accepted as causes of limited work endurance in some countries. In most countries indications are given to limit work endurance, general energy deficit being the most frequent. Methods to assess work endurance vary considerably across countries, objective methods rating highest.

Use of expert-based professional guidelines specific for the assessment of work endurance is very limited and evidence-based guidelines do not exist at all. On items as to whether work endurance is assessed at all, causes of limited work endurance, indications to limit work endurance and methods to assess work endurance, some participants from the same country gave inconsistent answers. In almost half of countries controversies on the assessment of work endurance exist.

The definition of work endurance we introduced in this paper, is confirmed by our results, showing that work endurance can be described as the physical and mental ability of a person to sustain working activities in hours per day and hours per week. Some countries seem to view work endurance from a broad perspective, including both medical and psychosocial factors. By doing so, they seem to adopt a biopsychosocial perspective as outlined in the ICF [12].

Although social security institutes in most western countries have developed new assessment procedures based on the ICF [8], the ICF is not yet a generally accepted framework to describe human functioning in disability assessment [12,29]. Use of the ICF may potentially support the assessment of work endurance by providing a point of reference for the ability of a person to work over a certain period of time. Although limited work endurance is an important aspect of work disability, in the ICF it is not specifically defined. The ICF includes only related concepts on the level of functioning, i.e. "general physical endurance" and "energy level", respectively defined as "functions related to the general level of tolerance of physical exercise or stamina", and as "mental functions that produce vigour and stamina" [8].

From the investigated countries it is reported that musculoskeletal diseases, mental disorders and diseases of the circulatory system are the most

prevalent accepted causes of limited work endurance. These chronic diseases range among the most prevalent conditions where work adjustments as to working times are needed and implemented [15]. This indicates that these categories of chronic diseases are broadly recognized as being importantly associated with limited work endurance.

A variety of methods is used to assess functional limitations including work endurance, such as clinical interview, physical examination, functional capacity evaluation, self-report questionnaire, expert assessment by medical specialists. None of these methods have proven reliability and validity [23].

This study shows that a guideline on assessing work endurance is used only in the Netherlands. In general, guidelines for the evaluation of work disability are scarce, do not meet sufficient quality levels and are not evidence-based [30]. The indications for limited work endurance included in the Dutch guideline and confirmed by some other countries, especially general energy deficit, are not based on scientific evidence. Lack of evidence-based guidelines will cause variability across assessors [23,31,32].

Strengths and limitations

To our best knowledge, the present study is the first to examine work endurance and its assessment in disability settings in different countries. This study provides information which can facilitate understanding of similarities and differences in the assessment of work endurance across a number of European countries. The participants were contacted through the EUMASS network and may therefore be considered to be experts in the field.

Our study has limitations as well. In the total group, of the number of potential respondents per country differed from one to three. The group of expert representatives did not change during the study period, making it impossible to look for inconsistencies when only one respondent from a country responded. We checked for inconsistencies in respondents in those countries with two or three representatives. If inconsistencies were found, we contacted the representatives and tried to reach consensus. If no consensus could be reached we included the positive answer in the analysis. We were not able to expand to other experts from the same country to discuss inconsistencies due to the chosen sampling method. In the first survey, 24 of the 35 potential responders reacted, from which 17 agreed to participate in the second survey. Of them, 12 responded in the second survey. Whether respondents and non-respondents differ in sociodemographics, cultural aspects and/or how it may have influenced their responses on the survey could not be examined, because we and/or EUMASS did not have this information available. This may restrict the generalisability of our results. We have insufficient reliable data to assess whether non-response has caused selection bias. It is an exploratory description of opinions of experts, not allowing any statements about the practice in these countries.

From several countries more than one participant responded. Some answers of participants were not unanimous, even after they were specifically requested to clarify. Given the descriptive character of our study we deemed it relevant to report on these inconsistent answers instead of merely concluding that apparently policy on items concerned is absent. This lack of uniformity may be the result of the way in which the questions were formulated, but seem more likely to result from differences among experts. This is in line with the findings of a recent systematic review showing that medical evaluations of work disability in general show high variability and often low reliability [33]. The inconsistencies of answers may also be illustrations of controversies on work endurance, other than those that were reported on. Our study does not inform on differences and similarities between countries on aspects of work endurance that may arise from different regulations regarding assessment of work ability, including work endurance.

Recommendations for future research

In many disability evaluations the assessment of work endurance is an issue. Reliable and valid instruments and methods to assess work endurance seem not to be in practice. Research could focus on the prevalence of limited capacity to work full time and on methods to establish this limitation in individuals. If reliable and valid instruments and methods to assess work endurance are not available, further research is needed to develop them. Such research is best conducted among chronically-ill workers, with repeated measurements of energy levels over time in and out of the actual workplace. Methods able to assess work endurance with sufficient reliability and validity should then be tested for feasibility, i.e. whether they can be implemented in practice of insurance physicians assessing disability benefit claims. If so, they can eventually be included in an evidence-based guideline for the assessment of work endurance.

CONCLUSION

Notwithstanding existing controversies and inconsistent answers from some countries, across European countries it is broadly recognised that limited work endurance has impact on work ability of chronically-ill workers applying for disability benefit. We conclude that the assessment of the ability to work full time is an issue in a majority of European countries. However, methods to assess work endurance vary and evidence-based guidelines are lacking. More research is needed to develop reliable and valid instruments and methods to assess work endurance of disability benefit claimants with chronic diseases.

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APPENDIX

S1 Table. Items in questionnaire on work endurance for experts (provided options and explanations in italics).

Items questionnaire in first round

1. What is generally seen as a normal number of working hours per day in your country?
2. What is generally seen as a normal number of working hours per week in your country?
3. Is the assessment of work endurance part of the assessment of work disability (short or long term) in your country?
4. Who assesses work endurance in your country?

   provided options: insurance physician, occupational physician, general practitioner, medical specialist, labour expert, case manager, rehabilitation specialist, other:
5. Are there any formal rules and/or professional guidelines for the assessment of work endurance in your country? Could you please provide us with these rules and/or professional guidelines and/or give references below?
6. What is an accepted cause for restricted work endurance in the context of work disability assessment in your country?

   provided options: physical disorders, mental disorders, health complaints (pain, fatigue), environmental factors (e.g. workplace, region), psychosocial factors (distress, anxiety, coping behavior), risk factors (life style, obesity, physical inactivity), other:
7. Is any of the following methods used regularly for work endurance assessment in your country? *provided options: semi-structured interview, ergometric test, functional capacity evaluation, psychological test, clinical test, assessment in rehabilitation center, self-report questionnaire, other:*
8. Is there any controversy on the assessment of work endurance in your country? Would you be so kind as to summarize this controversy below?

Items questionnaire in second round

In general the assessment of work endurance may include the evaluation of different time-related aspects, such as the maximum duration (in minutes or hours) a person is able to sustain specific activities without interruption, e.g. walking, standing up or sitting down, and/or generically the maximum duration (in hours per day/week) a person is able to work in suitable work.

9. Does the assessment of work endurance in your country include the evaluation of the maximum duration a person is able to sustain specific activities without interruption?

10. Does the assessment of work endurance in your country include the generic evaluation of the maximum duration a person is able to work in suitable work?

Limited work endurance may be associated with a variety of (sub)chronic diseases. For some diseases this association may be strong, while for some others it may be weaker.

11. Is limited work endurance restricted or associated with specific diseases in the allocation of work endurance in your country? If yes, could you please indicate below three specific diseases you as a professional think are most frequently associated with limited work endurance?

In the Netherlands, insurance physicians use a guideline for the assessment of work endurance. Across specific diseases, according to this guideline, work endurance may be limited due to a general energy deficit or a reduced availability for work due to medical treatment. The guideline states that work endurance may also be limited in order to prevent future health deterioration. Please indicate below whether these aspects are reasons to limit work endurance in your country.

12. Can the aspect general energy deficit be a reason to limit work endurance in your country? Please indicate below three specific diseases you think are the most frequently associated with energy deficit.
13. Can the aspect reduced availability for work due to medical treatment be a reason to limit work endurance in your country? Please indicate below three situations you think are the most frequently associated with reduced availability for work due to medical treatment.
14. Can the aspect prevention of future health deterioration be a reason to limit work endurance in your country? Please indicate below three specific diseases you think are most frequently associated with prevention of future health deterioration.
15. Can other aspects (besides energy deficit, reduced availability and prevention) be reasons to limit work endurance in your country? If yes, please indicate these aspects below.

Respondents in the first round of this survey indicated various methods commonly used in their countries to assess work endurance. These are (in random order: semi structured interview, ergometric test, functional capacity evaluation, psychological test, clinical test, assessment in rehabilitation center and self-report questionnaire.

16. Please rate each of these methods below by giving a number (0: not suitable -10: very suitable) as to indicate the extent to which in your professional opinion the method is suitable to assess work endurance.

Provided options: semi structured interview, ergometric, functional capacity evaluation, psychological test, clinical test, assessment in rehabilitation center, self-report questionnaire.

The assessment of work endurance could possibly be improved by combining two or more of the above mentioned methods.

17. Please indicate below which combinations of two (or more) of the above mentioned methods in your professional opinion are the most suitable to assess work endurance.

In the first round questionnaire two methods were most frequently cited: clinical test and psychological test. Both tests may include different elements.

18. Is the clinical test used in the assessment of work endurance in your country? If yes please indicate below which elements are included in this test.
19. Is the psychological test used in the assessment of work endurance in your country? If yes, please indicate below which elements are included in this test.

Any of the above mentioned methods may have specific indications as to disease, function or activity.

20. In your professional opinion, do any of the above methods to assess work endurance have specific indications? If yes, please explicate the indication(s) where applicable.

4

Inability to work fulltime, prevalence and associated factors among applicants for work disability benefit

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ABSTRACT

Purpose: Inability to work fulltime is an important outcome in the assessment of workers applying for a disability benefit. However, limited knowledge is available about the prevalence and degree of the inability to work fulltime, the associations between disease-related and socio-demographic factors with inability to work fulltime and whether the prevalence and the associations differ across disease groups.

Methods: Anonymized register data on assessments of workers with residual work capacity (n = 30,177, age 48.8 ± 11.0, 53.9% female) applying for a work disability benefit in 2016 were used. Inability to work fulltime was defined as being able to work less than 8 h per day.

Results: The prevalence of inability to work fulltime was 39.4%, of these 62.5% could work up to 4 h per day. Higher age (OR 1.01, 95% CI 1.01–1.01), female gender (OR 1.45, 95% CI 1.37–1.52), higher education (OR 1.44, 95% CI 1.33–1.55) and multimorbidity (OR 1.06, 95% CI 1.01–1.11) showed higher odds for inability to work fulltime. Highest odds for inability to work fulltime were found for diseases of the blood, neoplasms and diseases of the respiratory system. Within specific disease groups, different associations were identified between disease-related and socio-demographic factors.

Conclusion: The prevalence and degree of inability to work fulltime in work disability benefit assessments is high. Specific chronic diseases are found to have higher odds for inability to work fulltime, and associated factors differ per disease group.

INTRODUCTION

An important aspect of functioning at the level of the whole human being, is the ability of a person to be active in their working life [1, 2]. To determine whether someone is able to work, the concept "work ability" is seen as a standard and a marker for the current ability of a person to perform in a job [3–5]. Work ability reflects the extent to which people can do their job satisfactorily, taking their job demands and their (physical and mental) health into account [6]. Having a chronic disease, associated with activity limitations, can lead to decreased mental and physical functioning [7–9], and therefore threatening work ability and working hours [10–12]. In comparison to healthy workers, workers with a chronic disease work fewer hours and more often part-time due to differences in fatigue and emotional exhaustion [13–15].

In the Netherlands, long-term sick listed workers with a limited ability to work due to a chronic disease may apply for disability benefit to compensate for income loss. As part of the overall disability assessment, the (in)ability to work fulltime, i.e. the number of hours per day and per week the applicant is able to work, is assessed by insurance physicians from the Dutch Social Security Institute, The Institute for Employee Benefits Schemes (UWV). A limitation of working hours due to chronic disease usually results in partial disability in the Netherlands. Also in other countries the assessment of the (in)ability to work fulltime is an aspect of work disability assessment, although there are differences between countries in used definitions and measures to assess this construct [16]. Overall, more research on this topic is warranted, taking into account the huge impact the assessment outcome can have both from societal and individual perspective [17–19].

One knowledge gap is the limited knowledge about the prevalence of the (in)ability to work fulltime. A few studies across Europe reported on the prevalence of inability to work fulltime in their country, i.e. Belgium (2.6%) [20], Finland (2.9%) [21], Denmark (8.4%) [21], the Netherlands (ranging from 17 [22] to 48% [17]), Norway (18.0%) [21] and Sweden (36.3%) [21]. Differences in samples, e.g. type of sick leave (short- or long-term), included disease groups, assessment goals and social security systems, make the reported prevalence difficult to compare. For example the two Dutch studies are not comparable due to inclusion of different types of work disability benefit and timeframe. The first study [22] reported on all outcomes of (long-term) disability assessments for disability pension, for workers, and young handicapped persons in 1 year, while the other study [17] reported on workers with (not permanent) full disability benefit over a 7-year period.

Another knowledge gap is that little is known about sociodemographic and disease-related factors that are associated with inability to work fulltime. Previous studies found that socio-demographic factors, such as age, gender and educational level are associated with having work (dis)ability. For

example, older age is associated with a higher risk of having one or more chronic diseases [23] and in particular individuals with a chronic disease are at an increased risk to exit paid employment due to unemployment, disability benefits, and early retirement. [24, 25]. Besides that, women more often suffer from common mental problems (e.g. depressive symptoms) compared to men [26]. Moreover, they work more often part-time [27, 28], and in jobs with low autonomy [29] and high mental work load [30]. These differences may lead to differences in impact of a chronic disease on the ability to work fulltime. In addition to age and gender differences, socio-economic differences may exist. It is known that workers with a low educational level are at a higher risk to exit paid employment compared to workers with a high educational level [24, 25]. These educational differences in disability benefits and unemployment can be explained for, respectively, 40% and 9% primarily due to a higher occurrence of chronic diseases among low educated workers [24].

Type of disease and multimorbidity might also be associated with the prevalence and degree of inability to work fulltime. Chronic diseases like cardiovascular diseases, neoplasms, musculoskeletal disorders, mental diseases and neurological diseases are highly prevalent and disabling diseases among individuals within the working age [10]. The prevalence of multimorbidity, i.e. having at least two chronic diseases, increases along with the ageing process [31, 32] and previous studies found that workers with multimorbidity are at an increased risk of involuntary exit from work, such as unemployment and disability benefits [24, 25].

Against this background, the present study aims to (1) gain insight in the prevalence and degree (number of hours per day able to work) of inability to work fulltime; (2) explore associations between socio-demographic and disease-related factors with inability to work fulltime; and (3) explore whether the prevalence and the associations differs across disease groups in a representative sample of applicants for a work disability benefit.

METHODS

Institutional Setting

In the Netherlands, social insurance legislation (Work and Income Act; WIA [33]) allows employees to apply for a disability benefit after 2 years of sick leave [34]. Individuals may receive disability benefits for a disease or handicap due to either occupational or non-occupational causes. For the disability benefit assessment, insurance physicians gather information on the medical situation, work- and social situation and functioning of the applicant mainly in an assessment interview and from other sources such as treating- and occupational health physicians. Part of the assessment is a conclusion about an individuals' (in)ability to work fulltime, reported as the number of hours

an applicant can work per day graded in steps of 2 h. Insurance physicians adhere to a guideline with regards to assessing inability to work fulltime; 'Endurance capacity in work' [35]. This guideline describes three indications for inability to work fulltime: 1. a lack of energy, resulting in the need for extra daily recovery (hours of rest) consistent with the findings of the insurance physicians and with the nature and severity of the disease, 2. when an increasing number of working hours cause (worsening of) disease symptoms, and 3. reduced availability for work because of necessary treatment. After the medical disability assessment by an insurance physician and assessment of earning capacity by a labor expert of the UWV, individuals can either have a full and permanent work disability, a non-permanent but full work disability, or a permanent and partial work disability. Individuals in the latter group have residual earnings capacity. Individuals with residual capacity are incentivized to continue in paid (part-time) employment at their current employer or enroll in a new, more appropriate (part-time) job, in accordance to their residual work capacity. The income in the original work before sick leave is compared with the income in the work they can perform according to their residual work capacity. The income loss determines the amount of the disability benefit, with a threshold of 35% loss of income. Students, self-employed workers, pensioners and individuals disabled since childhood are not entitled to a WIA-disability benefit. Instead, individuals disabled since childhood can apply for a WAJONG-disability benefit when they turn eighteen (Disablement Assistance Act for Handicapped Young Persons) [36].

Design and Sample

The study is a cross-sectional register based cohort study among applicants for a long term disability benefit according to the WIA [33], in a year cohort (January 1st to December 31st 2016). The data was provided by the UWV and derived from the register forms completed by the insurance physicians and labor experts at the time of assessment, and anonymized by UWV. For this study, we only included applicants in the analyses with residual work capacity and with complete data on all variables. Approval by a Medical Ethical Committee was not necessary under Dutch law.

Measures

Socio-demographic data included gender (male/female), age, and educational level. For educational level, three classes were differentiated based on the highest level of completed education: low (primary school, lower vocational education, lower secondary school), middle (intermediate vocational education, upper secondary school), and high (upper vocational education, university).

Insurance physicians use the Dutch Classification of Occupational Health and Social Insurance (CAS) to categorize diagnoses, derived from the

International Statistical Classification of Disease and Related Health Problems (ICD-10) [37]. For generalizability, the primary, secondary and tertiary (when available) CAS-diagnoses were recoded to the 22 chapters of the ICD-10 and presented in disease groups. Multimorbidity was defined as having one or more additional diagnosis from a different disease group than the primary diagnosis.

The (in)ability to work fulltime is reported by insurance physicians using five categories: 1 = at least 8 h per day; 2 = no more than 8 h per day; 3 = no more than roughly 6 h per day; 4 = no more than roughly 4 h per day; and 5 = no more than 2 h per day. Being able to work eight or more hours per day (categories 1–2) was considered as normal ability to work fulltime, all else (categories 3–5) was considered as an inability to work fulltime.

Statistical Methods

First, applicants were described on age, gender, educational level, primary disease groups, multimorbidity, and the degree of (in)ability to work fulltime. Second, differences between applicants with normal ability to work fulltime and applicants with inability to work fulltime were compared using t-tests for continuous data and Chi2-tests for categorical and ordinal data. Third, univariable and multivariable logistic regression analyses were performed to study the association of each socio-demographic variable (gender, age, educational level) and disease-related variable (primary disease group and multimorbidity) with the inability to work fulltime (no/yes). Disease group "diseases of the musculoskeletal system and connective tissue" was used as reference category. Fourth, for each of the disease groups population attributable fractions (expressed in percentages) were calculated using Levin's formula [38, 39] to study the proportional attribution of each disease group to the total number of applicants being assessed with an inability to work fulltime. A high positive percentage for a disease group indicates that the specific disease group has a high attributable fraction to the outcome (being assessed with an inability to work fulltime). A negative percentage indicates a protective fraction to the outcome. Furthermore, univariable and multivariable (adjusted for gender, age, educational level and multimorbidity) logistic regression analyses were performed to study if the primary disease group (no/yes) was associated with the inability to work fulltime, in comparison with all the other applicants in the study sample (not having a disease in that specific disease group as a primary diagnosis). Fifth, multivariable logistic analyses were stratified for each disease group to study the associations between gender, age, educational level and multimorbidity and the inability to work fulltime for each specific disease group. ICD-10 disease groups with a small sample size (n is less than 0.1% of total group) were excluded from the logistic regression analyses.

Analyses were performed using IBM SPSS Statistics version 25. For all analyses a p-level of < 0.05 was considered to indicate statistical significance.

RESULTS

Sample Description

We received data from n = 33,179 applicants with residual work capacity from the UWV. In total, 3002 cases were excluded due to missing data on educational level. This group did not differ from the study sample (n = 30,177) on age and on the frequency of applicants in about half of the disease groups. However, the excluded sample consisted of significantly more males (50.1% vs. 46.1%), had less often multimorbidity (36.5% vs. 52.7%), and were more often considered to be able to work fulltime (62.9% vs. 60.6%). The disease groups "no disease", neoplasms, mental and behavioural disorders, diseases of the nervous system, the eye and adnexa, the circulatory system, congenital malformations and deformations and chromosomal abnormalities, diseases of the musculoskeletal system, the respiratory system, pregnancy and childbirth and the puerperium, and symptoms, signs and abnormal clinical and laboratory findings differed significantly between both groups. Differences ranged from 0.2 to 16.2%, with the largest differences for diseases of the musculoskeletal system (12.2% vs. 28.4%) and mental and behavioural disorders (35.3% vs. 29.5%).

Applicants' ages in the study sample (n = 30,177) ranged from 18 to 65 years (mean age 48.8 ± 11.0) with 53.9% women, 52.5% finished low education, 33.0% middle education and 14.5% high education. Of the disease groups, the groups with the highest frequencies of primary diagnosis were mental and behavioural disorders (29.5%) followed by diseases of the musculoskeletal system (28.5%). A small majority of the sample had an additional diagnosis in a different disease group (52.7%). The prevalence of inability to work fulltime in the sample was 39.4%. Of the applicants that were assessed with an inability to work fulltime (n = 11,893), the majority (62.5%) were considered to be able to work about 4 h per day (see Table 1 for more detailed information).

Differences Ability and Inability to Work Fulltime

Applicants with a normal ability to work fulltime (n = 18,284, 60.6% of the study sample) were significantly younger (48.5 ± 11.1 vs. 49.3 ± 10.9), more often male (48.9% vs. 41.8%) and had more often a low educational level (56.9% vs. 45.8%) than applicants with an inability to work fulltime (n = 11,893, 39.4% of the study sample). Nearly all disease groups showed significant differences in the frequency of (in)ability to work fulltime between both groups, except for diseases of the eye, diseases of the ear and mastoid process, and factors influencing health status. The five disease groups

with the highest frequencies of the primary diagnosis showed the following results: applicants with an ability to work fulltime were significantly more often diagnosed with diseases of the musculoskeletal system (37.5% vs. 14.8%), whereas applicants with an inability to work fulltime were more often diagnosed with neoplasms (11.2% vs. 3.2%), mental and behavioural disorders (30.9% vs. 28.6%), diseases of the nervous system (8.0% vs. 3.4%) and the circulatory system (12.0% vs. 5.0%). Although the majority of both groups were diagnosed with two or more diseases, multimorbidity was significantly more frequent in the applicants with an inability to work fulltime (54.5% vs. 51.5%) (see Table 1 for more detailed information).

Table 1 Characteristics of the applicants, and differences between applicants with a normal ability and an inability to work fulltime

	Total group (n = 30,177) n (%)	**Ability to work fulltime (n = 18,284) n (%)**	**Inability to work fulltime (n = 11,893) n (%)**	**p-value**
Age (years) mean ± sd)	48.8 ± 11.0	48.5 ± 11.1	49.3 ± 10.9	<.001
Female gender	16,258 (53.9%)	9337 (51.1%)	6921 (58.2%)	<.001
Education level				<.001
Low	15,855 (52.5%)	10,407 (56.9%)	5448 (45.8%)	
Middle	9959 (33.0%)	5648 (30.9%)	4311 (36.2%)	
High	4363 (14.5%)	2229 (12.2%)	2134 (17.9%)	
Multimorbidity	15,893 (52.7%)	9415 (51.5%)	6478 (54.5%)	< .001
Disease group				
No disease	13 (0.0%)	13 (0.1%)	–	.004
Infectious and parasitic diseases	142 (0.5%)	55 (0.3%)	87 (0.7%)	< .001
Neoplasms	1908 (6.4%)	580 (3.2%)	1328 (11.2%)	< .001
Diseases of the blood and blood-forming organs	307 (1.0%)	78 (0.4%)	229 (1.9%)	< .001
Endocrine, nutritional and metabolic disorders	490 (1.6%)	272 (1.5%)	218 (1.8%)	.020
Mental and behavioural disorders	8902 (29.5%)	5223 (28.6%)	3679 (30.9%)	< .001
Diseases of the nervous system	1570 (5.2%)	615 (3.4%)	955 (8.0%)	< .001
Diseases of the eye and adnexa	281 (0.9%)	182 (1.0%)	99 (0.8%)	.150
Diseases of the ear and mastoid process	261 (0.9%)	154 (0.8%)	107 (0.9%)	.599
Diseases of the circulatory system	2345 (7.8%)	912 (5.0%)	1433 (12.0%)	< .001
Diseases of the respiratory system	790 (2.6%)	262 (1.4%)	528 (4.4%)	< .001
Diseases of the digestive system	462 (1.5%)	182 (1.0%)	280 (2.4%)	< .001
Diseases of the skin and subcutaneous tissue	134 (0.4%)	101 (0.6%)	33 (0.3%)	< .001

Table 1 Continued.

	Total group (n = 30,177) n (%)	Ability to work fulltime (n = 18,284) n (%)	Inability to work fulltime (n = 11,893) n (%)	p-value
Diseases of the musculoskeletal system and connective tissue	8612 (28.5%)	6854 (37.5%)	1758 (14.8%)	< .001
Diseases of the genitourinary system	275 (0.9%)	95 (0.5%)	180 (1.5%)	< .001
Pregnancy, childbirth and the puerperium	127 (0.4%)	96 (0.5%)	31 (0.3%)	.001
Conditions originating in the perinatal period	–	–	–	–
Congenital malformations, deformations and chromosomal abnormalities	137 (0.5%)	67 (0.4%)	70 (0.6%)	.005
Symptoms, signs and abnormal clinical and laboratory findings	1385 (4.6%)	1056 (5.8%)	329 (2.8%)	< .001
Injury, poisoning and certain other consequences of external causes	2010 (6.7)	1473 (8.1%)	537 (4.5%)	< .001
External causes of morbidity and mortality	–	–	–	
Factors influencing health status	26 (0.1%)	14 (0.1%)	12 (0.1%)	.481
Degree of (in)ability to work fulltime				< .001
> 8 h per day	15,370 (50.9%)	15,370 (84.1%)	–	
≤ 8 h per day	2914 (9.7%)	2914 (15.9%)	–	
≤ 6 h per day	2494 (8.3%)	–	2494 (21.0%)	
≤ 4 h per day	7438 (24.6%)	–	7438 (62.5%)	
≤ 2 h per day	1961 (6.5%)	–	1961 (16.5%)	

Univariable and Multivariable Regressions Analyses on Inability to Work Fulltime

The uni- and multivariable analyses showed similar significant findings (Table 2). Four ICD-10 disease groups were excluded from the analyses based on a small sample size (less than 0.1% of the total sample): disease groups no disease (n = 13), conditions originating in the perinatal period (n = 0), external causes of morbidity and mortality (n = 0), and factors influencing health status (n = 26). In the final analysis we found higher age (OR 1.01, 95% CI 1.01–1.01), female gender (OR 1.45, 95% CI 1.37–1.52), middle (OR 1.33, 95% CI 1.25–1.40) and high (OR 1.44, 95% CI 1.33–1.55) educational level (compared to low educational level) and multimorbidity (OR 1.06, 95% CI 1.01–1.11) to have a significantly higher risk of the inability to work fulltime. All included disease groups showed higher odds for an inability to work fulltime than the reference disease group “diseases of the musculoskeletal system and connective tissue”.

Table 2 Associations of socio-demographic and disease related variables with the inability to work fulltime (univariable and multivariable logistic regression analyses) (n = 30,138)

	Univariable analyses			Multivariable analyses		
	OR	**95% CI**	**p-value**	**OR**	**95% CI**	**p-value**
Age (years)	1.01	1.01–1.01	< .001	1.01	1.01–1.01	< .001
Female gender	1.33	1.27–1.40	< .001	1.45	1.37–1.52	< .001
Education level						
Low (ref)	–	–		–	–	
Middle	1.46	1.39–1.54	< .001	1.33	1.25–1.40	< .001
High	1.83	1.71–1.96	< .001	1.44	1.33–1.55	< .001
Multimorbidity	1.13	1.08–1.18	< .001	1.06	1.01–1.11	0.031
Disease group						
Infectious and parasitic diseases	6.16	4.37–8.66	< .001	6.10	4.32–8.61	< .001
Neoplasms	8.28	7.40–9.26	< .001	8.12	7.26–9.08	< .001
Diseases of the blood and blood-forming organs	11.42	8.79–14.85	< .001	10.91	8.37–14.21	< .001
Endocrine, nutritional and metabolic disorders	3.12	2.59–3.76	< .001	3.06	2.54–3.70	< .001
Mental and behavioural disorders	2.74	2.56–2.93	< .001	2.70	2.52–2.90	< .001
Diseases of the nervous system	6.04	5.39–6.77	< .001	5.83	5.19–6.54	< .001
Diseases of the eye and adnexa	2.12	1.65–2.72	< .001	2.01	1.56–2.58	< .001
Diseases of the ear and mastoid process	2.70	2.10–3.48	< .001	2.50	1.94–3.23	< .001
Diseases of the circulatory system	6.11	5.54–6.75	< .001	6.37	5.77–7.05	< .001
Diseases of the respiratory system	7.84	6.70–9.18	< .001	8.11	6.92–9.50	< .001
Diseases of the digestive system	6.00	4.93–7.27	< .001	5.87	4.83–7.14	< .001
Diseases of the skin and subcutaneous tissue	1.27	0.86–1.89	.235	1.30	0.87–1.93	.209
Diseases of the musculoskeletal system and connective tissue (ref)	–	–	–	–	–	–
Diseases of the genitourinary system	7.37	5.72–9.51	< .001	7.29	5.64–9.41	< .001
Pregnancy, childbirth and the puerperium	1.26	0.84–1.89	.273	1.09	0.72–1.65	.674
Congenital malformations, deformations and chromosomal abnormalities	4.07	2.90–5.71	< .001	4.09	2.90–5.76	< .001
Symptoms, signs and abnormal clinical and laboratory findings	1.55	1.37–1.76	< .001	1.20	1.05–1.37	.009
Injury, poisoning and certain other consequences of external causes	1.42	1.27–1.59	< .001	1.46	1.30–1.63	< .001

OR odds ratio, *CI* confidence interval, *ref* reference group

Associations of Each Included Disease Group with the Inability to Work Fulltime

For each of the included disease groups the population attributable fraction for being assessed with inability to work fulltime, and the association with the inability to work fulltime was studied and compared to the all the other applicants in the study sample not having that specific disease group as the primary diagnosis.

Disease groups with the highest population attributable fractions were neoplasms (5.2%) and diseases of the circulatory system (4.6%). Whereas diseases of the musculoskeletal system showed the lowest population attributable fraction (– 19.3%) (Table 3).

Univariable analyses showed significantly higher odds ratios for the inability to work fulltime for infectious and parasitic diseases, neoplasms, diseases of the blood and blood-forming organs, endocrine and nutritional and metabolic disorders, mental and behavioural disorders, diseases of the nervous system, the circulatory system, the respiratory system, the digestive system, the genitourinary system, and congenital malformations when compared to the applicants having a disorder of another disease group as the primary disorder. Applicants with diseases of the skin and subcutaneous tissue, the musculoskeletal system, pregnancy, symptoms and signs and abnormal clinical and laboratory findings, and injury and poisoning and certain other consequences of external causes had significantly lower odds ratios. Diseases of the eye and of the ear were not significantly associated with the inability to work fulltime (for odds ratio's see Table 3).

When adjusted for gender, age, educational level and multimorbidity, multivariable analyses showed similar results, except for endocrine disorders, which was not significantly associated anymore, and applicants with diseases of the eye were significantly less likely to have an inability to work fulltime (Table 3). The disease groups with the highest odds ratios for an inability to work fulltime in the multivariable analyses were diseases of the blood and blood forming organs (OR 4.35, 95% CI 3.36–5.65), neoplasms (OR 3.18, 95% CI 2.87–3.53), and diseases of the respiratory system (OR 3.34, 95% CI 2.87–3.89). The disease groups with the lowest odds for an inability to work fulltime were diseases of the musculoskeletal system and connective tissue (OR 0.29, 95% CI 0.27–0.30), pregnancy, childbirth and the puerperium (OR 0.46, 95% CI 0.31–0.69), and symptoms, signs and abnormal clinical and laboratory findings (OR 0.60, 95% CI 0.53–0.67) (Table 3).

Table 3 Population attributable fractions and associations of each disease group with the inability to work fulltime (univariable and multivariable logistic regression analyses, adjusted for gender, age, educational level and multimorbidity) (n = 30,138)

	PAF	Univariable analyses			Multivariable analyses		
	%	OR	95% CI	p-value	OR	95% CI	p-value
Infectious and parasitic diseases	0.26	2.44	1.74–3.43	< .001	2.40	1.70–3.37	< .001
Neoplasms	5.17	3.53	3.19–3.91	< .001	3.18	2.87–3.53	< .001
Diseases of the blood and blood-forming organs	0.92	4.58	3.54–5.93	< .001	4.35	3.36–5.65	< .001
Endocrine, nutritional and metabolic disorders	0.21	1.24	1.03–1.48	.021	1.20	1.00–1.44	.051
Mental and behavioural disorders	2.03	1.12	1.07–1.18	< .001	1.13	1.07–1.19	< .001
Diseases of the nervous system	2.98	2.51	2.26–2.78	< .001	2.42	2.18–2.69	< .001
Diseases of the eye and adnexa	- 0.10	0.84	0.65–1.07	.150	0.77	0.60–0.98	.037
Diseases of the ear and mastoid process	0.03	1.07	0.83–1.37	.599	0.95	0.74–1.22	.705
Diseases of the circulatory system	4.64	2.61	2.39–2.85	< .001	2.75	2.52–3.01	< .001
Diseases of the respiratory system	1.87	3.20	2.75–3.71	< .001	3.34	2.87–3.89	< .001
Diseases of the digestive system	0.84	2.40	1.99–2.89	< .001	2.83	1.97–2.88	< .001
Diseases of the skin and subcutaneous tissue	- 0.17	0.50	0.34–0.74	.001	0.52	0.35–0.77	.001
Diseases of the musculoskeletal system and connective tissue	- 19.29	0.29	0.27–0.31	< .001	0.29	0.27–0.30	< .001
Diseases of the genitourinary system	0.61	2.94	2.29–3.78	< .001	2.87	2.23–3.69	< .001
Pregnancy, childbirth and the puerperium	- 0.16	0.50	0.33–0.74	.001	0.46	0.31–0.69	< .001
Congenital malformations, deformations and chromosomal abnormalities	0.14	1.61	1.15–2.25	.005	1.64	1.17–2.30	.004
Symptoms, signs and abnormal clinical and laboratory findings	- 1.91	0.60	0.53–0.67	< .001	0.60	0.53–0.67	< .001
Injury, poisoning and certain other consequences of external causes	- 2.30	0.54	0.49–0.60	< .001	0.56	0.50–0.62	< .001

PAF population attributable fraction, *OR* odds ratio, *CI* confidence interval

Associations with the Inability to Work Fulltime Within Each Disease Group

Gender was associated with the inability to work fulltime for 11 disease groups. Women had in ten out of these 11 disease groups higher odds on having an inability to work fulltime compared to men, except for diseases of the genitourinary system. Higher age showed an increased risk to have an inability to work fulltime for the disease groups neoplasms, mental and behavioural disorders, diseases of the respiratory system, musculoskeletal system, and genitourinary system. Educational level was associated with seven disease groups: diseases of the nervous system, the eye, the circulatory system, the musculoskeletal system, pregnancy, symptoms, signs and abnormal clinical and laboratory findings, and injury. For these disease groups (except for diseases of the eye and pregnancy), high and middle educational levels showed significantly higher odds for an inability to work fulltime compared to a low educational level.

Multimorbidity showed higher risk of inability to work fulltime within four disease groups (diseases of the skin, musculoskeletal system, symptoms, signs and abnormal clinical and laboratory findings, and injury), and lower risk within five disease groups (diseases of the blood, nervous system, circulatory system, respiratory system and genitourinary system) (Table 4).

Table 4 Associations of gender, age, educational level and multimorbidity with the inability to work fulltime stratified for each disease group (multivariable logistic regression analyses, n = 30,138)

	Gender (male=ref) OR (95%CI)	Age OR (95%CI)	Educational level (low=ref)		Multimorbidity OR (95%CI)
			Middle OR (95%CI)	High OR (95%CI)	
Infectious and parasitic diseases	1.44 (0.70–2.95)	1.00 (0.96–1.03)	0.70 (0.33–1.51)	0.61 (0.23–1.59)	0.96 (0.48–1.93)
Neoplasms	1.31 (1.07–1.61)*	1.02 (1.01–1.03)**	1.05 (0.84–1.31)	1.25 (0.96–1.64)	0.83 (0.68–1.01)
Diseases of the blood and blood-forming organs	1.78 (1.04–3.07)*	1.02 (1.00–1.05)	0.62 (0.34–1.13)	0.79 (0.38–1.64)	0.56 (0.32–0.98)*
Endocrine, nutritional and metabolic disorders	1.57 (1.08–2.29)*	1.00 (0.98–1.02)	1.32 (0.88–1.98)	1.36 (0.79–2.35)	0.95 (0.60–1.52)
Mental and behavioural disorders	1.52 (1.39–1.66)**	1.00 (1.00–1.01)*	1.05 (0.95–1.16)	0.92 (0.82–1.03)	0.95 (0.87–1.04)
Diseases of the nervous system	1.14 (0.91–1.42)	1.00 (0.99–1.01)	2.05 (1.63–2.59)**	2.69 (1.98–3.66)**	0.64 (0.52–0.79)**
Diseases of the eye and adnexa	2.61 (1.54–4.41)**	0.98 (0.85–1.00)	1.37 (0.77–2.42)	2.43 (1.16–5.08)*	1.22 (0.71–2.09)
Diseases of the ear and mastoid process	1.21 (0.73–2.00)	1.01 (0.98–1.04)	1.59 (0.89–2.83)	1.02 (0.52–1.97)	1.44 (0.85–2.44)
Diseases of the circulatory system	1.62 (1.34–1.94)**	1.01 (1.00–1.02)	1.23 (1.02–1.48)*	1.38 (1.05–1.82)*	0.79 (0.67–0.95)*
Diseases of the respiratory system	2.04 (1.49–2.79)**	1.03 (1.01–1.05)*	1.32 (0.92–1.90)	1.82 (0.96–3.43)	0.64 (0.46–0.91)*
Diseases of the digestive system	1.58 (1.07–2.35)*	1.01 (0.99–1.02)	1.17 (0.78–1.77)	1.72 (0.92–3.21)	0.69 (0.45–1.04)
Diseases of the skin and subcutaneous tissue	0.81 (0.36–1.82)	1.00 (0.97–1.04)	1.28 (0.50–3.32)	1.58 (0.78–5.27)	2.88 (1.08–7.70)*
Diseases of the musculoskeletal system and connective tissue	1.55 (1.38–1.73)**	1.01 (1.01–1.02)**	1.60 (1.42–1.80)**	2.90 (2.39–3.52)**	1.66 (1.49–1.85)**
Diseases of the genitourinary system	0.51 (0.30–0.88)*	1.03 (1.00–1.06)*	1.22 (0.68–2.19)	0.99 (0.47–2.09)	0.47 (0.26–0.85)*
Pregnancy, childbirth and the puerperium	n.a.	1.05 (0.96–1.14)	2.25 (0.72–7.00)	4.11 (1.18–14.33	1.20 (0.51–2.87)
Congenital malformations, deformations and chromosomal abnormalities	1.10 (0.51–2.35)	1.03 (1.00–1.06)	1.93 (0.89–4.20)	1.51 (0.53–4.30)	1.37 (0.61–3.07)
Symptoms, signs and abnormal clinical and laboratory findings	1.11 (0.86–1.44)	1.01 (1.00–1.02)	1.72 (1.30–2.28)**	1.76 (1.22–2.55)*	1.37 (1.04–1.81)*
Injury, poisoning and certain other consequences of external causes	1.26 (1.03–1.55)*	1.01 (1.00–1.02)	1.96 (1.56–2.56)**	2.85 (2.13–3.82)**	1.35 (1.10–1.66)*

*p < .05, **p < .001, *n.a.* not applicable, due to empty cell(s), the variable was left out of the multivariable regression analysis, *OR* odds ratio, *CI* confidence interval

DISCUSSION

In a large cross-sectional register based study among a year cohort of applicants assessed for a long-term work disability benefit, the prevalence of inability to work fulltime was 39.4%. Regarding the degree of inability to work fulltime, the number of applicants who could work up to 4 h per day was approximately three times higher in comparison with applicants who could work up to 2 or 6 h per day. In the total sample, including all disease groups, associated factors for inability to work fulltime were higher age, female gender, higher education and multimorbidity. Applicants with diseases of the blood, the respiratory system, neoplasms and diseases of the genitourinary and circulatory system had higher odds for being assessed with inability to work fulltime, while applicants with diseases of the musculoskeletal system, pregnancy and diseases of the skin and injury had lower odds. Studying the association of age, gender, education level and multimorbidity within specific disease groups compared to all other diseases, showed a varying picture. Within 10 of the disease groups, female gender showed higher odds for inability to work fulltime and within seven of the disease groups higher education had the same but weaker effect. Age showed only small effects, and associations with multimorbidity varied.

The prevalence of inability to work fulltime in our study, 39.4%, is substantial but within the variation found in other Dutch studies, showing prevalences varying between 17 and 48% [17, 22]. The variation between prevalences may be due to differences in included populations. Our sample included applicants, generally 2 years after sick leave, applying for long-term disability benefit (WIA), with all diseases. The two Dutch studies differed on the types of work disability benefit and timeframe. The distribution of the degree of inability to work fulltime is in line with findings of other Dutch studies [17, 22] and in European countries [20, 21]. In Sweden (especially in the period between 1960 and 1990) [40], other Nordic countries [21] and Belgium [20], halftime work is a legally accepted degree of limitation in work disability assessment during sick leave. However, these numbers are difficult to translate into other samples and social security systems and therefore results of these studies should be considered in the contexts of the social security systems in the countries in which the studies are performed.

Higher age, female gender, higher education and multimorbidity showed higher risks of inability to work fulltime. Although the odds ratios for age and multimorbidity were not that large (1.01 and 1.06 respectively), the cumulative effect of age and working years is substantial; with increasing age, people suffer more from (and have) more chronic diseases [23, 41]. In line with our findings, previous studies showed that women have a greater risk of negative work outcomes such as sick leave and disability [42]. In our study, higher education has a strong positive association with inability to work

fulltime compared to lower and middle educational level. This seems to be in contrast with findings from other studies describing that higher educated workers are better able to adjust their work and are less work disabled than lower educated workers who are considered to be more vulnerable, have more health problems and worse working conditions [43–45]. In search for explanations for this difference, we explored if the higher educated workers in our study sample had more often diseases related with higher odds for inability to work fulltime, however this was not the case (data not shown). The difference might be due to a selection in our sample, as our sample was mostly already 2 years on sick leave, and had 2 years to find suitable working arrangements to continue working. Perhaps the selection of workers who were unable to find suitable work adjustments are those applying for a long term disability benefit. It might also be that higher educated people are better able to describe their experienced limitations, or that the effect of a chronic disease on cognitive functions has a more observable effect in daily functioning compared to lower educated people. Insurance physicians may be more inclined to go along with a consistent and credible story in the assessment of inability to work fulltime. Further research on this interesting finding on the association of educational level and inability to work fulltime is therefore recommended.

Different associations were found for the specific disease groups and the inability to work fulltime. The highest odds were found for diseases of the blood, neoplasms, diseases of the respiratory system (all above OR 3.1) and lowest odds for diseases of the musculoskeletal system, pregnancy and diseases of the skin (OR 0.52 and lower). When looking at the two disease groups including the most applicants, results show that diseases of the musculoskeletal system (28.5% of the total cohort) had the lowest risk for inability to work fulltime (OR 0.29). Whereas being diagnosed with a mental disorder (29.5% of the total cohort), showed a significant increased risk for inability to work fulltime (OR 1.13). Mental disorders include a variety of diseases where some disorders do have an impact on energy levels (e.g. severe depression and schizophrenia), while other disorders more often cause emotional disturbance than a lack of energy and therefore do not have an impact on the inability to work fulltime. Musculoskeletal diseases (with by far the lowest risks for inability to work fulltime) are more likely responsible for physical work limitations (like limited walking and standing and lifting weights because of problems with joints and pain) than inability to work fulltime. The diseases in the groups with high odds of inability (like diseases of the blood, respiratory diseases and neoplasms), are often accountable for energy deficits, for example by reduced exercise tolerance or increased fatigue. This is in line with the guideline 'Endurance capacity in work' in the Netherlands [35], but also with earlier research findings in European countries, stating

that energy deficit is seen as an important reason to limit the ability to work fulltime [16]. Additionally, some diseases cause limitations in available time to work, for example through part-time psychotherapy in a clinic for mental diseases, or dialysis in kidney disease and thus result in inability to work fulltime. To be able to draw conclusions on which diseases attribute the highest to being assessed with inability to work fulltime, population attributable fractions were calculated. The disease groups with the highest population attributable fraction were neoplasms (5.2%) and diseases of the circulatory system (4.6%). These percentages are relatively low, from which we can conclude that being assessed with an inability to work fulltime is not attributable to one or two specific disease groups. Diseases of the musculoskeletal system, however, showed a highly negative percentage (–19.3%) indicating being a protective fraction to the outcome. The findings in the present study show that the disease the person has, does seem to be important in terms of their ability to work fulltime, as the association between disease groups and inability to work fulltime varies between disease groups. In addition, there are some diseases associated with long term disability but not with an inability to work fulltime, such as musculoskeletal diseases. These diseases are usually more likely associated with physical work limitations and less likely with energy deficits. Our findings indicate that assessors of inability to work fulltime should be aware that various disease groups have higher odds for inability to work fulltime (i.e. diseases of the blood, neoplasms, diseases of the respiratory system) as well that one of the largest disease groups, diseases of the musculoskeletal system, shows a lower risk of inability to work fulltime in applicants who mostly could not fully resume their original work 2 years after sick leave. Furthermore, the population attributable fractions show that being assessed with inability to work fulltime could not be attributed to one specific disease whereas none of the disease groups showed a high proportion of the outcome. Future studies on the risk of individual diseases on inability to work fulltime could help to identify which applicants are at risk for inability to work fulltime, even earlier than at 2 years after sick leave.

Our finding in the total sample, showing a higher risk for inability to work fulltime for multimorbidity, is in line with previous studies [24, 25]. Our findings in the specific disease groups showed that in those disease groups with low risk of inability to work fulltime (such as diseases of the skin and musculoskeletal diseases) multimorbidity increases the risk of inability to work fulltime. Vice versa, in diseases with higher risk of inability to work fulltime (e.g. diseases of the blood and the nervous, respiratory and genitourinary system) multimorbidity lowered the odds for inability to work fulltime. This latter seems counter intuitive, and was therefore discussed with insurance physicians. Insurance physicians indicated that when assessing applicants with severe diseases it is clear that the impact of that disease itself on

work capacity, including inability to work fulltime, is so unambiguous that further exploration of the medical situation is felt unnecessary. In these cases no additional diagnosis are registered, and therefore not in our dataset, because these have no additional value to the outcome of the work disability assessment. Further research on the impact of multimorbidity, including the effect of the number of diagnosis and specific combinations of diagnoses, on inability to work fulltime is therefore recommended.

Our study was a first step towards exploring inability to work fulltime as an outcome of work disability assessment, using register data from work disability assessments according to the UWV. Due to the administrative data source, data was available on diagnosis and certain personal factors. Future studies on inability to work fulltime could be enriched with data from for example assessment reports and questionnaires on therapy, the course of the disease, severity of the disease, and on work and environmental factors to obtain more insight in the position of inability to work fulltime within the biopsychosocial model.

Strengths and Limitations

In this study, register data of a year cohort of applicants assessed for a long term work disability benefit, covering the entire Dutch population, was used. A strength of this study is the large sample including all assessments, data describing socio-demographics and all diagnoses in a representative sample. Additionally, all comprehensive assessments were carried out by skilled professionals adhering to professional guidelines and assessment methods. A study limitation is that register data was not collected for research purposes and did not contain data on possible determinants such as severity of diseases and treatment, or work and environmental factors. Although the Dutch Social Security System is using a biopsychosocial approach in the work disability assessment, important factors described in this model are lacking in the register data. Unfortunately, we had to exclude 3002 cases because of missing data (only) on educational level, this might have impacted our outcomes, as they had significantly more often a normal ability to work compared to the included sample. Additionally, the cross-sectional design prevents us from drawing conclusions about causal relationships.

CONCLUSION

The prevalence of inability to work fulltime in work disability benefits assessment is high: 39.4%. Of these applicants with inability to work fulltime, the majority is assessed as not being able to work over 4 h per day. In the total sample, age, gender, education, multimorbidity and specific disease groups were associated with inability to work fulltime. The risk of inability to work fulltime varies between disease groups, with diseases of the blood,

the respiratory system, neoplasms and diseases of the genitourinary and circulatory system showing high odds, and musculoskeletal diseases, the largest group in the sample, showing low odds. Within specific disease groups, compared to all other disease groups, different associations were identified for age, gender, education and multimorbidity, with female and higher educated applicants having higher odds, age having no effect and the effect of multimorbidity differing across disease groups. The findings of this study can contribute to a more evidence based assessment of inability to work fulltime in disability claim assessments, providing insight into which workers with chronic diseases are at risk for inability to work fulltime and can contribute to the development of interventions for work adjustments for workers with inability to work fulltime.

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5

Residual work capacity and (in)ability to work fulltime among a year cohort of cancer survivors who claim a disability benefit

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ABSTRACT

Purpose: Residual work capacity (RWC) and inability to work fulltime (IWF) are important outcomes in disability benefit assessments for workers diagnosed with cancer. The aim of this study is to gain insight into the prevalence of both outcomes, the associations of disease-related and socio-demographic factors and if these differ across cancer diagnosis groups.

Methods: A year cohort of anonymized register data of cancer survivors who claim a disability benefit after 2 years of sick leave (*n* = 3690, age 53.3 ± 8.8, 60.4% female) was used. Having no RWC was defined as having no possibilities to perform any work at all, whereas IWF was defined as being able to work less than 8 h per day.

Results: The prevalence of being assessed with no RWC was 42.6%. Of the applicants with RWC (57.4%), 69.8% were assessed with IWF. Cancers of the respiratory organs showed the highest odds for having no RWC, whereas lymphoid and haematopoietic cancers showed the highest odds for IWF. Within specific cancer diagnosis groups, different associations were identified for both outcomes.

Conclusion: The prevalence of no RWC and IWF in applicants of work disability benefits diagnosed with cancer is high compared to the prevalence in other diagnoses. The odds for no RWC, IWF, and associated factors differ per cancer diagnosis group.

Implications for Cancer Survivors: Being diagnosed with cancer has an enormous impact on work (dis)ability. Our results show that 2 years after being diagnosed with cancer, the majority of the disability benefit applicants are assessed with RWC; however, only 15% of all applicants with cancer had a normal ability to work fulltime, and therefore, it is of great importance to accompany them in their return to work.

INTRODUCTION

In Europe, each year 3.5 million persons are newly diagnosed with cancer [1]. Of these, 40 to 50% are of working age at time of diagnosis [2, 3]. Due to early diagnostic methods and effective treatment strategies, individuals are more likely to survive a cancer diagnosis. As a result, an increasing part of the cancer patients is able to return to work, or to (partly) stay at work during treatment [4]. A systematic literature review by Mehnert shows that about two-thirds of the people diagnosed with cancer return to work at some point after diagnosis [5]. Twelve months after diagnosis, approximately 60% of the working patients had returned to work or stayed at work; 24 months after diagnosis, this percentage increased up to 89% [5].

For people diagnosed with cancer, being able to work is central to their quality of life and is associated with multifaceted psychological, social, and economic benefits. Besides financial necessity, work resumption also re-establishes identity and the former structure of everyday life [6–8]. In cancer patients, it has been found that the disease and its treatment frequently led to health worries and distress, fatigue, cognitive problems, and other health problems which can persist for years after treatment [9–13]. Some of these health problems, such as fatigue and pain, are related to all types of cancer. Other health problems such as lymphedema, dyspnea, and depression usually occur with specific types of cancer, like breast and lung cancer, or with specific treatment options (neuropathy as a result of chemotherapy) [14]. These health problems interfere negatively with the ability to work (fulltime) and may result in poor work outcomes, such as prolonged sick leave, job loss, and long-term work disability [9, 10, 15]. Once returned to work, it might cause lower levels of work functioning [16].

A growing number of studies have documented the impact of cancer on employment outcomes [16–20]. These studies included populations of workers during the onset of a sick leave period [21, 22], or after people returned to work [16, 21, 23] or from the first day of sick leave until they applied for a disability benefit [24]. The majority of these study samples consisted of (female) patients with breast cancer, and no comparison between cancer diagnosis groups was made.

In the Netherlands, long-term sick-listed employees may apply for disability benefit to compensate for income loss after 2 years of sick leave. The insurance physician of the Dutch Social Security Institute: the Institute for Employee Benefits Schemes (UWV) assesses the health situation of an applicant and whether the applicant has residual work capacity [25]. When applicants are assessed with no residual work capacity, they have no possibilities to perform in any work at all. If the applicant is assessed with residual work capacity, the insurance physician also assesses the applicant's (in)ability to work fulltime. The assessment of (in) ability to work fulltime is expressed by the

number of hours per day and/or per week the applicant is able to work, due to mental, physical, and energetic limitations and restrictions for work. Both residual work capacity and (in)ability to work fulltime are therefore important outcomes of disability assessments. These usually lead to the decision of granting disability benefit yes or no, and determine to a significant extent if an applicant could start with reintegration in work. Also in many other European countries, assessing residual work capacity and inability to work fulltime have become part of current work disability assessments [26, 27].

Up to date, little is known about the prevalence of (no) residual work capacity and the (in)ability to work fulltime among working-age cancer survivors. Our previous study across chronic diseases showed that several socio-demographic characteristics and disease-related factors are associated with inability to work fulltime [28]. Especially in cancer patients, it is of great interest to distinguish between the types of cancer, since the prognosis and treatment strategies of the different types of cancers differ so much [29]. Therefore, for each type of cancer, different socio-demographic characteristics and disease-related factors may be associated with inability to work fulltime.

Within this background, the aim of this study is to gain insight into (1) the prevalence of no residual work capacity, (2) the prevalence and degree of inability to work fulltime in the case of residual work capacity, and (3) the associations of socio-demographic and disease-related factors with no residual work capacity and the inability to work fulltime in a representative sample of applicants for a work disability benefit after 2 years of sick leave, diagnosed with different types of cancers as the primary diagnosis.

METHODS

Institutional setting

In the Dutch social security system, workers (employed or receiving unemployment benefit) can apply for a long-term disability benefit after 2 years of sick leave according to the Work and Income Act Netherlands [30]. Incidentally, sick-listed workers suffering from severe diseases and fearing they will not return to work can apply for a full and permanent disability benefit at an earlier stage than 2 years after sick leave. In both cases, insurance physicians assess whether applicants have no residual work capacity if (1) they lose their total work capacity within 3 months, (2) when they have a terminal disease with such a bad life expectancy that they will lose their total work capacity within foreseeable time, (3) they have fluctuating work capacity, (4) they are hospitalized, or (5) they are not self-reliant due to a severe mental disorder or a physical disorder [31]. In that case, the insurance physician can conclude to (permanent or non-permanent) full work disability. If applicants are assessed with residual work capacity, the possible limitations in their mental and physical functioning caused by their disease are indicated as

well. This part of the assessment results in a conclusion about their (in)ability to work fulltime, reported as the number of hours one can sustain working activities per day. In these cases, an additional assessment by a labor expert follows to indicate whether the applicants are incentivized to continue in paid (part-time) employment at their current employer or should enroll in a new, more appropriate (part-time) job, according to their residual work capacity.

Design and sample

The study is a cross-sectional register-based cohort study among applicants for a long-term disability benefit according to the Work and Income Act, in the year 2016. Data were derived from the UWV register forms completed by the insurance physicians and labor experts at the time of assessment and anonymized by UWV. For this study, only applicants whose primary diagnosis was cancer (ICD-10 disease group Neoplasms, containing all cancer diagnoses) were included [32]. Subgroups of specific cancer diagnoses having less than 40 applicants, and other unspecified cancer diagnoses, were excluded from the data analyses. Approval by a Medical Ethical Committee was not necessary under Dutch law, as the study is a register-based study and therefore not subject to the Medical Research Involving Human Subjects Act (WMO).

Outcome variables

Residual work capacity (yes/no) was based on the insurance physicians' assessment. The insurance physician assessed and registered the degree of (in)ability to work fulltime using 1 = at least 8 h per day; 2 = no more than 8 h per day; 3 = no more than roughly 6 h per day; 4 = no more than roughly 4 h per day; and 5 = no more than 2 h per day. Being able to work 8 or more hours per day (categories 1–2) was considered normal ability to work fulltime, all else (categories 3–5) was considered an inability to work fulltime, according to the guideline [33].

Independent variables

Socio-demographic data included gender (male/female), age, and educational level. For educational level, three classes were differentiated based on the highest level of completed education: low (primary school, lower vocational education, lower secondary school), middle (intermediate vocational education, upper secondary school), and high (upper vocational education, university). Educational level is usually registered by the labor expert, and therefore only part of the assessment when an applicant has residual work capacity. As a consequence, educational level is often missing for applicants without residual work capacity, and therefore left out of the analyses on residual work capacity.

Disease-related data included type of cancer and multi-morbidity. The type of cancer was determined using the first diagnosis code. Insurance

physicians use the Dutch Classification of Occupational Health and Social Insurance (CAS) to categorize diagnoses, derived from the International Statistical Classification of Disease and Related Health Problems (ICD-10) [32]. For generalizability, the primary, secondary, and tertiary (when available) CAS diagnoses were recoded to the 22 chapters of the ICD-10 disease groups. Multimorbidity (yes/no) was defined as having one or more additional diagnosis from a different ICD-10 disease group than cancer.

Statistical methods

First, descriptive statistics were used to gain insight into the number of applicants with a primary diagnosis of cancer and with or without residual work capacity. Differences between applicants with and without residual work capacity were compared using *t*-tests for continuous data and chi2 tests for categorical and ordinal data. Only specific cancer diagnosis groups including more than 40 applicants were included in the analyses. Second, within the applicants with residual work capacity and complete data on all variables, the prevalence and degree of inability to work fulltime were studied for the total group and for each specific cancer diagnosis group. Third, univariable and multivariable logistic regression analyses were performed to study the association of each socio-demographic variable (age, gender, and educational level) and disease-related variable (cancer group and multimorbidity) with no residual work capacity (yes/no) and the inability to work fulltime (yes/no). Analyses on the ability to work fulltime also included educational level. Fourth, univariable and multivariable logistic regression analyses (adjusted for age, gender, multimorbidity, and educational level for the analyses on inability to work fulltime) were performed to study the association of the specific cancer diagnosis groups with no residual work capacity and inability to work fulltime. Fifth, multivariable logistic regression analyses were performed, stratified to the cancer diagnosis groups including more than 100 applicants (to have enough power), to study the association of each socio-demographic variable (age, gender for no residual work capacity, and additionally educational level for inability to work fulltime) and disease-related variable (multimorbidity) with no residual work capacity and inability to work fulltime within the specific cancer diagnosis groups.

Analyses were performed using IBM SPSS Statistics version 25. For all analyses, a *p*-level of < 0.05 was considered to indicate statistical significance.

RESULTS

Data from 40,263 applicants for a disability benefit in 2016 were available. The mean age of the sample was 48.7 years, 53.6% women, and 9.3% had cancer as the primary diagnosis (mean age 53.3 years; 60.3% women). After removal of applicants with another primary diagnosis than cancer, and those with specific cancer diagnoses with less than 40 applicants, the dataset included 3690 disability benefit applicants with cancer as a primary diagnosis, of these 6.8% applied for a full and permanent disability benefit at an earlier stage than 2 years after sick leave. An overview of the inclusion flow is presented in Fig. 1.

No residual work capacity

Of the 3690 applicants, 1572 applicants (42.6%) had no residual work capacity (Fig. 1). Applicants without residual work capacity were older, more often male, and had less often multimorbidity than applicants with residual work capacity (n = 2118, 57.4%). Educational level was difficult to compare due to a high percentage of missing data, especially in the group without residual work capacity. Applicants diagnosed with cancers of digestive organs, respiratory organs, urinary tract, and skin significantly more often had no residual work capacity, while applicants diagnosed with cancers of breast, nervous system, and lymphoid and haematopoietic tissue were more often assessed with residual work capacity (Table 1).

Inability to work fulltime

Of the 2118 applicants with residual work capacity, only 1864 had complete data on all variables (Fig. 1). Of these 1864, 1301 (69.8%) had an inability to work fulltime and 563 (30.2%) was assessed as being able to work fulltime (Fig. 1). Of the applicants with missing data on educational level (n = 254), the majority (52.8%) had a normal ability to work fulltime, which was higher compared to included applicants with complete data, of which 30.2% had a normal ability to work fulltime ($p < 0.001$).

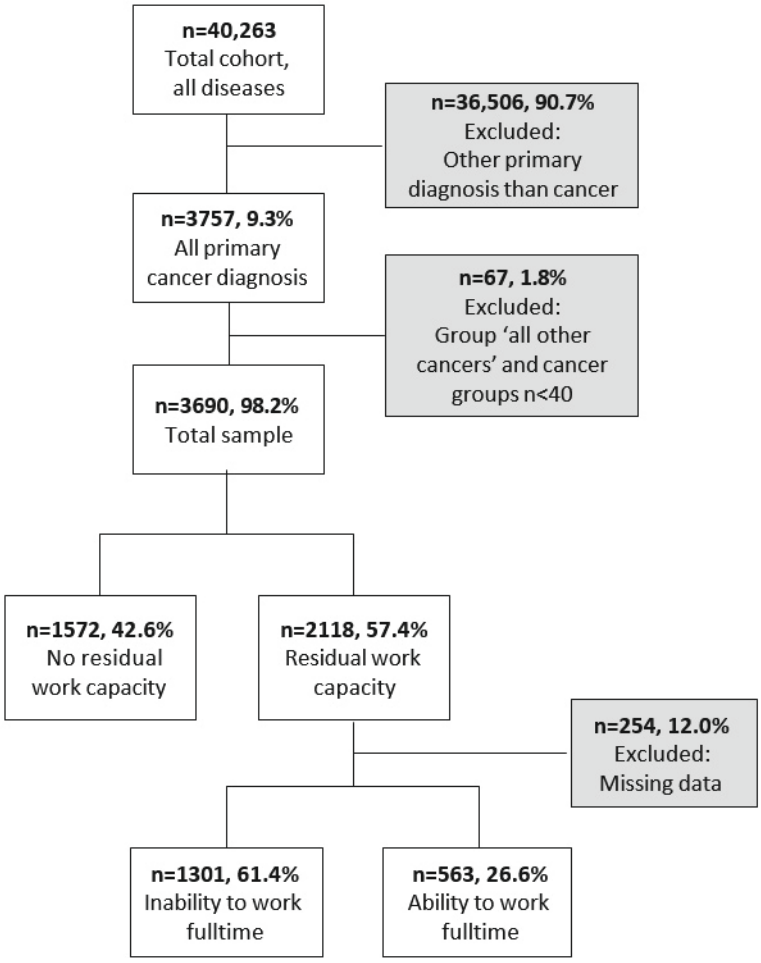
Applicants with an inability to work fulltime were significantly older. Gender, educational level, and multimorbidity did not differ significantly between applicants with an ability and an inability to work fulltime. Of all the cancer groups, only being diagnosed with lymphoid and haematopoietic cancers resulted significantly more often in an inability to work fulltime. Furthermore, applicants diagnosed with cancer of the locomotor system were significantly more often assessed as able to work fulltime. Of the applicants that were assessed with an inability to work fulltime, the majority (58.0%) was considered to be able to work about four hours per day (Table 1).

Table 1 Characteristics and differences between disability benefit applicants with cancer regarding residual work capacity and ability to work fulltime

	Total group (*n* = 3690) *N* (%)	**No residual work capacity (*N* = 1572, 42.6%) *N* (%)**	**Residual work capacity (*N* = 2118, 57.4%) *N* (%)**	***p*-value**	**Total group (*n* = 1864) *N* (%)**	**Inability to work fulltime (*N* = 1301, 69.8%) *N* (%)**	**Ability to work fulltime (*N* = 563, 30.2%)**	***p*-value**
Age (years) (mean ± sd)	53.3 ± 8.8	53.8 ± 8.7	52.9 ± 9.0	.002	52.8 ± 9.1	53.2 ± 8.9	51.7 ± 9.5	.001
Female gender	2230 (60.4%)	900 (57.3%)	1330 (62.8%)	.001	1178 (63.2%)	839 (64.5%)	339 (60.2%)	.079
Educational level[a]				.002				.224
Low	845 (41.8%)	87 (55.4%)	758 (40.7%)		758 (40.7%)	520 (40.0%)	238 (42.3%)	
Middle	746 (36.9%)	44 (28.0%)	702 (37.7%)		702 (37.7%)	485 (37.3%)	217 (38.5%)	
High	430 (21.3%)	26 (16.6%)	404 (21.7%)		404 (21.7%)	296 (22.8%)	108 (19.2%)	
Multimorbidity	1448 (39.2%)	331 (21.1%)	1117 (52.7%)	< .001	1009 (54.1%)	688 (52.9%)	321 (57.0%)	.100
Degree of ability to work fulltime								< .001
>8h per day					391 (21.0%)	-	391 (69.4%)	
≤ 8 h per day					172 (9.2%)	-	172 (30.6%)	
≤ 6 h per day					237 (12.7%)	237 (18.2%)	-	
≤ 4 h per day					755 (40.5%)	755 (58.0%)	-	
≤ 2 h per day					309 (16.6%)	309 (23.8%)	-	
Cancer diagnosis group								
Cancers of breast	1042 (28.2%)	322 (20.5%)	720 (34.0%)	< .001	648 (34.8%)	437 (33.6%)	211 (37.5%)	.106
Cancer of digestive organs	753 (20.4%)	412 (26.2%)	341 (16.1%)	< .001	296 (15.9%)	205 (15.8%)	91 (16.2%)	.826
Lymphoid and haematopoietic cancers	452 (12.2%)	128 (8.1%)	324 (15.3%)	< .001	292 (15.7%)	229 (17.6%)	63 (11.2%)	< .001
Cancers of respiratory organs	430 (11.7%)	266 (16.9%)	164 (7.7%)	< .001	137 (7.3%)	105 (8.1%)	32 (5.7%)	.070

Cancers of nervous system	361 (9.8%)	128 (8.1%)	233 (11.0%)	.004	199 (10.7%)	127 (9.8%)	72 (12.8%)	.052
Cancers of urinary tract	197 (5.3%)	101 (6.4%)	96 (4.5%)	.011	82 (4.4%)	54 (4.2%)	28 (5.0%)	.426
Cancers in the female genital organs	148 (4.0%)	74 (4.7%)	74 (3.5%)	.063	69 (3.7%)	52 (4.0%)	17 (3.0%)	.305
Cancers in the male genital organs	108 (2.9%)	47 (3.0%)	61 (2.9%)	.845	53 (2.8%)	38 (2.9%)	15 (2.7%)	.760
Cancers of skin	83 (2.2%)	47 (3.0%)	36 (1.7%)	.009	32 (1.7%)	19 (1.5%)	13 (2.3%)	.195
Cancers of endocrine glands	68 (1.8%)	26 (1.7%)	42 (2.0%)	.462	33 (1.8%)	25 (1.9%)	8 (1.4%)	.452
Cancers of the locomotor system	48 (1.3%)	21 (1.3%)	27 (1.3%)	.871	23 (1.2%)	10 (0.8%)	13 (2.3%)	.006

[a]Frequencies do not add up to the total n due to missing values



Figuur 1 Overview of the inclusion flow

Socio-demographic and disease-related associations with no residual work capacity and inability to work fulltime

Age, gender and multimorbidity were significantly associated with no residual work capacity in the multivariable analysis, where higher age resulted in higher odds, and female gender and multimorbidity resulted in lower odds for no residual work capacity (OR 1.01, 95%CI 1.01-1.02 for age, OR 0.86, 95%CI 0.75-0.99 for female gender, and OR 0.24, 95%CI 0.20-0.28 for multimorbidity). Age and gender also showed significant associations with the inability to work fulltime in the multivariable analysis, where higher age and female gender resulted in higher odds for inability to work fulltime (OR 1.02, 95%CI 1.01-1.03 for age and OR 1.28, 95%CI 1.04-1.58 for female gender).

Educational level and multimorbidity were not significantly associated with inability to work fulltime (Table 2).

Of the specific cancer diagnosis groups, cancers of the digestive organs (OR 1.69, 95%CI 1.42–2.01), respiratory organs (OR 2.22, 95%CI 1.78–2.77), urinary tract (OR 1.40, 95%CI 1.02–1.91), and skin (OR 1.85, 95%CI 1.16–2.96) showed significant higher odds for no residual work capacity in the multivariable logistic regression analyses. Additionally, cancers of the breast, nervous system, and lymphoid, and haematopoietic cancers showed significant lower odds for no residual work capacity (Table 3).

With regard to inability to work fulltime, only lymphoid and haematopoietic cancers showed significant higher odds for the inability to work fulltime (OR 1.89, 95%CI 1.39–2.57), whereas being diagnosed with cancer of the locomotor system resulted in significantly lower odds for being assessed with an inability to work fulltime (OR 0.41, 95%CI 0.18–0.96) (Table 3).

Associations with no residual work capacity and inability to work fulltime within specific cancer diagnosis groups

Within the eight cancer diagnosis groups with $n > 100$ (cancers of the breast, digestive organs, lymphoid and haematopoietic cancers, cancers of the respiratory organs, nervous system, urinary tract, female genital organs, and male genital organs), only multimorbidity was associated with no residual work capacity. Having an additional diagnosis was negatively associated with no residual work capacity within all these cancer diagnosis groups (Table 4).

For cancers of the breast, digestive system, respiratory organs, nervous system, and lymphoid and haematopoietic cancers, multivariable logistic regression analyses were performed to study the associations with the inability to work fulltime for each cancer diagnosis group. For applicants with cancers of breast, higher age showed increased odds for inability to work fulltime (OR 1.03, 96%CI 1.01–1.05), whereas for applicants with lymphoid and haematopoietic cancers, female gender was significantly associated with higher odds for inability to work fulltime (OR 3.13, 95%CI 1.57–6.24). Within the other three cancer diagnosis groups, no significant associations with inability to work fulltime were found (Table 4).

Table 2 Associations of socio-demographic and disease-related variables with the no residual work capacity and inability to work fulltime (univariable and multivariable logistic regression analyses)

	No residual work capacity (*n*=3690)						**Inability to work fulltime (*n*=1864)**					
	Univariable analyses			**Multivariable analyses**			**Univariable analyses**			**Multivariable analyses**		
	OR	**95%CI**	***p*-value**	**OR**	**95%CI**	***p*-value**	**OR**	**95%CI**	***p*-value**	**OR**	**95%CI**	***p*-value**
Age (years)	1.01	1.00–1.02	.002	1.01	1.01–1.02	<.001	1.02	1.01–1.03	.001	1.02	1.01–1.03	<.001
Female gender	0.79	0.70–0.91	.001	0.86	0.75–0.99	.038	1.20	0.98–1.47	.079	1.28	1.04–1.58	.020
Educational level (low=ref)												
Middle							1.02	0.82–1.28	.841	1.03	0.83–1.29	.773
High							1.25	0.96–1.64	.098	1.24	0.95–1.64	.118
Multimorbidity	0.24	0.21–0.28	< .001	0.24	0.20–0.28	<.001	0.85	0.69–1.03	.100	0.83	0.67–1.01	.063

Table 3 Associations of the cancer groups with no residual work capacity and inability to work fulltime (univariable and multivariable logistic regression analyses, adjusted for age, gender, educational level (only analyses on inability to work fulltime), and multimorbidity)

	No residual work capacity (*n* = 3690)						Inability to work fulltime (*n* = 1864)					
	Univariable analyses			Multivariable analyses			Univariable analyses			Multivariable analyses		
	OR	95%CI	p-value	OR	95%CI	p-value	OR	95%CI	p-value	OR	95%CI	p-value
Cancers of breast	0.50	0.43–0.58	<.001	0.56	0.47–0.65	<.001	0.84	0.69–1.04	.106	0.86	0.70–1.05	.141
Cancers of digestive organs	1.85	1.58–2.18	<.001	1.69	1.42–2.01	<.001	0.97	0.74–1.27	.826	0.97	0.73–1.28	.969
Lymphoid and hematopoietic cancers	0.49	0.40–0.61	<.001	0.46	0.36–0.57	<.001	1.70	1.26–2.29	.001	1.89	1.39–2.57	<.001
Cancers of respiratory organs	2.43	1.97–2.98	<.001	2.22	1.78–2.77	<.001	1.46	0.97–2.19	.071	1.47	0.97–2.23	.069
Cancers of nervous system	0.72	0.57–0.90	.004	0.67	0.53–0.86	.001	0.74	0.54–1.00	.053	0.81	0.59–1.11	.188
Cancers of urinary tract	1.45	1.09–1.93	.012	1.40	1.02–1.91	.035	0.83	0.52–1.32	.427	0.83	0.51–1.33	.434
Cancers in the female genital organs	1.36	0.98–1.90	.064	1.38	0.97–1.95	.075	1.34	0.77–2.33	.306	1.43	0.82–2.50	.214
Cancers in the male genital organs	1.04	0.71–1.53	.845	0.99	0.66–1.49	.962	1.10	0.60–2.02	.760	1.05	0.57–1.93	.882
Cancers of skin	1.78	1.15–2.77	.010	1.85	1.16–2.96	.010	0.63	0.31–1.28	.199	0.67	0.32–1.37	.268
Cancers of endocrine glands	0.83	0.51–1.36	.463	0.88	0.52–1.48	.626	1.36	0.61–3.03	.453	1.46	0.65–3.28	.358
Cancers of locomotor system	1.05	0.59–1.86	.871	1.23	0.67–2.27	.506	0.33	0.14–0.75	.008	0.41	0.18–0.96	.039

* For cancers of the breast, female and male genital organs, gender was left out of the multivariable analysis due to the small number of male or female applicants within these cancer groups

Table 4 Associations of gender, age, multimorbidity, and educational level (for inability to work fulltime) with no residual work capacity and inability to work fulltime stratified to cancer groups with n>100 (multivariable logistic regression analyses)

	Gender (male=ref) OR (95%CI)	Age OR (95%CI)	Educational level (low = ref)		Multimorbidity OR (95%CI)
			Middle OR (95%CI)	High OR (95%CI)	
No residual work capacity					
Cancers of breast (n =1042)	n.a.a	0.99 (0.98-1.01)	-	-	0.34 (0.25-0.45)*
Cancers of digestive organs (n = 753)	1.12 (0.81-1.53)	1.00 (0.98-1.02)	-	-	0.18 (0.13-0.25)*
Lymphoid and hematopoietic cancers (n = 452)	1.14 (0.73-1.77)	1.01 (0.98-1.03)	-	-	0.38 (0.24-0.59)*
Cancers of respiratory organs (n = 430)	1.19 (0.77-1.85)	1.02 (0.99-1.06)	-	-	0.12 (0.07-0.19)*
Cancers of nervous system (n = 361)	0.95 (0.61-1.48)	1.02 (0.99-1.04)	-	-	0.47 (0.29-0.77)*
Cancers of urinary tract (n = 197)	0.87 (0.42-1.78)	0.99 (0.95-1.03)	-	-	0.27 (0.15-0.50)*
Cancers of female genital organs (n = 148)	n.a.[a]	1.00 (0.97-1.04)	-	-	0.17 (0.08-0.38)*
Cancers of male genital organs (n = 108)	n.a.[a]	1.00 (0.95-1.05)	-	-	0.13 (0.05-0.34)*
Inability to work fulltime					
Cancers of breast (n = 648)	n.a.[a]	1.03 (1.01-1.05)*	1.04 (0.71-1.53)	1.43 (0.91-2.26)	0.95 (0.68-1.33)
Cancers of digestive organs (n = 296)	1.29 (0.87-2.56)	1.03 (1.00-1.07)	1.11 (0.63-1.93)	1.18 (0.56-2.45)	0.88 (0.53-1.47)
Lymphoid and hematopoietic cancers (n = 292)	3.13 (1.57-6.24)*	1.00 (0.97-1.03)	0.66 (0.34-1.27)	0.59 (0.27-1.28)	0.77 (0.43-1.38)
Cancers of respiratory organs (n=137)	2.27 (0.94-5.47)	1.05 (0.99-1.10)	1.99 (0.70-5.68)	1.95 (0.56-6.82)	0.62 (0.25-1.53)
Cancers of nervous system (n=199)	1.18 (0.65-2.11)	1.00 (0.98-1.03)	0.86 (0.44-1.66)	1.04 (0.47-2.31)	0.79 (0.44-1.43)

*p<.05

[a]*n.a.* not applicable, gender was left out of the multivariable analysis due to the small number of male or female applicants

DISCUSSION

Our results show that 42.6% of a year cohort of disability benefit applicants with cancer as their primary diagnosis were assessed with no residual work capacity. Specifically, applicants diagnosed with cancers of the digestive organs, respiratory organs, urinary tract, and skin showed significant higher odds for no residual work capacity. Although the majority of the applicants (57.4%) had residual work capacity, almost 70% of this sample was assessed with an inability to work fulltime. Of the applicants assessed with inability to work fulltime, 81.8% could work no more than 4 h per day. For inability to work fulltime, lymphoid and haematopoietic cancers showed significantly higher odds, and cancers of the locomotor system significantly lower odds. Age and gender were significantly associated with both outcomes. Multimorbidity was associated with residual work capacity in all cancer groups. Within cancer groups, higher age, for applicants with cancers of the breast, and female gender, for applicants with lymphoid and haematopoietic cancers, were significantly associated with higher odds for inability to work fulltime.

In our study, only 15.3% of all applicants with cancer were assessed with a normal ability to work fulltime. Although this outcome can be seen as proof of the severity of cancer and its impact on work capacity, our findings also point out that a small majority (57.4%) of the applicants with cancer had residual work capacity, i.e. that they could work with or despite limitations and restrictions for work [31]. We could not find many studies on (no) residual work capacity and inability to work fulltime as outcome of work disability assessment in cancer patients. Most previous research focusses on actual return to work or being employed and work functioning. One study by Van Muijen and colleagues studied assessment outcomes within cancer patients [24]. Their results showed that 17.4% of sick-listed employed cancer survivors were assessed with no residual work capacity 2 years after sick leave. The possible cause of this lower percentage, compared to our study, is the difference in study sample. We included a year cohort of disability benefit applicants who were, mostly, already 2 years on sick leave. In the study of Van Muijen, 531 sick-listed (employed) workers were included at the first day of sick leave and followed until the disability assessment, 24 months later [24]. In our recently published study, using data of all applicants for a disability benefit in 2016 with residual work capacity, we found that the prevalence of inability to work fulltime was 39.4% [28]. In the current study, only including applicants with a cancer diagnosis from the same cohort, the prevalence is extremely higher, namely 69.8%. This extremely higher percentage indicates the severity of cancer compared to other diseases with regard to work capacity. However, the distribution of the degree of inability to work fulltime within the current study is comparable to the year cohort including all diseases [28].

Breast cancer survivors were the largest cancer group in our sample. They had a significant lower risk of being assessed with no residual work capacity, and no significant associations with inability to work fulltime. This is not a surprising result, considering that studies have shown that the 5-year survival rate for breast cancer patients is high (88%) [29]. This implies that breast cancer patients might return to work after being treated for their cancer, and will not lose their total work capacity within foreseeable time. Although breast cancer survivors have increased physical impairment and physical health problems over a longer period of time after being diagnosed and treated, they do not have a consistently poorer psychosocial functioning [34]. On the other hand, a study by Dorland and colleagues showed that within a sample of breast cancer survivors who had returned to work, about 80% did have a persistently low and moderate to high work functioning over time. These results might suggest that there is still residual work capacity for this group, but there are work limitations and restrictions with regard to work functioning [16].

Compared to other cancers, in patients with respiratory cancers, the survival rate is relatively low (lung cancer: 20% 5-year survival, [29]) and the disease has an enormous (negative) impact on energy levels, employment, and earnings [20, 35]. This may explain that in our sample applicants with cancer of the respiratory organs had the highest risk of having no residual work capacity (OR 2.22). Additionally, 76.6% of the applicants with respiratory cancer and residual work capacity were assessed with inability to work fulltime.

The lymphoid and haematopoietic cancer group, with cancer types like leukaemia and (non)Hodgkin lymphoma, had a significant low association (OR 0.46) with no residual work capacity. It also was the only cancer group with a significant positive association with inability to work fulltime. The fact that these patients have a relatively long survival (5 years survival rates from 24 to 87% leukaemia and 62–86% for (non) Hodgkin tumours [29]) with fatigue as the most prevalent long-term functional complication for non-Hodgkin survivors could be reflected in our results [34]. The latter study described that fatigue in patients after non-Hodgkin lymphoma may in part result from not returning to pre-diagnosis levels of physical activity despite overall good health [34]. Cancers of the locomotor system in our sample had the lowest significant association with inability to work fulltime. This is in line with the finding of our previous study on inability to work fulltime including all disease groups [28] where applicants with diseases of the locomotor system also significantly had the lowest odds for inability to work fulltime. In our previous study, we argued that musculoskeletal diseases are more likely responsible for physical work limitations than inability to work fulltime, which is in line

with the findings by Stein describing a higher risk on physical impairments for bone cancer (a cancer of the locomotor system) [34].

Our findings showed that being diagnosed with an additional disease other than cancer lowered the odds for no residual work capacity. This seems counter intuitive, because one should expect that when diagnosed with more than one disease would have larger impact on work ability. In order to find an explanation, we discussed these results with insurance physicians. They thought a possible explanation might be that when they assess applicants with such a severe disease, of which the impact on work capacity is so obvious they feel that further exploration of the medical situation is unnecessary. In these cases, they usually do not register any additional diagnosis. The dataset used for our study only included data registered by the insurance physicians at the time of the assessment, data supporting this possible explanation of the insurance physicians cannot be verified by our dataset. However, we did not see this association of multimorbidity for the specific cancer groups with inability to work fulltime; in none of the specific cancer groups, an association of multimorbidity was found with inability to work fulltime. This might indicate that the cancer diagnosis itself already has such a major impact on work capacity, that an additional diagnosis does not increase the risk for being assessed with an inability to work fulltime.

Strengths and limitations

In this study, we used register data of a year cohort of applicants assessed for a long-term work disability benefit after (in most cases) 2 years of sick leave. Using register data is a strength of our study, as it covers the entire Dutch population. Another strength of our study is the large sample size of work disability benefit assessments by skilled insurance physicians adhering to professional guidelines and assessment methods. Furthermore, our sample seems representative, as the prevalence of the specific cancer groups in our sample is in line with prevalence nation- and worldwide [36]. The prevalence of cancers of the male genital organs in our sample was, however, lower than in the society. This might be due to the fact that this type of cancer is specifically higher prevalent among older males, who are not part of the working population anymore.

A study limitation is that register data was not collected for research purposes and did not contain data on other possible determinants such as severity of diseases, time from cancer diagnosis, stage of cancer, the treatment received, and physical and psychosocial work demands. Although the UWV uses a biopsychosocial approach in the work disability assessment, important factors described in this model, as mentioned above, are lacking in the register data. The absence of these determinants can also affect the generalizability of the findings. Furthermore, for the analysis on inability to work fulltime, we had to exclude 254 cases due to missing data on

educational level. This might have impacted our outcomes, as the majority of the excluded cases had a normal ability to work fulltime, whereas in our study sample the majority of the applicants were assessed with an inability to work fulltime. Furthermore, because of the cross-sectional design we cannot draw conclusions about causal relationships.

Implications for practice and future research

The findings in the present study show that more than half of all applicants with cancer have abilities to work but often cannot work fulltime. This implies that (supporting) return to work is of great importance among cancer patients, and adjustments in work, like working hours, could be beneficial for their return to original or adapted work. Several studies have evaluated the effectiveness of intervention strategies to help people with cancer to return to work. For instance, Van Egmond et al. did not find a significant effect of a tailored return to work program carried out by reintegration coaches [37]. Furthermore, De Boer et al. evaluated in their review interventions to enhance return to work in cancer patients and found moderate-quality evidence that multidisciplinary interventions enhance the return to work of patient with cancer [38]. The findings among the different types of cancers and of the socio-demographic determinants could help to develop tailored interventions for enhancing work participation of specific cancer survivors. Furthermore, our findings can contribute to a more evidence-based assessment of residual work capacity and inability to work fulltime in disability claim assessments. Our study provides insight into which workers within specific cancer diagnosis groups are at risk for no residual work capacity and inability to work fulltime and can contribute to the development of interventions for work adjustments and reintegration.

Our study aimed to explore two important work outcomes of the disability benefit assessment, using register data from the UWV. Future studies could focus on the effect of other indicators on no residual work capacity and inability to work fulltime, such as the individual diagnosis, treatment, and other personal and environmental factors. Additionally, future longitudinal studies should be conducted on the work trajectories from the onset of sick leave, or the date of diagnosis, until after the disability assessment of patients diagnosed with different types of cancer. Linkage of data from, for example, the National Cancer Registry and/or occupational health services, with data on disability benefit assessment, will provide insight into the ability to work of cancer patients before the disability benefit assessment, from the onset of the diagnosis, and compare return to work between different types of cancer on the short term. It also will provide insight into the effect of being assessed with (in)ability to work fulltime on actual (return to) work after the assessment.

CONCLUSION

The findings of this study showed that the prevalence of cancer patients who have no work capacity 2 years after being diagnosed is high (42.6%). Additionally, of those who have residual work capacity, about 70% is assessed as being unable to work fulltime. This means that only 15% of all applicants with cancer are assessed by the insurance physician with a normal ability to work fulltime 2 years after the start of their sick leave. Our findings show that the type of cancer seems to be important in terms of residual work capacity and the ability to work fulltime as shown by significant differences on these assessment outcomes between the specific diagnosis. The findings of this study can contribute to a more evidence-based assessment of residual work capacity and inability to work fulltime in disability claim assessments, providing insight into which workers within specific cancer diagnosis groups are at risk for no residual work capacity and inability to work fulltime.

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6

Residual work capacity and (in)ability to work fulltime among a year-cohort of disability benefit applicants diagnosed with mental and behavioural disorders

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ABSTRACT

Aims: Residual work capacity and inability to work fulltime are important outcomes in disability benefit assessment for workers with mental and behavioural disorders. The aim of this study is to gain insight into the prevalence and associations of socio-demographic and disease-related factors of these outcomes across different mental and behavioural diagnoses groups.

Methods: A year cohort of anonymized register-data of patients diagnosed with a mental or behavioural disorder who claim a work disability benefit after two years of sick-leave was used (n = 12,325, age 44.5 ± 10.9, 55.5% female). Limitations in mental and physical functioning caused by disease are indicated according to the Functional Ability List (FAL). No residual work capacity was defined as having no possibilities to work, whereas inability to work fulltime was defined as being able to work less than 8 h per day.

Results: The majority (77.5%) of the applicants were assessed with residual work capacity, of these 58.6% had an ability to work fulltime. Applicants diagnosed with (post-traumatic) stress, mood affective and delusional disorders showed significant higher odds for no residual work capacity and for inability to work fulltime, while other diagnoses groups, like adjustment and anxiety disorders, showed decreased odds for both assessment outcomes.

Conclusions: The type of mental and behavioural disorder seems important in the assessment of residual work capacity and inability to work fulltime, as the associations differ significantly between the specific diagnoses groups.

INTRODUCTION

Mental health-related disability poses one of the greatest social and labour market policy challenges in OECD countries. Around one-third of the annual number of new work disability benefit grants is attributable to mental and behavioural disorders [1,2,3] and there is a trend increase in most OECD countries [4, 5]. Besides huge economic costs at population level [4, 6], long-term disability in general and due to mental and behavioural disorders in particular, is associated at the individual level with lower socio-economic status, reduced quality of life and higher morbidity/mortality rates [7]. It is therefore of great importance to prevent the transition of short-term sickness absence into long term or permanent disability and to rehabilitate those persons already on long term disability benefit by facilitating return to work.

In the Netherlands, long-term sick-listed employees may apply for a work disability benefit after two years of sick-leave, to compensate for income loss. The insurance physician of the Dutch Social Security Institute: The Institute for Employee Benefits Schemes (UWV) assesses the health situation of an applicant and whether the applicant is able to work. When the applicant has no possibilities to perform any work at all, he or she is assessed with no residual work capacity. No residual work capacity can be assessed when an applicant is, for example, not self-reliant due to a severe mental disorder or a physical disorder [8]. When applicants are able to (partly) work, they are assessed with residual work capacity. In this latter case, the possible limitations in their mental and physical functioning caused by their disease are indicated according to the Functional Ability List (FAL) [9, 10]. This part of the assessment results in a conclusion about the (in)ability to work fulltime, reported as the number of hours the applicant can sustain working activities per day. Particularly energy deficit, fatigue and increased need for rest are primary indicators of inability to work fulltime [11, 12]. Both residual work capacity and (in)ability to work fulltime are important outcomes of work disability assessments, which usually lead to the decision of granting the benefit or not. Not only in the Netherlands, but also in many other European countries, assessing residual work capacity and (in)ability to work fulltime are part of the current work disability assessments [13, 14].

In a recent study, we showed, using register data of a year cohort of applicants assessed with residual work capacity, that the prevalence of inability to work fulltime strongly varied between different types of disease groups [15]. Moreover, we found that being diagnosed with a mental or behavioural disorder showed a significant increased risk for being assessed with inability to work fulltime compared to applicants having a disorder of another disease group. Furthermore, for applicants diagnosed with a mental or behavioural disorder, female gender and higher age were associated with an increased risk to be assessed with inability to work fulltime [15].

In our previous study we did not differentiate between the different diagnoses groups within the disease group mental and behavioural disorders as we were interested in the prevalence of (in)ability to work fulltime across different disease groups [15]. However, mental and behavioural disorders include a large variety of specific diagnoses groups, like mood disorders, stress disorders and delusional disorders, which all differ in degree and patterns of work capacity impairment [16,17,18]. Some mental and behavioural disorders can affect self-reliance, like delusional disorders and severe addictions, while other disorders may not have such an impact. On the other hand, there are disorders that may have an impact on energy levels (e.g., mood affective disorders, schizophrenia), which may impact capacities such as endurance, while other disorders more often cause emotional disturbance (e.g., personality disorders), and impair interactional capacities (contact behaviour, group integration, assertiveness). Different qualities and patterns of capacity impairments may impact the assessment of residual work capacity and inability to work fulltime [16,17,18]. It can be expected that individuals having a diagnosis that comes along with a decrease in self-reliance may show increased odds for being assessed with no residual work capacity, while diagnoses associated with reduced energy levels and fatigue may show increased odds for being assessed with inability to work fulltime. On the other hand, diagnoses more associated with emotional disturbances, may have a decreased risk for being assessed with both residual work capacity and inability to work fulltime. Therefore, each mental and behavioural disorder may show a different association with residual work capacity and inability to work fulltime, and different socio-demographic and disease-related factors within each disorder may be associated with both disability assessment outcomes.

Many studies have been conducted to give more insight into the work ability description of workers with different mental and behavioural disorders. However, up to date, little is known about the prevalence of (no) residual work capacity and the (in)ability to work fulltime, two important aspects of the work disability benefit assessment in many European countries [13, 14], among workers diagnosed with a mental or behavioural disorder. Especially in employees diagnosed with these disorders, it is of great interest to distinguish between the types of diagnoses groups, since there is a large variety in the impact the different types of diagnoses have on the work capacity of these patients [16,17,18]. Additionally, for each diagnosis group, different socio-demographic characteristics and disease-related factors may be associated with (no) residual work capacity and (in)ability to work fulltime. Insight into these associations can contribute to a more evidence-based assessment of residual work capacity and inability to work fulltime in disability claim assessments, and may contribute to specify for which diagnoses groups supporting return to work is most useful.

Within this background, the aim of this study is to gain insight into 1) the prevalence of no residual work capacity, 2) the prevalence and degree of inability to work fulltime in case of residual work capacity, and 3) the associations of socio-demographic and disease related factors with no residual work capacity and the inability to work fulltime in a representative sample of applicants for a work disability benefit, diagnosed with a mental and behavioural disorder as their primary diagnosis, of the International Statistical Classification of Disease and Related Health Problems (ICD-10) disease group.

METHODS

Design and Sample

The study is a cross-sectional register-based cohort study among applicants for a long-term disability benefit in the year 2016. Data were derived from the UWV register forms completed by the insurance physicians and labour experts at the time of assessment and anonymized by UWV. For this study only applicants whose primary diagnosis was a mental or behavioural disorder were included. Approval by a Medical Ethical Committee was not necessary under Dutch law, as the study is a register-based study and therefore not subject to the Medical Research Involving Human Subjects Act (WMO).

Institutional Setting

In the Dutch social security system, workers can apply for a long-term disability benefit after two years of sick leave according to the Work and Income Act (WIA) Netherlands [19]. They may receive disability benefits for a disease or handicap due to either occupational or non-occupational causes. After a medical disability assessment by an insurance physician of the UWV, individuals can either have a full and permanent work disability, a non-permanent but full work disability, a partial work disability, or no work disability. Insurance physicians assess whether applicants have no residual work capacity if: (1) they lose their total work capacity within three months, (2) when they have a terminal disease with such a bad life expectancy that they will lose their total work capacity within foreseeable time, (3) they have fluctuating work capacity, (4) they are hospitalized, or (5) they are not self-reliant due to a severe mental disorder or a physical disorder [8]. In that case, the insurance physician can conclude to (permanent or non-permanent) full work disability. If applicants are assessed with residual work capacity, the possible limitations in their mental and physical functioning caused by their disease are indicated. After the insurance physician has completed the assessment, an additional assessment by the labour expert follows to indicate whether the applicants are incentivized to continue in paid (part-time) employment at their current employer or should enrol in a new, more appropriate (part-time) job, according to their residual work capacity.

Measures

The presence of residual work capacity is based on the insurance physicians' assessment (yes/no). If there is residual work capacity, the possible limitations in mental and physical functioning caused by the disease are indicated using the Functional Ability List (FAL) [9, 10]. The FAL is a standardized format list, based on the International Classification of Functioning (ICF), but with more detailed items. The 106 items of the FAL are categorized into six domains: personal functioning (30 items, e.g. focusing attention, dividing attention, insight into own abilities), social functioning (17 items, e.g. dealing with conflicts, working with others), dynamic movements (31 items, e.g. walking, use of hand and fingers), static posture (11 items, e.g. sitting at work, standing), adjusting to environment (13 items, e.g. working in an environment with dust, smoke, gases), and working hours (4 items, e.g. number of hours per day, working nights). For the current study, we used the data on the last domain, working hours, of the assessment. The number of working hours is reported by insurance physicians using 1 = at least eight hours per day; 2 = no more than eight hours per day; 3 = no more than roughly six hours per day; 4 = no more than roughly four hours per day; and 5 = no more than two hours per day. For the current study, being able to work eight or more hours per day (categories 1–2) was considered as normal ability to work fulltime, all else (categories 3–5) was considered as an inability to work fulltime.

Socio-demographic data included gender (male/female), age, and educational level. For educational level three classes were differentiated based on the highest level of completed education: low (primary school, lower vocational education, lower secondary school), middle (intermediate vocational education, upper secondary school), and high (upper vocational education, university). Educational level is usually registered by the labour expert, and therefore only part of the assessment when an applicant has residual work capacity. Consequently, educational level is often missing for applicants without residual work capacity, and therefore left out of the analyses on residual work capacity.

Insurance physicians use the Dutch Classification of Occupational Health and Social Insurance (CAS) to categorize diagnoses, derived from the International Statistical Classification of Disease and Related Health Problems (ICD-10) [20]. For generalizability, the primary, secondary and tertiary (when available) CAS-diagnoses were recoded to the 22 chapters of the ICD-10 disease groups. The type of mental and behavioural disorder was determined using the first diagnosis code. Multimorbidity was defined as having one or more additional diagnosis from a different disease group than mental and behavioural disorders.

Statistical Methods

First, descriptive statistics were used to gain insight in the number of applicants with a primary diagnosis concerning a mental and behavioural disorder and with or without residual work capacity. Differences between applicants with and without residual work capacity were compared using t-tests for continuous data and Chi2-tests for categorical and ordinal data. Only specific and defined mental and behavioural disorder diagnosis groups including more than 40 applicants were included in the analyses, resulting in deleting applicants with unspecified behavioural problems, emotional sleeping disorders and unspecified mental and behavioural disorders. Second, within the group of applicants with residual work capacity and complete data on all variables, the prevalence and degree of inability to work fulltime was studied for the total group and for each specific mental health diagnosis group. Third, univariable and multivariable logistic regression analyses were performed to study the association of each socio-demographic variable (age, gender) and disease related variable (multimorbidity) with no residual work capacity (no/yes). Fourth, univariable and multivariable logistic regression analyses (adjusted for age, gender, multimorbidity, for the analyses on residual work capacity, educational level was added for the analyses on inability to work fulltime) were performed to study the association of the specific mental and behavioural disorder diagnosis groups with no residual work capacity and inability to work fulltime. Fifth, multivariable logistic regression analyses were performed, stratified to the mental and behavioural disorder diagnosis groups, to study the association of each socio-demographic variable (age, gender for no residual work capacity and additionally educational level for inability to work fulltime) and disease-related variable (multimorbidity) with no residual work capacity and inability to work fulltime within the specific mental health diagnosis groups.

Analyses were performed using IBM SPSS Statistics version 25. For all analyses a p-level of < 0.05 was considered to indicate statistical significance.

RESULTS

Data from 40,263 applicants for a WIA benefit in 2016 (mean age 48.7 (± 11.0) years; 53.6% women) were used. Of these, 12,901 (32.0%) had a mental or behavioural disorder as the primary diagnosis (mean age 44.4 (± 11.0) years; 55.4% women). After removal of applicants with unspecified mental disorders and diagnoses groups with 40 or less applicants, the dataset included 12,325 disability benefit applicants with a mental or behavioural disorder (Fig. 1).

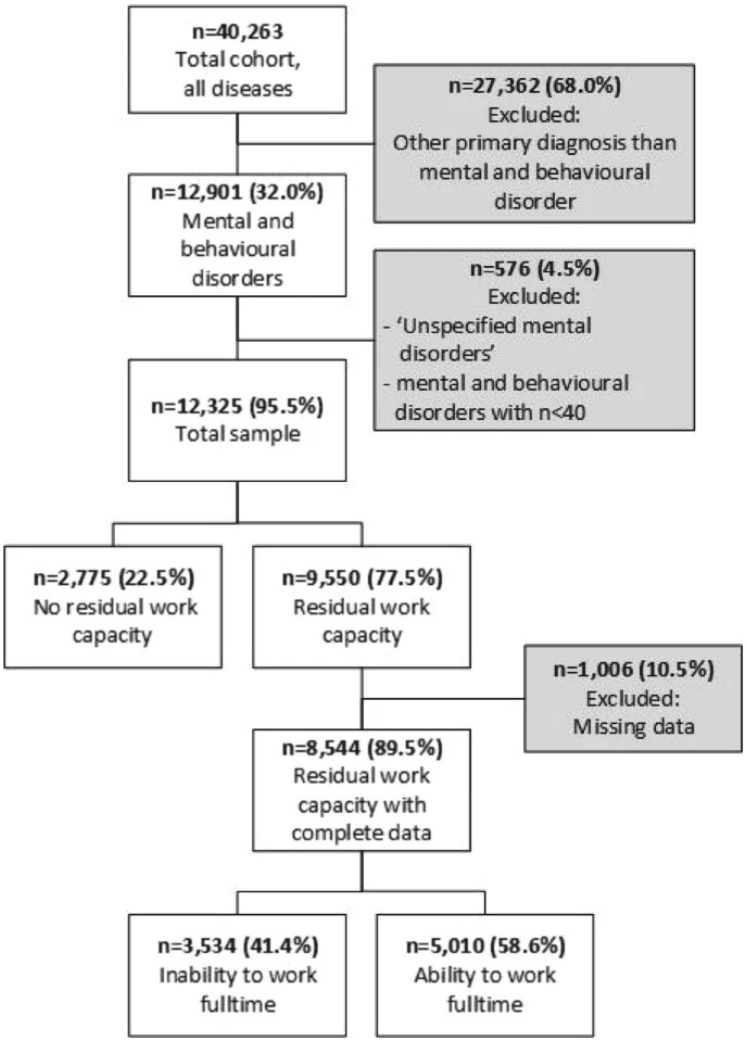

Figure 1 Overview of the inclusion flow

No Residual Work Capacity

Of the 12,325 applicants, 77.5% (n = 9550) were assessed with residual work capacity. Applicants without residual work capacity were younger, more often male and had less often multimorbidity than applicants with residual work capacity (see Table 1). Educational level was difficult to compare due to a high percentage of missing data, especially in the group without residual work capacity. Applicants diagnosed with (post-traumatic) stress disorders, mood affective disorders, addictions, and schizophrenia and delusional disorders were significantly more present in the group with no residual work

capacity, while applicants diagnosed with mental retardation, autism spectrum disorders, ADHD, somatoform disorders, adjustment disorders (including burn-out), and anxiety disorders were significantly more present in the group assessed with residual work capacity (Table 1).

Inability to Work Fulltime

Of the 9,550 applicants with residual work capacity, 8544 (89.5%) applicants had complete data on all variables. Of the applicants with missing data (n = 1006, mainly on educational level), the majority (67.4%) had a normal ability to work fulltime, whereas in the study sample, including applicants with complete data, 58.6% had normal ability to work fulltime ($p < 0.001$).

Of the applicants assessed with an inability to work fulltime, the majority (64.7%) were considered to be able to work about four hours per day (Table 1). Applicants with an inability to work fulltime were significantly more often female. Age, educational level and multimorbidity did not differ significantly between applicants with an ability and an inability to work fulltime. Applicants diagnosed with (post-traumatic) stress disorders, mood affective disorders, and schizophrenia and delusional disorders were significantly more present in the group assessed with an inability to work fulltime, while applicants diagnosed with mental retardation, ADHD, adjustment disorders (including burn-out), anxiety disorders, personality disorders and addictions were significantly more present in the group assessed with an ability to work fulltime (Table 1).

Associations with No Residual Work Capacity and Inability to Work Fulltime

Age, gender and multimorbidity were significantly associated with no residual work capacity in the multivariable analyses, where higher age, female gender and being diagnosed with an additional disorder resulted in lower odds for no residual work capacity (Table 2).

Of the specific diagnoses groups, (post-traumatic) stress disorders, mood affective disorders, addictions and schizophrenia and delusional disorders showed significant higher odds for no residual work capacity, both in univariable and multivariable regression analyses. On the other hand, mental retardation, autism spectrum disorders, ADHD, somatoform disorders, adjustment disorders (including burn-out), and anxiety disorders showed significant lower odds for no residual work capacity. Of all mental and behavioural disorders, only the diagnosis group personality disorders was not associated with no residual work capacity (Table 3).

Table 1 Characteristics and differences between work disability benefit applicants regarding residual work capacity and ability to work fulltime

	Total group (n = 12,325) N (%)	**No residual work capacity (n = 2775, 22.5%) N (%)**	**Residual work capacity (n = 9550, 77.5%) N (%)**	**p-value**	**Total group (n = 8544) N (%)**	**Inability to work fulltime (n = 3534, 41.4%) N (%)**	**Ability to work fulltime (n = 5010, 58.6%) N(%)**	**p-value**
Age (years) (mean±SD)	44.5 ± 10.9	43.4 ± 10.7	44.8 ± 10.9	< .001	44.8 ± 11.0	45.0 ± 11.0	44.8 ± 10.9	.538
Female gender	6815 (55.5%)	1485 (53.5%)	5330 (55.8%)	.032	4815 (56.4%)	2194 (62.1%)	2621 (52.3%)	< .001
Educational level[a]				< .001				.117
Low	4155 (44.4%)	430 (53.1%)	3725 (43.6%)		3725 (43.6%)	1510 (42.7%)	2215 (44.2%)	
Middle	3279 (35.1%)	274 (33.8%)	3005 (35.2%		3005 (35.2%)	1288 (36.4%)	1717 (34.3%)	
High	1920 (20.5%)	106 (13.1%)	1814 (21.2%)		1814 (21.2%)	736 (20.8%)	1078 (21.5%)	
Multimorbidity	4916 (39.9%)	788 (28.4%)	4128 (43.2%)	< .001	3823 (44.7%)	1579 (44.7%)	2244 (44.8%)	.920
Degree of ability to work fulltime								< .001
> 8 h per day					3941 (46.1%)	–	3941 (78.7%)	
≤ 8 h per day					1069 (12.5%)	–	1069 (21.3%)	
≤ 6 h per day					732 (8.6%)	732 (20.7%)	–	
≤ 4 h per day					2285 (26.7%)	2285 (64.7%)	–	
≤ 2 h per day					517 (6.1%)	517 (14.6%)	–	
Mental and behavioural disorder								
Mental retardation	236 (1.9%)	35 (1.3%)	201 (2.1%)	.004	124 (1.4%)	39 (1.1%)	84 (1.7%)	.029

Autism spectrum disorders	427 (3.5%)	62 (2.2%)	365 (3.8%)	< .001	310 (3.6%)	116 (3.3%)	194 (3.9%)	.151
ADHD	281 (2.3%)	22 (0.8%)	259 (2.7%)	< .001	229 (2.7%)	76 (2.2%)	153 (3.1%)	.011
Somatoform disorders	495 (4.0%)	75 (2.7%)	420 (4.4%)	< .001	388 (4.5%)	155 (4.4%)	233 (4.7%)	.563
Adjustment disorders (including burn-out	1402 (11.4%)	74 (2.7%)	1328 (13.9%)	< .001	1201 (14.1%)	323 (9.1%)	878 (17.5%)	< .001
(Post-traumatic) stress disorders	1743 (14.1%)	475 (17.1%)	1268 (13.3%)	< .001	1125 (13.2%)	531 (15.0%)	594 (11.9%)	< .001
Anxiety disorders	1019 (8.3%)	158 (5.7%)	861 (9.0%)	< .001	774 (9.1%)	278 (7.9%)	496 (9.9%)	.001
Personality disorders	901 (7.3%)	211 (7.6%)	690 (7.2%)	.500	626 (7.3%)	215 (6.1%)	411 (8.2%)	< .001
Mood affective disorders	4894 (39.7%)	1277 (46.0%)	3617 (37.9%)	< .001	3318 (38.8%)	1585 (44.9%)	1733 (34.6%)	< .001
Addictions	418 (3.4%)	158 (5.7%)	260 (2.7%)	< .001	235 (2.8%)	78 (2.2%)	157 (3.1%)	.010
Schizophrenia and delusional disorders	509 (4.1%)	228 (8.2%)	281 (2.9%)	< .001	215 (2.5%)	138 (3.9%)	77 (1.5%)	< .001

[a] Frequencies do not add up to the total n due to missing values

With regards to inability to work fulltime, (post-traumatic) stress disorders, mood affective disorders and schizophrenia and delusional disorders showed significant higher odds for the inability to work fulltime, whereas adjustment disorders (including burn-out), anxiety disorders and personality disorders showed significant lower odds for being assessed with an inability to work fulltime (Table 3).

Associations with No Residual Work Capacity and Inability to Work Fulltime Within Specific Mental Health Diagnosis Groups

The multivariable logistic regression analyses, stratified to the specific mental and behavioural disorder diagnoses groups, showed that for applicants with a (post-traumatic) stress disorder, women had lower odds to be assessed with no residual work capacity. For applicants with a somatoform disorder or an anxiety disorder, a higher age was negatively associated with no residual work capacity. Multimorbidity was negatively associated with no residual work capacity for applicants with autism spectrum disorders, (post-traumatic) stress disorders, anxiety disorders, personality disorders, mood affective disorders, addictions, or schizophrenia and delusional disorders (Table 4).

The stratified analyses for inability to work fulltime, showed that for applicants with mental retardation or a mood affective disorder, higher age was associated with an increased odds for inability to work fulltime. Whereas for applicants with ADHD, adjustment disorders (including burn-out), (post-traumatic) stress disorders, personality disorders, mood affective disorders, addictions, and schizophrenia and delusional disorders, female gender was significantly associated with higher odds for inability to work fulltime. A middle educational level (compared to a low educational level) showed increased odds for inability to work fulltime for applicants with mental retardation or a somatoform disorder, and a high educational level was associated with inability to work fulltime within applicants with a personality disorder. Multimorbidity was negatively associated with inability to work fulltime within applicants with an autism spectrum disorder (Table 5).

Table 2 Associations of socio-demographic and disease related variables with no residual work capacity (univariable and multivariable logistic regression analyses)

	No residual work capacity (n = 12,325)					
	Univariable analyses			**Multivariable analyses**		
	OR	**95%**	***p*-value**	**OR**	**95%**	***p*-value**
Age (years)	0.99	0.98–0.99	<.001	0.99	0.99–1.00	.001
Female gender	0.91	0.84–0.99	.032	0.91	0.83–0.99	.028
Multimorbidity	0.52	0.48–0.57	<.001	0.54	0.49–0.59	<.001

Table 3 Associations of the mental and behavioural disorder diagnosis groups with no residual work capacity and inability to work fulltime (univariable and multivariable logistic regression analyses, adjusted for age, gender, educational level (only analyses on inability to work fulltime) and multimorbidity)

	No residual work capacity (n = 12,325)						Inability to work fulltime (n = 8,544)					
	Univariable analyses			Multivariable analyses			Univariable analyses			Multivariable analyses		
	OR	95%	*p*-value	OR	95%	*p*-value	OR	95%	*p*-value	OR	95%	*p*-value
Mental retardation	0.59	0.41–0.85	.005	0.62	0.43–0.90	.011	0.65	0.45–0.96	0.030	0.70	0.48–1.03	0.072
Autism spectrum disorders	0.58	0.44–0.76	< .001	0.51	0.39–0.67	< .001	0.84	0.67–1.07	0.151	0.96	0.76–1.22	0.729
ADHD	0.29	0.19–0.44	< .001	0.26	0.17–0.40	< .001	0.70	0.53–0.92	0.011	0.76	0.57–1.01	0.055
Somatoform disorders	0.60	0.47–0.78	< .001	0.62	0.48–0.80	< .001	0.94	0.76–1.16	0.563	0.90	0.73–1.11	0.309
Adjustment disorders (including burn-out)	0.17	0.13–0.22	< .001	0.18	0.14–0.23	< .001	0.47	0.41–0.54	< .001	0.44	0.38–0.51	< .001
(Post-traumatic) stress disorders	1.35	1.20–1.51	< .001	1.36	1.21–1.52	< .001	1.32	1.16–1.49	< .001	1.30	1.14–1.48	< .001
Anxiety disorders	0.61	0.51–0.73	< .001	0.58	0.49–0.69	< .001	0.78	0.67–0.91	.001	0.76	0.65–0.89	.001
Personality disorders	1.06	0.90–1.24	.500	0.98	0.84–1.16	.840	0.73	0.61–0.86	< .001	0.71	0.60–0.85	< .001
Mood affective disorders	1.40	1.28–1.52	< .001	1.50	1.37–1.63	< .001	1.54	1.41–1.68	< .001	1.54	1.41–1.68	< .001
Addictions	2.16	1.76–2.64	< .001	2.05	1.67–2.52	< .001	0.70	0.53–0.92	0.010	0.78	0.60–1.05	.105
Schizophrenia and delusional disorders	2.95	2.47–3.54	< .001	2.56	2.13–3.08	< .001	2.60	1.96–3.45	< .001	3.02	2.26–4.02	< .001

Table 4 Associations of gender, age and multimorbidity with no residual work capacity stratified to the mental and behavioural disorder diagnosis (multivariable logistic regression analyses)

	Gender (male = ref) OR (95%CI)	**Age OR (95%CI)**	**Multimorbidtty OR (95%CI)**
Mental retardation	0.94 (0.44–1.99)	1.00 (0.97–1.04)	0.86 (0.41–1.81)
Autism spectrum disorders	0.85 (0.46–1.57)	0.99 (0.96–1.01)	0.49 (0.25–0.96)*
ADHD	0.78 (0.31–1.99)	1.00 (0.95–1.05)	0.52 (0.18–1.50)
Somatoform disorders	1.21 (0.68–2.13)	0.96 (0.94–0.99)*	1.21 (0.73–2.01)
Adjustment disorders (including burn-out)	1.10 (0.69–1.81)	1.00 (0.97–1.02)	1.15 (0.72–1.86)
(Post-traumatic) stress disorders	0.79 (0.63–0.98)*	1.00 (0.99–1.01)	0.51 (0.41–0.65)*
Anxiety disorders	1.18 (0.82–1.70)	0.98 (0.96–0.99)*	0.56 (0.38–0.83)*
Personality disorders	1.11 (0.80–1.55)	0.98 (0.97–1.00)	0.44 (0.30–0.65)*
Mood affective disorders	1.06 (0.93–1.21)	1.00 (0.99–1.00)	0.53 (0.46–0.61)*
Addictions	0.72 (0.43–1.19)	0.99 (0.97–1.01)	0.47 (0.29–0.75)*
Schizophrenia and delusional disorders	0.89 (0.60–1.31)	1.01 (0.99–1.03)	0.47 (0.29–0.77)*

*$p < .05$

Table 5 Associations of gender, age, educational level and multimorbidity with the inability to work fulltime stratified to the mental and behavioural disorder diagnosis (multivariable logistic regression analyses)

	Gender (male = ref)	Age	Educational level (low=ref)		Multimorbidity
	OR (95%CI)	OR (95%CI)	Middle OR (95%CI)	High OR (95%CI)	OR (95%CI)
Mental retardation	1.83 (0.77–4.36)	1.06 (1.03–1.10)*	7.03 (1.04–47.32)*	–	1.32(0.53–3.29)
Autism spectrum disorders	1.63 (0.97–2.73)	1.01 (0.99–1.04)	1.74 (0.99–3.05)	1.14 (0.60–2.15)	0.56 (0.34–0.94)*
ADHD	2.52 (1.34–4.74)*	0.98 (0.95–1.01)	1.68 (0.89–3.18)	0.60 (0.24–1.52)	1.36 (0.74–2.48)
Somatoform disorders	1.14 (0.72–1.81)	1.00 (0.98–1.02)	2.05 (1.25–3.38)*	1.28 (0.75–2.19)	1.13 (0.74–1.74)
Adjustment disorders (including burn-out)	2.11 (1.57–2.82)**	1.01 (0.99–1.02)	1.27 (0.92–1.75)	1.08 (0.77–1.51)	1.21 (0.92–1.59)
(Post-traumatic) stress disorders	1.74 (1.35–2.24)**	1.00 (0.99–1.01)	1.08 (0.83–1.40)	0.92 (0.65–1.31)	0.93 (0.72–1.18)
Anxiety disorders	1.36 (1.00–1.86)	1.01 (0.99–1.02)	0.86 (0.62–1.20)	0.77 (0.51–1.17)	1.01 (0.74–1.37)
Personality disorders	1.47 (1.02–2.10)*	1.00 (0.99–1.02)	1.20 (0.81–1.78)	1.86 (1.19–2.90)*	0.87 (0.61–1.25)
Mood affective disorders	1.51 (1.31–1.74)**	1.01 (1.00–1.01)*	0.98 (0.84–1.15)	0.96 (0.80–1.16)	0.94 (0.81–1.08)
Addictions	1.89 (1.02–3.52)*	1.00 (0.97–1.03)	1.29 (0.72–2.32)	0.94 (0.27–3.32)	1.51 (0.82–2.76)
Schizophrenia and delusional disorders	2.61 (1.31–5.23)*	0.98 (0.95–1.01)	0.83 (0.44–1.57)	1.51 (0.63–3.63)	0.69 (0.35–1.40)

*p < .05, **p < .001

DISCUSSION

The findings of our study are in line with our expectations. Especially the diagnoses groups that are associated with a decreased self-reliance (e.g., (post-traumatic) stress disorders, mood affective disorders, schizophrenia and delusional disorders), are associated with increased odds for no residual work capacity. These diagnoses are known to affect the energy levels as well, resulting in increased odds for inability to work fulltime, when there was residual work capacity. On the other hand, diagnoses that affect energy levels less (e.g., ADHD, somatoform disorders) or that are related with emotional disturbances (e.g., personality disorders), showed decreased odds for being assessed with inability to work fulltime. We conducted a similar study regarding applicants diagnosed with cancer as the primary diagnosis [21]. Although when being diagnosed with cancer, other factors, like survival rate, play a role. Our results, indeed, showed that cancers with a low survival rate (like respiratory cancers) were associated with no residual work capacity. However, with regards to being assessed with inability to work fulltime, the results are comparable. Especially cancers that have a negative impact on energy levels (lymphoid and haematopoietic cancers, and cancers of the respiratory organs) showed increased odds for inability to work fulltime [21]. This might not be surprising, as energy deficit and fatigue are mentioned as the primary indicators of inability to work fulltime [11, 12].

Other mental and behavioural disorders, like mental retardation, autism spectrum disorders, ADHD, somatoform disorders, adjustment disorders (including burn-out), and anxiety disorders showed decreased odds for being assessed with no residual work capacity. Additionally, for adjustment, anxiety and personality disorders we found decreased odds for being assessed with inability to work fulltime. This confirms the high variety among mental and behavioural disorders with regards to the ability to work. In other words, diagnosis matters. For mental retardation and developmental disorders like autism spectrum disorders and ADHD, these results may seem surprising, as the employment rates of individuals with these disorders are very low [22,23,24,25]. It is therefore important to realize that our study population concerns individuals who were employed and on sick leave for about 2 years. In the Netherlands young adults with congenital disabilities or disabilities originated during childhood (before the age of 18) can apply for a disability benefit based on 'Invalidity Insurance Act for Young Disabled Persons' (Wajong Act) [26]. As the current sample was already active on the labour market, it is quite possible that insurance physicians are less inclined to assess them with no residual work capacity.

For addiction the results seem counterintuitive, as there is an increased risk for being assessed with no residual work capacity, but a decreased risk for being assessed with an inability to work fulltime. An explanation for this result

could be that the severe cases are admitted to rehabilitation clinics at the time of assessment, and therefore have no residual work capacity. However, the less severe patients, and the patients who are not admitted (anymore) to a clinic, should be able to work fulltime according to the insurance physician. Having an addiction is seen as a chronic condition, but once in remission, does not seem to impact the ability to work in a way that an inability to work fulltime is indicated [27,28,29].

A notable finding is the decreased odds of multimorbidity for being assessed with no residual work capacity within most of the diagnoses groups. The association of being diagnosed with more than one disease seems counterintuitive, because one could expect that this would have an increased impact on work ability. However, we also found this result in our study on residual work capacity and inability to work fulltime within cancer patients [21]. We discussed these findings with insurance physicians, and they thought a possible explanation might be that when the primary diagnosis is so severe and has a major impact on work capacity, they feel further explanation of the medical situation is unnecessary. In these cases, they do not register any additional diagnoses.

Strengths and Limitations

In this study we used register-data of a year cohort of applicants assessed for a work disability benefit after 2 years of sick leave. Using register-data is a strength of our study, as it covers the entire Dutch population including data on socio-demographic variables and all mental and behavioural diagnoses. This gave us the opportunity to compare the work disability assessment outcomes of the specific diagnoses groups. Another strength of our study is the large sample size of work disability benefit assessments by skilled insurance physicians adhering to professional guidelines and assessment methods. On the other hand, using register-data is also a limitation to our study, as the data was not collected for research purposes and therefore information on the severity of the disorder, treatment and personal factors are not available. Furthermore, for the analyses on inability to work fulltime, we had to exclude 1,006 cases due to missing data mostly on educational level. This might have impacted our outcomes, as the prevalence of being assessed with a normal ability to work fulltime was higher among the excluded sample than in the selected sample. Furthermore, because of the cross-sectional design, we are not able to draw conclusions on causal relationships.

Implications for Practice and Future Research

The findings of our study show that the majority of the applicants with mental and behavioural disorders for a work disability benefit have residual work capacity and are assessed with a normal ability to work fulltime. This implies that (supporting) return to work is of great importance among individuals

with mental and behavioural disorders who are on sick-leave as the chances of receiving a work disability benefit, two years after sick-leave, are low. As the disease group 'mental and behavioural disorders' concerns a wide variety of diseases, including a wide variety in the effect on self-reliance, energy levels and emotion regulation, there are large differences between the diagnoses groups for the odds of being assessed with residual work capacity or inability to work fulltime. Applicants of the different diagnoses groups might therefore require a different approach with regards to the assessment and the support for return to work. Our study contributes to providing insight into for which specific diagnoses groups supporting return to work is most useful. Furthermore, our findings can contribute to a more evidence-based assessment of residual work capacity and inability to work fulltime in disability claim assessments, providing insight into which workers within mental and behavioural disorder diagnoses groups are at risk for no residual work capacity and inability to work fulltime.

Our study aimed to explore two important work outcomes of the disability benefit assessment, using register data from the UWV. Future research including other indicators like the individual diagnosis, the severity of the disease, treatment, work limitations and other personal and environmental factors, could provide more insight in possible indicators for no residual work capacity and inability to work fulltime and a clearer understanding of work (dis)ability phenomenology. Additionally, longitudinal studies should be conducted on the work trajectories from the onset of sick leave until after the disability assessment of patients diagnosed with different types mental and behavioural disorders. These studies will provide insight into the possible changes in ability to work of individuals with mental and behavioural disorders before and after the disability benefit assessment. It will also provide insight on the effect of being assessed with (in)ability to work fulltime on actual (return to) work after the assessment.

CONCLUSION

Our results showed that among work disability benefit applicants with a mental or behavioural disorder, about three quarters are assessed with residual work capacity, and of these, the majority is assessed with a normal ability to work fulltime, two years after sick leave. However, the type of mental and behavioural disorder seems important in terms of the assessment of residual work capacity and the ability to work fulltime, as the associations with these outcomes differ significantly between the specific diagnoses groups. The findings of our study can contribute to a more evidence-based assessment of residual work capacity and inability to work fulltime in disability claim assessments, providing insight into which workers within specific diagnoses groups are at risk for both outcomes. Subsequently, our

study provides insight into which workers within specific diagnoses groups are not at risk for both outcomes, and might benefit from additional support to improve return to work.

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7

Inability to work fulltime and the association with paid employment one year after the work disability assessment: a longitudinal register based cohort study

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ABSTRACT

Objectives: Disability benefit applicants with residual work capacity are often not able to work fulltime. In Dutch work disability benefit assessments, the inability to work fulltime is an important outcome, indicating the number of hours the applicant can sustain working activities per day. This study aims to gain insight into the association between inability to work fulltime and having paid employment one year after the assessment.

Methods: The study is a longitudinal register based cohort study of work disability applicants who were granted a partial disability benefit (n=8300). Multivariable logistic regression analyses were conducted to study the association between inability to work fulltime and having paid employment one year after the assessment, separately for working and non-working applicants.

Results: For disability benefit applicants, whether working (31.9%) or not working (68.1%) at the time of the disability assessment, there was generally no association between inability to work fulltime and having paid employment one year later. However, for working applicants diagnosed with a musculoskeletal disease or cancer, inability to work fulltime was positively and negatively associated with having paid employment, respectively. For non-working applicants with a respiratory disease or with multimorbidity, inability to work fulltime was negatively associated with paid employment.

Conclusions: Inability to work fulltime has limited association with paid employment one year after the disability benefit assessment, regardless of the working status at the time of assessment. However, within certain disease groups, inability to work fulltime can either increase or decrease the odds of having paid employment after the assessment.

INTRODUCTION

For people with long-term disabilities, it is often difficult to continue in fulltime jobs due to their health conditions. Reduction of working hours may accommodate these workers to continue in paid employment as working in a parttime job may better match with their residual work capacity [1]. As part of the Dutch disability benefit assessment, long-term sick-listed workers who apply for disability benefits are assessed on their (in)ability to work fulltime. The (in)ability to work fulltime, is one of the key outcomes of the disability benefit assessment, and indicates the number of hours the applicant can sustain working activities per day, and is assessed by insurance physicians from the Dutch Social Security Institute: The Institute for Employee Benefits Schemes (UWV). In previous research we found that about 40% of the workers who apply for disability benefits are assessed as being unable to work fulltime [2]. We also found a large variety between different disease groups, i.e., especially applicants with diagnoses associated with energy deficits, like diseases of the blood, have a higher likelihood of being assessed with inability to work fulltime [2]. Moreover, (in)ability to work fulltime is associated with factors like age, gender, educational level and multimorbidity. Applicants with higher age, higher educational level and multimorbidity, and women have a higher chance of being assessed with inability to work fulltime [2].

Being unable to work fulltime does not mean that these workers are not able to work at all. Most of the applicants are assessed as having residual work capacity and receive partial work disability benefit. Besides financial compensation they are also supported by the UWV to find a suitable new job or to accommodate their current job in a way that the work requirements match with their residual work capacity. From previous research it is known that reduction of working hours may accommodate workers in the return to work process [1, 3]. Høgelund and Holm [4] found that reduced working hours was the most common (about one-third) workplace accommodation among a sample of sick-listed workers. Another multinational cohort study described that working hours adaptations were significantly related to earlier sustainable return to work for applicants with chronic occupational back pain [5]. Butler et al. [6] found that workers with permanent partial impairments who returned to work with work accommodations as reduced working hours had significantly more stable labour market attachment than workers who did not have work accommodations. In a more recent survey study, it was found that about half of the employed cancer survivors received reduced hours and that receipt of this type of workplace accommodation strongly increased the continued employment of cancer survivors five years after diagnosis [7]. Within the social security setting, it is known that having paid employment at the time of the disability assessment has major impact on labour participation in later years: those working (part- and fulltime) and having paid employment

continue to participate more [8-10]. Gaining insight into the impact of inability to work fulltime as an outcome of work disability assessment and having paid employment after the assessment among workers and non-workers at the time of assessment and applicants with different diagnoses may help develop approaches to support applicants assessed with an inability to work fulltime.

Within this context, the aim of this study was to examine the association between inability to work fulltime and paid employment one year after the disability benefit assessment in a nationwide register study of Dutch applicants who applied for disability benefits and were granted a partial disability benefit. The second aim was to study if the association is moderated by socio-demographic and disease-related factors. We conducted the analyses for applicants who had and did not have paid employment at the time of the work disability benefit assessment separately, as having paid employment at the time of the assessment is known to have an effect on labour participation in later years.

METHODS

Setting

In the Netherlands, long-term disability benefits can be applied for under the Work and Income Act (WIA) Netherlands [11] after two years of sick leave by both employed and unemployed workers. The insurance physician of UWV evaluates the health situation of an applicant and first determines the residual work capacity based on several criteria. Applicants are assessed with no residual work capacity on specific conditions: (1) total work capacity loss within three months, (2) terminal disease with foreseeable total work capacity loss, (3) fluctuating work capacity, (4) hospitalization, or (5) lack of self-reliance due to severe mental or physical disorders [12]. If any of these apply, the insurance physician determines (permanent or non-permanent) full work disability. If applicants have residual work capacity, the insurance physician continues the assessment indicating potential limitations caused by their disease using the Functional Ability List (FAL) [13, 14]. Part of the assessment involves a conclusion about the (in)ability to work fulltime, reported as the number of hours the applicant can sustain working activities per day. Particularly energy deficit, fatigue and increased need for rest are primary indicators of inability to work fulltime [15]. Following the medical disability benefit assessment by the insurance physician, the earning capacity is evaluated by a labour expert of the UWV. The disability benefit amount is determined based on the income loss, comparing the pre-sick leave earnings of the applicant with the income that can be generated considering the assessed residual work capacity, with a threshold of 35% to be granted a partial disability benefit. Applicants may fall into four categories: 1) full and permanent work disability, (2) non-permanent but full work disability, (3)

partial work disability, or (4) no work disability. Individuals in the last two groups have residual earnings capacity and are encouraged to continue (part-time) employment with their current employer or seek a new (part-time) job that aligns with their residual work capacity. The UWV holds register data of these assessments, and has access to data on paid employment and income of all residents of the Netherlands.

Data

Data on socio-demographic factors, diagnoses and assessment outcomes including the estimation of inability to work fulltime were derived from the disability benefit assessment register of UWV and included all disability benefits assessments in 2016. These data were linked to register data on work status and income at the time of assessment up to one year after the assessment. UWV provided anonymized data. When studying the association between inability to work fulltime and having paid work, a follow-up of one year is suitable as it is likely that changes in the health-, social and societal situation impacting return to work will occur when the follow-up period increases. Longer follow-up makes it difficult to disentangle the impact of the inability to work fulltime assessment with impact from these changes.

Design and study sample

The study is a longitudinal register based cohort study of work disability applicants assessed with residual work capacity and who were granted a partial disability benefit in 2016. In 2016, N=40,263 workers applied for a disability benefit. Of these, N=30,177 (74.9%) were assessed with residual work capacity [2]. For this study, only applicants with residual work capacity who were granted a partial disability benefit were included. Therefore, applicants granted no (30.5%) or full (41.2%) disability benefit were excluded (n=21,624, 71.7%). Additionally, applicants who died, retired, or were detained for a period of time, within one year after the assessment (n=104), and those with missing data on the variables included in the analyses (n=149) were also excluded from the study. The final study sample for the current study included n=8300 applicants, which was 20.6% of all work disability benefit applicants in the Netherlands in 2016; see Figure 1. The Medical Ethics Review Board of the University Medical Center Groningen concluded (METc 2018/570, 23-10-2018) that this study is not clinical research with human subjects as meant in the Medical Research Involving Human Subjects Act (WMO).

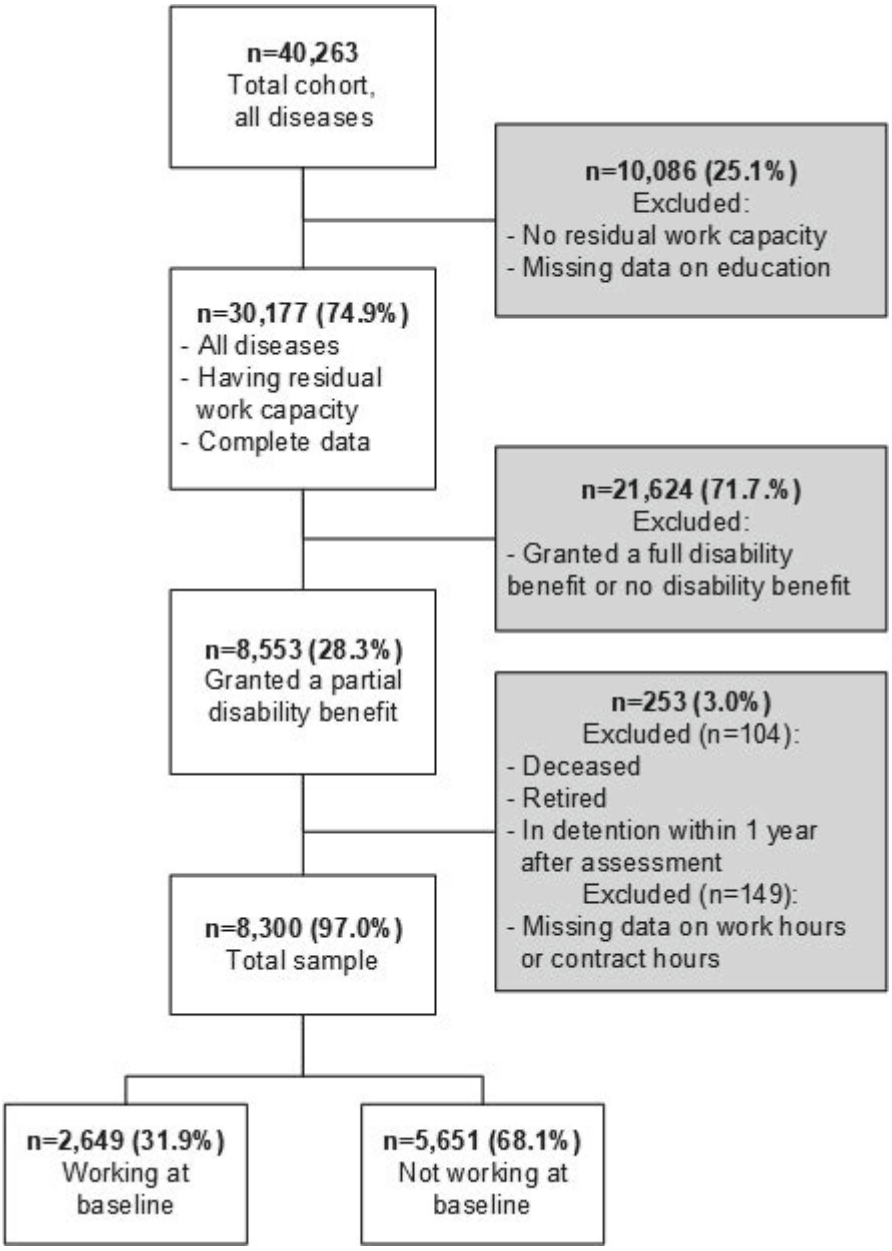

Figure 1. Flow chart of the study sample

Measures

Dependent variable: Paid employment

Paid employment was defined as being employed and working with income of 12 hours or more per week, in line with previous research [16]. Not having paid employment was defined as not working or working with income less than 12 hours per week. For the determination of having paid employment at baseline (i.e. at the time of disability assessment), register data on work status at four months after the disability assessment was used, as it usually takes time before employment transitions, such as termination of a contract, are administered in the income records [17]. Applicants were considered to have paid employment at one year follow-up when they were employed and working with income of 12 hours or more per week, for at least 3 consecutive months around the period of 12 months after the date of the disability assessment.

Independent variable: (In)ability to work fulltime

The (in)ability to work fulltime was assessed by an insurance physician and reported by the number of hours per week an applicant is able to work on a five-point scale ranging from no more than two hours per day to at least eight hours per day. Being able to work eight or more hours per day was considered as having a normal ability to work, being able to work six hours or less per day, was considered as having an inability to work fulltime.

Socio-demographic and disease-related factors

Socio-demographic factors included age at date of assessment, sex (male/female), educational level and working hours before sick leave. Age was classified according to working life stages: early (up to 35 years), mid (35 up to 50 years) and late (50 years and older) work life stage. Educational level was categorized into low (primary school, lower vocational education, lower secondary school), middle (intermediate vocational education, upper secondary school), and high (upper vocational education, university). Working hours per week were classified as the number of hours an applicant worked the year before sick leave, which is roughly two years before the work disability assessment. Working less than 32 hours per week was considered part time work. The type of diagnosis was registered by the insurance physician using the Dutch Classification of Occupational Health and Social Insurance (CAS), derived from the International Statistical Classification of Disease and Related Health Problems [18]. For generalizability, the primary, secondary and tertiary (when available) CAS-diagnoses were recoded to the 22 chapters of the ICD10. For the primary disease group in the multivariable logistic regression model, the variable was recoded into 15 categories, due to a small sample size in certain disease groups. We differentiated 14 ICD10-disease groups with 25 cases or more in the subsamples working or not

working at baseline, and combined all other ICD-10 chapters (with n<25 in either the subsample working or not working at baseline) to the group 'all other diseases' (e.g. infectious and parasitic diseases, diseases of the skin, diseases related to pregnancy, childbirth and the puerperium, congenital malformations, factors influencing health status). Multimorbidity was defined as having one or more additional diagnoses from a different ICD10 chapter than the primary diagnosis.

Statistical methods

First, descriptive statistics were used to describe the baseline characteristics for the total sample, and separately for applicants working and not working at baseline. Baseline characteristics were compared using Chi^2-tests. To give insight into paid employment and inability to work fulltime for each disease group, frequencies and percentages of 1) having paid employment at baseline (total group), 2) having paid employment one year after the disability assessment and 3) being assessed with inability to work fulltime (separately for applicants working and not working at baseline), are displayed per disease group.

Second, univariable and multivariable logistic regression analyses were performed to study the association of being assessed with an inability to work fulltime and having paid employment one year after the assessment. The univariable logistic regression analyses concerns the crude model. The multivariable logistic regression analyses were conducted in three steps to gain insight into the effect of socio-demographic and disease-related factors on the association of inability to work fulltime on having paid employment. Model 1 was adjusted for work life stage, gender, educational level, and contract hours at date of sick leave. Model 2 was additionally adjusted for disease groups, and Model 3 was additionally adjusted for multimorbidity.

Third, to examine if the associations of being assessed with inability to work fulltime and having paid employment one year after assessment were moderated by socio-demographic and disease-related factors, interaction terms were added to the final model (Model 3). The interaction effects of work life stage, gender, educational level, contract hours at date of sick leave, primary diagnosis (14 categories and 'all other diseases') and multimorbidity were all analysed separately. For primary diagnosis, disease group neoplasms was considered the reference group. In case of a significant interaction concerning a variable with more than two categories, analyses were stratified by the moderator under investigation, adjusting for all other factors.

For the interaction analyses, a two-sided p-value of <.10 was considered to indicate statistical significance, for all other analyses a p-value of <.05 was considered to indicate statistical significance. IBM SPSS Statistics version 28 was used to perform the analyses.

RESULTS

Sample description

Of the analytic study sample (n=8300), 68.1% of the applicants did not work at baseline, 54.2% were in their late work life stage and 45.8% were women (Table 1). Of all applicants, 44.9% were assessed with inability to work fulltime, but being assessed with inability to work fulltime varied greatly between different disease groups (Appendix Table I). Applicants working at time of the assessment were more often women (51.2%) and the majority was assessed with inability to work fulltime (55.7%) (Table 1). The applicants who were not working at baseline were less often women (43.2%) and the minority was assessed with inability to work fulltime (39.8%).

Table 1. Characteristics of the applicants, and differences between applicants working and not working at the time of work disability benefit assessment (baseline)

	Total group (n = 8300 n (%)	Working at baseline (n = 2649) n (%)	Not working at baseline (n = 5651) n (%)	p-value
Work life stage				0.013
Early work life stage (up to 35 years)	1050 (12.7%)	304 (11.5%)	746 (13.2%)	
Mid work life stage (35 to 50 years)	2753 (33.2%)	853 (32.2%)	1900 (33.6%)	
Late work life stage (from 50 years)	4497 (54.2%)	1492 (56.3%)	3005 (53.2%)	
Female gender	3800 (45.8%)	1357 (51.2%)	2443 (43.2%)	<.001
Education level				<.001
Low	3381 (40.7%)	792 (29.9%)	2589 (45.8%)	
Middle	3023 (36.4%)	990 (37.4%)	2033 (36.0%)	
High	1896 (22.8%)	867 (32.7%)	1029 (18.3%)	
Contract hours at date of sick leave (>32h per week)	5812 (70.0%)	1797 (67.8%)	4015 (71.0%)	0.002
Inability to work fulltime	3723 (44.9%)	1476 (55.7%)	2247 (39.8%)	<.001
Having paid employment at one year follow-up	2872 (34.6%)	2204 (83.2%)	668 (11.8%)	0.000
ICD10 Disease groups				
Neoplasms	566 (6.8%)	304 (11.5%)	262 (4.6%)	<.001
Diseases of the blood and blood-forming organs	108 (1.3%)	44 (1.7%)	64 (1.1%)	
Endocrine, nutritional and metabolic disorders	127 (1.5%)	37 (1.4%)	90 (1.6%)	
Mental and behavioural disorders	3062 (36.9%)	797 (30.1%)	2265 (40.1%)	
Diseases of the nervous system	329 (4.0%)	158 (6.0%)	171 (3.0%)	
Diseases of the eye and adnexa	61 (0.7%)	29 (1.1%)	32 (0.6%)	
Diseases of the ear and mastoid process	80 (1.0%)	25 (0.9%)	55 (1.0%)	
Diseases of the circulatory system	626 (7.5%)	267 (10.1%)	359 (6.4%)	
Diseases of the respiratory system	178 (2.1%)	56 (2.1%)	122 (2.6%)	
Diseases of the digestive system	153 (1.9%)	59 (2.2%)	94 (1.7%)	
Diseases of the musculoskeletal system	1940 (23.4%)	509 (19.2%)	1431 (25.3%)	
Diseases of the genitourinary system	94 (1.1%)	49 (1.8%)	45 (0.8%)	
Symptoms, signs and abnormal clinical and laboratory findings	382 (4.6%)	97 (3.7%)	285 (5.0%)	
Injury, poisoning and other consequences of external causes	474 (5.7%)	171 (6.5%)	303 (5.4%)	
All other diseases	120 (1.4%)	47 (1.8%)	73 (1.3%)	
Multimorbidity	4256 (51.3)	1219 (46.0%)	3037 (53.7%)	<.001

Associations of inability to work fulltime and paid employment

For applicants working at baseline, being assessed with inability to work fulltime was significantly associated (OR 1.31, 95%CI 1.07-1.61) with having paid employment one year after the assessment in the crude model (Table 2). The association remained significant after adjusting for socio-demographic factors (OR 1.32, 95%CI 1.07-1.62) but not after additional adjustment for disease-related factors (OR 1.14, 95%CI 0.92-1.42). For applicants not working at baseline, no significant associations between the assessment of inability to work fulltime and having paid employment one year after the assessment were found.

Table 2. Associations of inability to work fulltime and having paid employment one year after the assessment, stratified by working and not working at baseline (univariable and multivariable logistic regression analyses)

	Working at baseline (n = 2649)			Not working at baseline (n = 5651)		
	OR	95% CI	p-value	OR	95%CI	p-value
Univariable	1.312	1.070-1.609	.009	1.061	0.900-1.250	.480
Multivariable						
Model 1*	1.316	1.070-1.620	.009	0.958	0.804-1.141	.631
Model 2**	1.143	0.919-1.422	.229	0.942	0.783-1.133	.525
Model 3***	1.148	0.923-1.428	.215	0.935	0.777-1.125	.476

* Model 1: Adjusted for work life stage, gender, educational level, contract hours at date of sick leave.

** Model 2: Adjusted for all variables of Model 1 and for disease groups.

*** Model 3: Adjusted for all variables of Model 2 and for multimorbidity.

OR odds ratio*, CI* confidence interval

Moderation of inability to work fulltime by socio-demographic and disease-related factors

Inability to work fulltime was not significantly moderated by socio-demographic factors in both the working and non-working applicants. For the applicants working at baseline, the interaction of inability to work fulltime with disease groups showed a significant association with having paid employment one year after assessment. Similarly, for applicants who were non-working, the interaction of inability to work fulltime with disease groups showed a significant association with having paid employment one year after the assessment. Additionally, within this group the interaction of inability to work fulltime with multimorbidity also showed a significant association (OR 0.71, 95%CI 0.51-1.00) with having paid employment one year after the assessment (Appendix Table II).

Table 3. Paid employment one year after assessment and associations of inability to work fulltime with having paid employment one year after the assessment, stratified by ICD10 disease groups and to working and not working at baseline (multivariable logistic regression adjusted for work life stage, gender, educational level, multimorbidity and contract hours at date of sick leave)

	Working at baseline				Not working at baseline			
ICD10 Disease groups	**Paid employment 1 year follow-up N (%)***	**OR**	**95% CI**	**p-value**	**Paid employment 1 year follow-up N (%)***	**OR**	**95%CI**	**p-value**
Neoplasms	274 (90.1%)	0.398	0.133-1.190	.099	26 (9.9%)	0.656	0.278-1.544	.334
Diseases of the blood and blood-forming organs	43 (97.7%)	0.183	0.000	1.000	14 (21.9%)	1.008	0.238-4.278	.991
Endocrine, nutritional and metabolic disorders	28 (75.7%)	0.465	0.075-2.903	.413	12 (13.3%)	0.000	0.000	.998
Mental and behavioural disorders	600 (75.3%)	1.058	0.756-1.481	.741	298 (13.2%)	1.082	0.832-1.409	.556
Diseases of the nervous system	139 (88.0%)	2.329	0.748-7.250	.144	22 (12.9%)	1.427	0.464-4.383	.535
Diseases of the eye and adnexa	28 (96.6%)	0.004	0.000	1.000	4 (12.5%)	2.090	0.037-117.336	.720
Diseases of the ear and mastoid process	19 (76.0%)	0.206	0.006-7.307	.386	0 (0%)	-**	-	-
Diseases of the circulatory system	235 (88.0%)	1.323	0.573-3.054	.512	32 (8.9%)	0.998	0.461-2.159	.996
Diseases of the respiratory system	44 (78.6%)	1.695	0.339-8.482	.521	8 (6.6%)	0.149	0.020-1.120	.064
Diseases of the digestive system	55 (93.2%)	3.259	0.088-120.880	.522	17 (18.1%)	1.819	0.403-8.209	.437
Diseases of the musculoskeletal system	433 (85.1%)	2.194	1.204-4.000	.010	148 (10.3%)	0.839	0.490-1.435	.521
Diseases of the genitourinary system	42 (85.7%)	0.132	0.009-1.966	.142	7 (15.6%)	0.474	0.057-3.930	.489
Symptoms, signs and abnormal clinical and laboratory findings	87 (89.7%)	2.464	0.468-12.967	.287	31 (10.9%)	0.562	0.216-1.461	.237
Injury, poisoning and other consequences of external causes	137 (80.1%)	0.914	0.402-2.080	.831	41 (13.5%)	0.813	0.359-1.839	.619
All other diseases	40 (85.1%)	7.536	0.244-232.292	.248	8 (11.0%)	0.434	0.035-5.382	.516

* N (%) within applicants working or not working at baseline

** None of the applicants were having paid employment one year after the assessment, therefore analyses were not possible.

OR odds ratio, *CI* confidence interval

As inability to work fulltime was significantly moderated by disease groups (a variable with more than two categories) for both the applicants working and not working at baseline, multivariable logistic regression analyses stratified to disease groups were conducted.

For applicants working at baseline and having a disease of the musculoskeletal system, being assessed with inability to work fulltime showed increased odds (OR 2.19, 95%CI 1.20-4.00) for having paid employment one year after the assessment. Furthermore, for applicants assessed with neoplasms, being assessed with inability to work fulltime was significant at the level of p<.10 to having decreased odds for having paid employment one year after the assessment (OR 0.40, 95%CI 0.13-1.19).

For applicants not working at baseline, within none of the disease groups inability to work fulltime was significantly associated with having paid employment one year later. However, inability to work fulltime showed a significant association at the p-level <.10 to having decreased odds of having paid employment within the group diseases of the respiratory system (OR 0.15, 95%CI 0.02-1.12). See Table 3 for more details.

DISCUSSION

Our aim was to examine the association of being assessed with inability to work fulltime with having paid employment one year after the disability assessment, separately for applicants working and not working at the time of assessment. Our results showed that for the total sample, inability to work fulltime was not associated with having paid employment one year later when adjusted for socio-demographic and disease-related factors. However, our results showed that the type of chronic disease moderated the associations between the inability to work fulltime and paid employment. The inability to work fulltime increased the odds of having paid employment one year later for those working at baseline with musculoskeletal diseases. For those working at baseline with a neoplasm, and those not working at baseline with a disease of the respiratory system, inability to work fulltime decreased the odds of having paid employment one year later. Socio-demographic factors did not moderate the association between the inability to work fulltime and employment one year later.

In our study population, 44.9% of the applicants who were granted a partial disability two years after sick leave, were assessed with inability to work fulltime. We did not find evidence that being assessed with inability to work fulltime supports or hinders workers with residual work capacity to remain or re-enter in paid employment in the total samples, but did find associations within specific disease groups. We found a beneficial effect of inability to work fulltime on having paid employment one year later for those applicants who worked at the time of assessment and were diagnosed with a musculoskeletal

disease. Moreover, we found borderline significant associations ($p<0.10$) between inability to work fulltime and paid employment for working applicants with neoplasm and for non-working applicants diagnosed with a disease of the respiratory system.

A possible explanation for the disease-specific findings is that diseases of the musculoskeletal system are mostly chronic conditions resulting in more physical (non-energetic) participation restrictions with a lower risk of being assessed with inability to work fulltime [2] while diseases resulting in energy deficits are known to be related with an inability to work fulltime [2]. As diseases of the musculoskeletal system usually have a stable prognosis regarding the limitations, and occupational physicians and employers are familiar with adjusting work to these limitations [17, 19-21] applicants who still (partly) work at the time of assessment will have a fair chance to remain in the adjusted work [22-24]. On the other hand, for cancer survivors it might be difficult to stay in paid employment due to the impact on energy levels and cognitive functioning [25-27]. This may explain the negative association which was found between inability to work fulltime and paid employment one year after the disability assessment. The findings for applicants not working at baseline with diseases of the respiratory system (e.g. pneumonia, emphysema, chronic obstructive pulmonary disease and pneumoconiosis), that inability to work fulltime lowers the chance of having paid work one year later, is in line with an international survey in 2011, showing that 40% of the working population had retired prematurely because of COPD [28]. Most of the diseases of the respiratory system are chronic with a negative effect on energy and endurance and with a higher risk [2] to be unable to work fulltime. The findings on multimorbidity may also be due to be more at risk for involuntary labour market exit in comparison to those workers without or with one a chronic health condition [29, 30]. Especially those applicants with multiple chronic diseases may not be able to work fulltime and will have more problems finding paid employment as they have more severe medical problems, resulting in more work limitations, than those diagnosed with one disease or those who are able to work fulltime.

Strengths and limitations

A strength of the study is the large sample size, including register data of a Dutch year cohort of applicants for work disability benefit, granted a partial disability benefit in 2016. Data included socio-demographics, all diagnoses, and monthly work status in 2016 and 2017. Furthermore, all assessments were carried out by skilled professionals, adhering to professional guidelines and assessment methods. Although the sample size of our study is large and the data are rich, possible confounders such as severity of diseases, symptoms of the diseases and the course of the disease after the assessment, and personal

(e.g. motivation) and environmental (e.g. work accommodations, support at the job) factors, are not included in the data, which is a limitation of our study. Furthermore, having an insufficient amount of energy for work, expressed in an inability to work fulltime, also impacts other daily activities as self-care, social activities, and household and leisure activities. People with inability to work fulltime could, based on their situation, possibilities and preferences, decide or being forced to restrict working activities or restrict their activities in other fields of daily participation to stay in a certain balance [31]. We have no insight into the factors playing a role in this decision-making process from our register data.

Implications for practice and future research

This study shows that for both working and non-working disability benefit applicants the association of inability to work fulltime with having paid employment one year after the assessment is limited, but within specific disease groups, inability to work fulltime was either positively or negatively associated with having paid employment. Especially applicants with a disease of the musculoskeletal system may benefit from being assessed with inability to work fulltime, whereas applicants with neoplasm, a disease of the respiratory system and applicants diagnosed with more than one chronic disease, inability to work fulltime hinders having paid employment after the disability benefit assessment. Occupational and insurance physicians can integrate this knowledge in supporting workers on sick-leave with return to work, and in the assessment of work disability. Considering the potential to work part-time can be useful for supporting these applicants to remain in paid employment after assessment, also to convince employers to let these people stay in their job two years after sick leave. However, further research is needed to gain more insight into how being assessed with inability to work fulltime contributes or hinders stay at work and return to work after the disability benefit assessment.

Additionally, in our study, we only focused on the applicants who were granted a partial disability benefit, as they are partially compensated and are expected to find a job for the part of income loss. Future research on inability to work fulltime and paid employment might include other samples as the associations of being assessed with inability to work fulltime and paid employment after the assessment might be different for those applicants who were granted a full or no work disability benefit. Subsequently, we only looked into having paid employment after the assessment. To gain more detailed knowledge about the impact of the assessment of work disability on labour market participation, future research could focus on other outcomes such as the increase or decrease in number of hours someone works one year after the assessment.

CONCLUSION

This study shows that for both working and non-working disability benefit applicants the association of inability to work fulltime with having paid employment one year after the assessment is limited. However, within specific disease groups, inability to work fulltime increases or decreases the odds of having paid employment. For applicants working at baseline and diagnosed with a musculoskeletal disease, inability to work fulltime was positively associated with having paid employment one year later. For applicants with cancer, respiratory diseases and multimorbidity, inability to work fulltime showed a trend towards significance in being negatively associated with having paid employment a year later.

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APPENDIX

Table I. Prevalence of inability to work fulltime per ICD10 disease group for the total sample and separately for working and not working at baseline

	Total			Working at baseline		Not working at baseline	
ICD10 Disease groups	**N (%)***	**Working at baseline N (%)****	**Not working at baseline N (%)****	**Inability to work fulltime N (%)****	**Ability to work fulltime N (%)****	**Inability to work fulltime N (%)****	**Ability to work fulltime N (%)****
Neoplasms	566 (6.8%)	304 (53.7%)	262 (46.3%)	275 (90.5%)	29 (9.5%)	180 (68.7%)	82 (31.3%)
Diseases of the blood and blood-forming organs	108 (1.3%)	44 (40.7%)	64 (59.3%)	40 (90.9%)	4 (9.1%)	55 (85.9%)	9 (14.1%)
Endocrine, nutritional and metabolic disorders	127 (1.5%)	37 (29.1%)	90 (70.9%)	27 (73.0%)	10 (27.0%)	38 (42.2%)	52 (57.8%)
Mental and behavioural disorders	3062 (36.9%)	797 (26.0%)	2265 (74.0%)	518 (65.0%)	279 (35.0%)	1395 (61.6%)	870 (38.4%)
Diseases of the nervous system	329 (4.0%)	158 (48.0%)	171 (52.0%)	137 (86.7%)	21 (13.3%)	106 (62.0%)	65 (38.0%)
Diseases of the eye and adnexa	61 (0.7%)	29 (47.5%)	32 (52.5%)	20 (69.0%)	9 (31.0%)	9 (28.1%)	23 (71.9%)
Diseases of the ear and mastoid process	80 (1.0%)	25 (31.3%)	55 (68.8%)	16 (60.0%)	9 (40.0%)	26 (45.5%)	29 (54.5%)
Diseases of the circulatory system	626 (7.5%)	267 (42.7%)	359 (57.3%)	210 (78.7%)	57 (21.3%)	185 (51.5%)	174 (48.5%)
Diseases of the respiratory system	178 (2.1%)	56 (31.5%)	122 (68.5%)	40 (71.4%)	16 (28.6%)	78 (63.9%)	44 (36.1%)
Diseases of the digestive system	153 (1.9%)	59 (38.6%)	94 (61.4%)	54 (91.5%)	5 (8.5%)	67 (71.3%)	27 (28.7%)
Diseases of the musculoskeletal system	1940 (23.4%)	509 (26.2%)	1431 (73.8%)	225 (44.2%)	284 (55.8%)	280 (19.6%)	1151 (80.4%)
Diseases of the genitourinary system	94 (1.1%)	49 (52.1%)	45 (47.9%)	44 (89.8%)	5 (10.2%)	36 (80.0%)	9 (20.0%)
Symptoms, signs and abnormal clinical and laboratory findings	382 (4.6%)	97 (25.4%)	285 (74.6%)	62 (63.9%)	35 (36.1%)	110 (38.6%)	175 (62.4%)
Injury, poisoning and other consequences of external causes	474 (5.7%)	171 (36.1%)	303 (63.9%)	86 (50.3%)	85 (49.7%)	104 (34.3%)	199 (65.7%)
All other diseases	120 (1.4%)	47 (39.2%)	73 (60.8%)	35 (74.5%)	12 (25.5%)	33 (45.2%)	40 (54.8%)

* Percentage of diseases within of total sample ** Percentage of (not) working and (in)ability to work fulltime within disease groups

Table II. Interactions of inability to work fulltime with socio-demographic and disease-related factors on the association with having paid employment one year after the assessment, separately for applicants working and not working at baseline (multivariable logistic regression analysis)

	Working at baseline (n=2649)			Not working at baseline (n=5651)		
	OR	**95% CI**	**p-value**	**OR**	**95%CI**	**p-value**
Work life stage (early – ref)*inability to work fulltime						
Mid work life stage (35.00 to 50.00 years)	0.693	0.325-1.477	.342	0.759	0.472-1.221	.256
Late work life stage (from 50.00 years)	1.031	0.499-2.127	.935	0.703	0.433-1.142	.155
Female gender*inability to work fulltime	0.828	0.541-1.266	.383	1.077	0.762-1.523	.675
Educational level (low – ref)*inability to work fulltime						
Mid	0.700	0.407-1.203	.196	1.082	0.737-1.587	.688
High	0.742	0.435-1.264	.272	1.189	0.756-1.872	.454
Contract hours (>32h)*inability to work fulltime	0.928	0.600-1.434	.735	1.193	0.798-1.784	.389
ICD10 Disease groups*inability to work fulltime						
Neoplasms – reference group						
Diseases of the blood and blood-forming organs	.000	0.000	.999	1.481	0.307-7.148	.625
Endocrine, nutritional and metabolic disorders	1.191	0.175-8.131	.858	0.000	0.000	.998
Mental and behavioural disorders	2.521	0.809-7.860	.111	1.682	0.711-3.979	.237
Diseases of the nervous system	3.958	0.893-17.541	.070	3.000	0.820-10.970	.097
Diseases of the eye and adnexa	.000	.000	.999	3.911	0.373-41.048	.256
Diseases of the ear and mastoid process	3.744	0.406-34.530	.244	1.626	0.000	1.000
Diseases of the circulatory system	2.813	0.727-10.887	.134	1.459	0.485-4.384	.501
Diseases of the respiratory system	2.350	0.412-13.420	.336	0.488	0.089-2.669	.408
Diseases of the digestive system	5.063	0.363-70.557	.228	3.743	0.775-18.065	.100
Diseases of the musculoskeletal system	5.357	1.567-18.310	.007	1.171	0.445-3.086	.749
Diseases of the genitourinary system	0.810	0.069-9.580	.867	0.755	0.116-4.931	.769
Symptoms, signs and abnormal clinical and laboratory findings	3.474	0.619-19.504	.157	0.691	0.199-2.400	.561
Injury, poisoning and other consequences of external causes	2.438	0.645-9.212	.189	1.236	0.406-3.769	.709
All other diseases	1.728	0.215-13.856	.607	0.272	0.027-2.742	.269
Multimorbidity*inability to work fulltime	1.057	0.696-1.604	.794	0.713	0.508-1.001	.051

OR odds ratio*, CI* confidence interval, *ref* reference group

8

General discussion

GENERAL DISCUSSION

The overall aim of this thesis was to explore, conceptualize and operationalize the concept 'Inability to Work Fulltime' in the context of work disability benefit assessments. This chapter summarizes and discusses the main findings of the thesis, addressing methodological considerations and implications for both practice and research, and closing with its leading conclusions.

MAIN FINDINGS

Research question 1: What does the concept inability to work fulltime entail, and how can this be measured?

In the first part of the thesis, we aimed to conceptualize and operationalize the concept of inability to work fulltime. In Chapter 2 we further contributed to this aim by interviewing occupational and insurance physicians and representatives of patient organizations. Our qualitative study found inability to work fulltime explained as 'inability to work normal working hours'; this concept is considered complex to operationalize -- it is strongly individually determined and variable, affected by changes over time as well as change in the underlying disease. However, we found three measurable indicators: fatigue, cognitive impairments, and restrictions in functioning in- and outside work. A combination of methods (e.g., assessment interviews, testing, and assessment in the actual work setting) and measurements at different time points were considered the most suitable way to assess inability to work fulltime in the context of work disability benefits.

Our international survey study (Chapter 3) provided additional information about whether the (in)ability to work fulltime (in that study called 'work endurance') is also assessed in other social security systems across Europe, and if so, about the assessment procedures used. We gathered data from 16 countries; these showed that the ability to work fulltime is indeed assessed in most countries. It is considered normal when a person is able to work the standard fulltime working hours per week, ranging from 35.0 (France) to 42.0 (Switzerland). General energy deficit was reported as an important indication of limited ability to work fulltime. Our findings indicated some significant differences in definitions, operationalization, and measures. In some countries, (in)ability to work fulltime is defined as the maximum time during which a person is able to sustain specific physical activities (walking, standing, sitting) without interruption; others define it more generally, as the maximum time during which a person is able to perform suitable work. In all countries, all somatic and mental diagnoses were accepted as causes of inability to work fulltime however, countries showed inconsistencies regarding whether other factors (i.e., psychosocial and environmental factors) could

be accepted as causes. Clinical tests, functional capacity evaluations, and psychological tests were the most commonly used methods to assess inability to work fulltime, although all countries mentioned different combinations of methods as suitable for this purpose. In all countries, research on this topic was found to be very limited, and only in the Netherlands was a guideline (not evidence-based) available. More evidence on this concept is obviously warranted, considering the huge impact of these assessment outcomes for both society and the individual.

Research question 2: What is the prevalence of inability to work fulltime and what are associated socio-demographic and disease-related factors?

The research described in Chapters 4 to 6 used different study samples to examine the prevalence of inability to work fulltime and associated socio-demographic and disease-related factors. In Chapter 4, we used register-based data of a year cohort of 30,177 sick-listed workers applying for long-term work disability benefits according to the Work and Income Act (WIA), including all types of diagnoses.

This study showed an almost 40% overall prevalence of inability to work fulltime. Of these applicants unable to work fulltime, the majority could not work more than 4 hours per day. We found that applicants with higher age, female gender, higher educational level (compared to lower level) and multimorbidity had a significantly higher risk of an inability to work fulltime. This risk varied between disease groups, with diseases of the blood, the respiratory system, neoplasms, and diseases of the genitourinary and circulatory system indicating higher odds, and musculoskeletal diseases, the largest group in the sample, indicating lower odds.

In Chapters 5 and 6, we used the same dataset, but included only applicants whose primary diagnosis involved a cancer (Chapter 5) or a mental and behavioral disorder (Chapter 6) to further explore inability to work fulltime within these disease groups. For applicants diagnosed with cancer, we found a prevalence of 69.8% inability to work fulltime, and for the group diagnosed with a mental disorder, a prevalence of 41.4%. Different associations between socio-demographic and disease-related factors were identified in both groups. For applicants diagnosed with cancer, age and female gender were significantly associated with higher risk of inability to work fulltime. For applicants diagnosed with a mental disorder, age and female gender were again significantly associated with higher risk of inability to work fulltime.

Regarding disease-related factors, for both cancer and mental disorders we found differences between type of diagnoses and inability to work fulltime. Applicants diagnosed with lymphoid and haematopoietic cancers showed higher risks of being assessed as unable to work fulltime, whereas being diagnosed with cancer of the musculoskeletal (locomotor) system indicated

lower risks (Chapter 5). Applicants with mental disorders, delusional disorders, (post-traumatic) stress disorders or mood disorders were found to be at higher risk, while those with personality or anxiety disorders were at lower risk, of being assessed as unable to work fulltime (Chapter 6). Within cancer groups, higher age (for applicants with cancers of the breast), and female gender (for applicants with lymphoid and haematopoietic cancers), were significantly associated with higher risk of inability to work fulltime. Within mental disorder groups, for applicants with mental retardation or a mood affective disorder, higher age was associated with an increased risk of inability to work fulltime, whereas for applicants with ADHD, adjustment disorders (including burn-out), (post-traumatic) stress disorders, personality disorders, mood affective disorders, addictions, schizophrenia and delusional disorders, female gender was significantly associated with higher risk of inability to work fulltime. A middle- to high educational level (compared to a low educational level) was linked to increased risk of inability to work fulltime for applicants with mental retardation, a somatoform disorder, or a personality disorder (Chapter 6). Only for applicants who had an autism spectrum disorder multimorbidity was negatively associated with inability to work fulltime. Multimorbidity was operationalized as having one or more additional diagnoses from different disease groups.

Research question 3: What is the association between inability to work fulltime and having paid employment one year after the work disability benefit assessment?

In the final study (Chapter 7), we aimed to explore the association between inability to work fulltime and having paid employment a year later; this involved evaluation of the moderating effects of socio-demographic and disease-related factors. We conducted separate analyses for workers (partly) employed in a paid job at the time of assessment, and for those not employed in a paid job, as we expected that the risk of having paid employment one year after the assessment could differ between these groups.

After adjusting for disease-related factors, we found no associations between inability to work fulltime and having paid employment one year after the work disability benefit assessment, both for applicants working and not working at the time of the assessment. Furthermore, we found no discrimination for age, gender, and educational level, as none of these variables moderated the associations. When we looked into the associations within the diagnosis groups, we found that for applicants working at time of assessment and diagnosed with a musculoskeletal disease, inability to work fulltime was positively associated with having paid employment one year later. For applicants not working, the association of inability to work fulltime with paid employment was moderated by having multimorbidity: for those with

multiple diagnoses, inability to work fulltime reduced the risks of returning to paid employment after the work disability benefit assessment.

Reflections on the findings

The studies in this thesis shed light on the complexity of the construct 'inability to work fulltime', and provide novel insights into the definition and operationalization of the construct, the prevalence and associated sociodemographic and disease-related factors, as well as an initial insight into how inability to work fulltime relates to having paid employment one year after a work disability benefit assessment.

The novelty of this topic was illustrated at the start of our study by the discovery that no suitable word was available in English for the Dutch word 'urenbeperking', and that scientific literature on the subject was lacking. We first decided to use the term 'work endurance', as endurance is related to the ability to perform work over an extended period of time. However, we soon learned that from the perspective of the assessor (the professional assessing the work disability benefit), 'work endurance' may not completely cover the construct, as it may more commonly apply to physical endurance. Based on our findings from the qualitative interview study and the international survey, incorporating professionals' perspectives as well as the help of researchers in Canada and the USA with expertise in the field of insurance medicine, we decided to replace 'work endurance' with '(in)ability to work fulltime'. This term better renders the sense of the Dutch word 'urenbeperking' (related mainly to the "restricted number of hours per day or week an applicant is able to work due to a disabling health condition"), and explains its use by insurance physicians to describe the total number of hours someone is able to work per day and per week.

In the Dutch social security setting, being able to work eight or more hours per day is considered normal ability to work fulltime, and being able to work fewer than eight hours per day is considered an inability to work fulltime. Based on this definition, register data of a year cohort of applicants with residual work capacity indicated that almost 40% had been assessed with an inability to work fulltime. This means that almost half of applicants with residual work capacity are not able to work fulltime. Interestingly, in this group 79% were able to work about 4 hours per day. The other side of the coin is that more than half of the applicants were assessed as having the ability to work fulltime. This does not necessarily mean that they were denied a work disability benefit; many of these applicants had other limitations restricting their work capacity, which entitled them to a partial or full work disability benefit. An interesting finding in the international comparison study (Chapter 3) was the varying definitions of fulltime work across countries. In the Netherlands, fulltime means 40 hours (8 hours, 5 days/week) or more, whereas in other countries the definition of fulltime ranged from 35 hours

(France) to 42 hours (Switzerland) per week. This implies that the definition of fulltime depends on social norms, as well as legal and collective arrangements between employers and employees, and policies within companies. Moreover, Dutch professionals and patient representatives stated that it is impossible to prescribe a universal maximum of working hours, as the ability to work fulltime may be influenced by the context: i.e., workers' social situations can positively (resources) and negatively (additional roles/tasks, stressors) affect their ability to work fulltime. These findings confirm the complexity and variable nature of the concept inability to work fulltime, which may be interpreted as: every person has his/her own maximum of hours that he/she can work, given the current context. The findings also stress that the assessment of inability to work fulltime should be considered from a more holistic, biopsychosocial view, taking into account the influence of personal- and environmental factors.

Although we have not investigated the normative aspect, we have provided insight into the different factors associated with inability to work fulltime. In Chapters 4 to 6 we further explored associations of age, gender, educational level, and multimorbidity with inability to work fulltime, as explorative studies had mentioned these as potential dimensions of the issue (Chapters 2 and 3). Although findings in the studies using register data suggested that higher age, female gender, higher education and multimorbidity were in the total sample associated with being assessed as unable to work fulltime, it was interesting to see that these associations were not consistent; they differed between and within diagnosis groups (for cancer and mental disorders; see Chapters 5 and 6). Furthermore, with regard to being employed we found no discrimination for age, gender and educational level, as none of these variables significantly moderated the association of inability to work fulltime with having paid employment a year later (Chapter 7). An additional finding was that the prevalence of inability to work fulltime varied greatly among different disease groups (Chapter 4), as well as within diagnosis groups (cancer and mental disorders, Chapters 5 and 6). This may indicate that when assessing inability to work fulltime, the physician takes into account the diagnosis and its impact on someone's functioning. Perhaps this has to do with the relationship between diagnosis of a disease itself, and debilitating symptoms related to it, such as energy deficit and cognitive impairment.

In the different studies using register data, we found that especially applicants with diagnoses associated with symptoms of energy loss (i.e., blood-related diseases, respiratory diseases and specific mental disorders like mood affective disorders and schizophrenia) had higher risk of being unable to work fulltime. Energy loss may affect capacities like endurance, making it more difficult for these workers to work 8 hours a day and/or 5 days a week. Our qualitative interview study (Chapter 2), indicated fatigue, cognitive

impairments, and restrictions in functioning in- and outside work as the three measurable indicators of inability to work. From the literature it is known that fatigue and cognitive impairments require special attention because they are debilitating symptoms of many diseases, for example multiple sclerosis, Parkinson's disease, cancer, post-covid-19-syndrome, immune mediated inflammatory diseases, and mood disorders, and have great impact on daily functioning [1-9]. Daily activities like work require energy, and a need for periods of rest for recovery can restrict prolonged all-day functioning [10, 11]. Measuring these indicators could be the way forward toward reliable and valid assessments of inability to work fulltime. (*See implications for research*).

Methodological considerations

In this paragraph, we discuss the methodological issues regarding the research methods, the representativeness of the stakeholders included in the studies, and the quality of the data.

Combining quantitative and qualitative methods

For this thesis we used both quantitative and qualitative methods to broadly explore inability to work fulltime. We used interviews as a basis to develop a conceptual framework of inability to work fulltime; in this framework we included indicators and suggestions for assessment methods. We used survey data from key informants to explore similarities and differences in views and experiences between countries, confirming the need for more research regarding this question. We also used register data, taken from a rich pool of first WIA assessments of all applicants over an entire year. This combined use of methods allowed us to explore the concept inability to work fulltime from multiple perspectives and unravel it in-depth, and the quantitative studies provided more insight into prevalence's and factors associated with the concept, thereby broadening our understanding and suggesting directions for further research.

Included stakeholder perspectives

To explore, conceptualize, and operationalize inability to work fulltime and to inventory assessment methods in the context of work disability benefit assessment, we included the perspectives of two important stakeholders: physicians and patient representatives. We included mainly physicians involved in public and private work disability insurance, and occupational health physicians with experience in both policy and practice, as well as in science and/or dealing with staff. However, as not all physicians performed assessments of inability to work fulltime on a day-to-day basis, this may have impacted our findings; the hands-on experiences of those who actively and regularly perform these assessments could have provided additional

information for the conceptualization and operationalization of our subject. Nevertheless, the participating physicians mentioned in Chapters 2 and 3 may be regarded as experts in their field. They provided us with extensive information about, and insight into, the concept of inability to work fulltime.

To represent the patient perspective, we included experienced staff members of organizations representing patients with specific chronic diseases that are common among long-term sick listed workers receiving work disability benefits. We hereby endeavored to acquire the broadest possible picture of inability to work fulltime. Some patient representatives had themselves been patients, while others, themselves not former patients, had to rely on information from patients who were members of their organization. Again, this may have impacted our results, as experiences from patients who had actually experienced inability to work fulltime and who had undergone an assessment, could have provided additional information.

Quality of the data

The register data used, were derived from assessments conducted by trained assessors, in our case insurance physicians in public practice; they include data from all comprehensive assessments of sick-listed workers applying for work disability benefits in the Netherlands in 2016. A major strength of these data is that all assessors were required to adhere to an existing professional guideline on assessing inability to work fulltime; this enhanced the reliability and validity of the data. Although previous studies revealed the presence of inter-rater variations in the assessment of inability to work fulltime [12, 13], the large sample size, n= 40263, may level off these differences.

A disadvantage of register data is that, because they were not originally collected for research purposes, they do not contain all relevant factors and determinants related to inability to work fulltime. For example, data regarding well-known factors related to work disability were not included -- such as severity and treatment of disease; work characteristics; personal factors like coping, motivation and illness perceptions; and time-related aspects such as training or recovery. In addition, we encountered several missing values on the education variable. Upon inquiry we discovered that current internal procedures do not always require the labor expert to include education in the register; this explains the missing values. For some cases, however, we found earlier entries regarding educational level, and used these in the analyses.

In the register data, diagnoses are recorded using the Dutch Classification of Occupational Health and Social Insurance, (CAS). For generalizability and international comparison, we recoded the CAS-diagnoses into the 22 chapters of the ICD10 [14]. This allowed us to compare our findings on inability to work fulltime with other studies on, for example, work disability, using similar disease groups [15, 16]. As these disease groups include numerous diagnosis

groups, exploration at diagnosis group level contains more detail. We therefore performed two studies on the prevalence and associations of inability to work fulltime: in the diagnosis groups cancer and mental disorders. These studies provided additional, as well as varying, findings on the effect of diagnosis groups and socio-demographic variables. We recommend further studies regarding diagnosis level to provide information to insurance physicians, clients and others (like occupational and treating physicians) with assessment of individual cases.

Implications and recommendations for policy and practice

Several implications and recommendations can be drawn, based on the findings in this thesis.

First, our evidence on the conceptualization and operationalization of the concept, the prevalence of inability to work fulltime and related socio-demographic and disease-related factors, could be added to the existing professional guideline, and/or used in the development of training and education to improve evidence-based practice among assessors. This could, in turn, help to reduce the inter-rater variation among insurance physicians. Furthermore, our results could be included in disease-specific or multi-disciplinary protocols, guidelines, frameworks, and taxonomies used by related professions, both national and international. Patient organizations could also incorporate our findings in the information they supply to their patient members.

The findings that the diagnoses impacting energy levels and cognitive functioning (e.g., blood-related diseases, respiratory diseases, nervous diseases and specific mental disorders) are related to higher risks of inability to work fulltime, can help insurance physicians to more easily identify those applicants at risk. In addition, because the impact of these debilitating symptoms on daily functioning, and functioning at work, can be great, we recommend including a structural and uniform evaluation of symptoms like fatigue, cognitive impairments and restrictions in daily functioning in the assessment of inability to work fulltime. As concluded in chapter 2, data about these symptoms can be gathered by a combination of methods, such as self-report measures, more objective measures like exercise tests, or observations during daily functioning, and trial placements. The complexity and variable nature of the concept implies that these symptoms should not be measured only by a single method at a single time point, but should be monitored over a longer period of time. Taking into account personal- and environmental factors that may influence someone's ability to work fulltime at a specific point in time, and the reality that circumstances may change over time, one should consider repeated assessments over time, especially when change is to be expected. We recommend beginning to monitor these symptoms during the sick leave period, prior to assessment of the work disability benefit. For

example, data reported by the occupational health service and employer regarding reduced energy levels, cognitive impairments, and daily functioning, as well as efforts to return to work during the two years of sick leave prior to the work disability benefit, could be used in the insurance physician's assessment of inability of work fulltime.

We hypothesized in chapter 7 that being assessed with an inability to work fulltime could have a supportive effect for returning to, or remaining in, the labor market. However, being unable to work fulltime may also have a negative impact on work participation, as workers with a fulltime contract might not be able to re-integrate fully into their jobs. This could lead to involuntary job loss. Although we found no association between being assessed with inability to work fulltime and having paid employment one year after the assessment, we consider such an assessment to have value, in addition to the diagnosis, as it enlightens both employer and employee about the extent to which the worker is still able to work. Such insight can help the employer to better understand the sick-listed worker's position and to provide work accommodations like adjusted working hours or tasks. For example, to include and (re-)integrate people with a work disability, work could be (re)designed and differently organized and adapted to their capacities, taking into account limitations and vulnerabilities like fatigue or cognitive impairments [17]. Further, sharing knowledge and insight with sick-listed workers about (in) ability to work fulltime can help them and their significant others (partners, family, friends) in taking more self-control in the return to work, in the end possibly contributing to sustainable returning to work.

Recommendations for future research

We suggest several recommendations for further research. First, for optimal assessment, more research is needed into the most reliable and valid methods to measure fatigue, cognitive impairments, and reduced functioning in the work disability benefit setting. For example, more evidence is needed on the use of real time measurements of fatigue and concentration span in daily life, preferably over time in trial situations or in real work settings, before this is implemented in the assessments. A recent study has been initiated to identify disease-generic symptoms like fatigue, pain, and cognitive impairment, which are relevant for occupational care and the assessment of work disability. In this study the researchers will measure the severity and course of these symptoms over time, embedding them in, and thus improving, occupational care and work disability benefit assessments from the start of sick leave until the onset of application for work disability pension.

Second, we would advise more inclusive register studies, using detailed information on diagnosis and individual disease level, to further study the associations of the latter with inability to work fulltime and to help assessors

with early identification of those at risk. For this purpose the above-mentioned study could provide relevant information.

Third, in this thesis as well as in other research in this field, the perspectives of workers with an inability to work fulltime have been underrepresented. Their experience, needs, preferences and views are important for understanding inability to work fulltime and its consequences, as well as for providing data for an evidence-based guideline for assessment [18].

Fourth, further knowledge is needed to explore the working mechanisms on the association of inability to work fulltime for future work status to understand how and for who this effect occurs.

Finally, efforts should be targeted at transferring the knowledge from this thesis to practice. Identifying the best ways to implement our findings, and helping insurance physicians to adhere to guidelines and protocols [19], are important to achieve the overall aim -- to help people with health problems to make the best possible use of their potential to work. To achieve this goal, a valid and reliable assessment of inability to work fulltime is an important prerequisite.

General conclusions

This thesis is the first to focus on assessment of inability to work fulltime in work disability benefit settings. It adds knowledge regarding the operationalization of the concept of inability to work fulltime, and its prevalence as well as associated factors, and provides directions on how and when to measure. We found that inability to work fulltime is a complex concept, and one that varies over time. A person's type of disease, age, gender, and educational level are associated with inability to work fulltime, as are disorders resulting in energy deficits, and impairments in cognition and general functioning. However, we found no evidence that inability to work fulltime affected having paid employment one year later. The implications and recommendations presented in this thesis provide important knowledge for building the evidence for assessment of inability to work fulltime by the insurance physician.

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APPENDIX

SUMMARY

The central concept of this thesis is the 'Inability to Work Fulltime', assessed as part of the work disability benefit assessment in the Dutch social security system. With the studies in this thesis, we aim to expand the knowledge on the concept by exploring, conceptualizing and operationalizing inability to work fulltime in the context of work disability benefit assessments. More research into the concept of inability to work fulltime can help to bridge an important knowledge gap in insurance medicine and will provide stepping stones toward establishing clear evidence regarding inability to work fulltime.

The overall aim has been broken down into three research questions:

1. What does the concept inability to work fulltime entail, and how can this be measured?
2. What is the prevalence of inability to work fulltime and what are associated socio-demographic and disease-related factors?
3. What is the association between inability to work fulltime and having paid employment one year after the work disability benefit assessment?

In **Chapter 1,** we provided a general introduction describing the societal background of this thesis and introduced the concept of inability to work fulltime as an outcome of work disability benefit assessments in social security setting. Insurance physicians performing work disability benefit assessments report unclarity about the concept inability to work fulltime, despite the existence of a professional guideline. Especially for inability to work fulltime, a low inter-doctor agreement is reported. Therefore, we aimed to explore, conceptualize and operationalize inability to work fulltime in the context of work disability benefit assessments.

To explore what the concept inability to work fulltime entails and how it can be measured, we interviewed insurance and occupational physicians as well as representatives from patient organizations on their knowledge, experience and views about inability to work fulltime and its assessment. From this qualitative study, described in **Chapter 2,** we learned that inability to work fulltime is considered a complex concept to operationalize, strongly individually determined and variable. It depends not only on health related factors, but also on personal and environmental factors. Three important indicators were mentioned: fatigue, cognitive impairments and restrictions in functioning in- and outside work. Participants mentioned a combination of self-assessment, assessment interviews, testing and assessment in the actual work setting and measuring at different time points as a suitable method to assess inability to work fulltime.

In **Chapter 3** we conducted a survey among expert physicians performing work disability benefit assessment in European countries to inventory their experiences and views on inability to work fulltime and its assessment.

Experts from 16 countries responded and we found that inability to work fulltime is assessed in a majority of those countries. In almost all cases, assessments are conducted by medical examiners specialized in insurance medicine. In all countries, both physical and mental disorders are accepted causes for inability to work fulltime, and health complaints, psychosocial and environmental factors are also mentioned as accepted causes in a number of countries. Methods to assess inability to work fulltime vary considerably across countries. Only in the Netherlands, a professional guideline specific for the assessment of inability to work fulltime is in use.

In the register based study described in **Chapter 4**, we explored the prevalence, degree and associations with disease-related and socio-demographic factors of inability to work fulltime in a year cohort of assessments of all applicants for work disability benefit, two years after sick leave, in the Netherlands. Almost 40% of all applicants with residual work capacity were assessed with inability to work fulltime, the majority of them was assessed as not able to work over 4 hours per day. Applicants with higher age, female gender (compared to male), higher education (compared to lower) and multimorbidity had higher risk of being assessed with inability to work fulltime. The type of (ICD10) disease group mattered, as applicants with diseases such as the diseases of the blood, respiratory system and neoplasms showed higher risks, and diseases of the musculoskeletal system showed lower risks of being assessed with inability to work fulltime.

In **Chapter 5**, we used the same year cohort as in chapter 4, but focused on a group of applicants with a primary diagnosis from the ICD10 disease group cancer (n=3757, 9% of total cohort). We explored the prevalence and associations for being assessed with no residual work capacity and inability to work fulltime. We found that the prevalence of no residual work capacity was over 40%. From the less than 60% of the applicants with residual work capacity, 61% were assessed with inability to work fulltime. For inability to work fulltime applicants with lymphoid and haematopoietic cancers showed higher and with cancers of the locomotor system lower odds. Age and gender were significantly associated with inability to work fulltime.

In **chapter 6** we focused on applicants with a primary diagnosis of mental and behavioral disorders, the largest group in the total cohort (n=12901, 32%). We explored the prevalence and associations of no residual work capacity and inability to work fulltime. We found a prevalence of 22.5% for no residual work capacity and from the sample with residual work capacity, 41.4% were assessed with inability to work fulltime. For the association with inability to work fulltime, differences were seen across diagnosis groups. Applicants with diseases from the diagnose group (post) traumatic stress disorders, mood affective disorders and schizophrenia and delusional disorders showed higher risks, and applicants in the diagnose groups adjustment-, personality- and

anxiety disorders showed lower risks of being assessed with inability to work fulltime. Age and gender were significantly associated with inability to work fulltime.

In **Chapter 7**, the aim was to explore the association between inability to work fulltime and paid employment one year later, and to study the moderating effects of socio-demographic and disease-related factors. We conducted separate analysis for workers who were (partly) employed in a paid job at the time of assessment and for those who were not employed in a paid job. The findings showed no associations between inability to work fulltime and having paid employment one year after the work disability benefit assessment when adjusted for disease-related factors. Furthermore, there was no discrimination for age, gender and educational level either, as none of these variables moderated the associations. When we examined the associations within the disease groups, we found that for applicants working at time of assessment and diagnosed with a musculoskeletal disease, inability to work fulltime was positively associated with having paid employment one year later. For applicants not working, the association of inability to work fulltime with paid employment was moderated by having multimorbidity, in the way that for those having multiple diagnoses, inability to work fulltime decreased the chances of returning to paid employment after the work disability benefit assessment.

In **Chapter 8,** we present and reflect on the main findings, discuss methodological considerations, describe the implications and recommendations for policy and practice, as well as recommendations for future research. We found that inability to work fulltime is a complex and in time varying concept. The type of disease, age, gender and educational level are associated with inability to work fulltime, and diagnoses resulting in energy deficits, cognitive impairments and functioning in general have stronger positive associations with inability to work fulltime. Within the studies in this thesis, we did not find evidence of an effect of inability to work fulltime on having paid employment one year later.

Several implications and recommendations for policy and practice could be drawn, based on the findings in this thesis. First, the evidence on the conceptualization and operationalization, the prevalence of inability to work fulltime and related socio-demographic and disease-related factors, could be added to guidelines, protocols and used in the development of training and education for assessors to improve evidence-based practice. Second, the findings that diagnoses impacting energy levels and cognitive functioning are related with higher risk of inability to work fulltime, could be useful for insurance physicians and provide directions to develop a structural and uniform assessment of their disease-generic symptoms such as fatigue, cognitive impairments and restrictions in daily functioning. Third, the complexity and

variable nature of the concept implies that measuring these symptoms should not be conducted with a single method at a single time point, but should be monitored over a longer period of time, using multiple methods.

Several recommendations for further research were made. First, more research is needed on the methods to assess fatigue, cognitive impairments and reduced functioning in the work disability benefit setting, to provide the most reliable and valid information to base the assessment on. Second, we call for more inclusive register studies using detailed information on diagnosis and individual disease level to further study the associations with inability to work fulltime and help assessors with early identification of those at risk for inability to work fulltime. Further knowledge is also needed to explore the working mechanisms on the association of inability to work fulltime for future work status to understand how and for who this effect occurs.

SAMENVATTING

In dit proefschrift staat het concept 'beperkte duurbelastbaarheid' centraal. Beperkte duurbelastbaarheid is het onvermogen fulltime werkactiviteiten vol te houden en daarbij is het een belangrijk concept dat frequent beoordeeld wordt tijdens de arbeidsongeschiktheidsbeoordeling in het Nederlandse socialezekerheidsstelsel. Verzekeringsartsen geven aan dat er, ondanks de professionele richtlijn, nog onduidelijkheid bestaat over het concept beperkte duurbelastbaarheid en dat er een hoge inter-dokter variatie bestaat bij de beoordeling van dit concept. Onderzoek naar het concept beperkte duurbelastbaarheid is tot op heden zeer beperkt. Met de studies in dit proefschrift willen wij bijdragen aan het conceptualiseren en operationaliseren van het concept beperkte duurbelastbaarheid in de context van de arbeidsongeschiktheidsbeoordeling.
De volgende drie onderzoeksvragen staan hierbij centraal:

1. Wat houdt het concept beperkte duurbelastbaarheid in en hoe kan het gemeten worden? (hoofdstuk 2 en 3)
2. Wat is de prevalentie van beperkte duurbelastbaarheid en welke socio-demografische en ziekte-gerelateerde factoren hangen daarmee samen? (hoofdstuk 4-6)
3. Wat is de associatie tussen beperkte duurbelastbaarheid en het hebben van betaald werk een jaar na de arbeidsongeschiktheidsbeoordeling? (hoofdstuk 7)

In **Hoofdstuk 2** beschrijven we de interviewstudie die is uitgevoerd onder verzekeringsartsen, bedrijfsartsen en vertegenwoordigers van patiëntenorganisaties. Uit deze studie bleek dat beperkte duurbelastbaarheid wordt beschouwd als een complex concept om te operationaliseren. Het concept is sterk individueel bepaald en variabel, en de mate van beperktheid hangt niet alleen af van gezondheid gerelateerde factoren, maar ook van persoonlijke factoren. Drie belangrijke indicatoren voor beperkte duurbelastbaarheid werden geïdentificeerd: vermoeidheid, cognitieve beperkingen en beperkingen in het functioneren binnen en buiten het werk. Voor het beoordelen van de duurbelastbaarheid werd een combinatie van de eigen inschatting van de client, het beoordelingsgesprek, testen en proefplaatsing als geschikte methoden genoemd. Daarbij is het van belang dat de duurbelastbaarheid op verschillende momenten wordt gemeten.

In **hoofdstuk 3** is een vragenlijstonderzoek uitgevoerd onder artsen die arbeidsongeschiktheidsbeoordelingen uitvoeren in 19 Europese landen. In dit onderzoek werd informatie verzameld over hun ervaringen en opvattingen over het concept en de beoordeling van beperkte duurbelastbaarheid. Uit deze resultaten bleek dat beperkte duurbelastbaarheid in de meeste landen (81 %) wordt beoordeeld tijdens een arbeidsongeschiktheidsbeoordeling. In bijna alle gevallen wordt de beoordeling uitgevoerd door artsen die gespecialiseerd

zijn in verzekeringsgeneeskunde. In alle landen zijn zowel fysieke als mentale aandoeningen geaccepteerde oorzaken voor beperkte duurbelastbaarheid en worden ook gezondheidsklachten en psychosociale factoren genoemd als geaccepteerde oorzaken. De methoden om beperkte duurbelastbaarheid te beoordelen verschillen aanzienlijk tussen de deelnemende landen. Alleen in Nederland is er een professionele richtlijn specifiek voor de beoordeling van beperkte duurbelastbaarheid.

In hoofdstuk 4 - 6 is maakten we gebruik van registerdata van het UWV. Het betrof data van een jaarcohort (2016) van beoordelingen van alle aanvragers van een arbeidsongeschiktheidsuitkering twee jaar na ziekmelding. In **hoofdstuk 4** gebruikten we de gegevens van alle aanvragers met benutbare mogelijkheden voor werk uit het jaarcohort. Hieruit bleek dat bijna 40% van alle aanvragers werd beoordeeld met beperkte duurbelastbaarheid. De meerderheid van hen werd beoordeeld als niet in staat om meer dan 4 uur per dag te werken. Aanvragers met hogere leeftijd, vrouwelijk geslacht (vergeleken met mannen), hogere opleiding (vergeleken met lagere) en multimorbiditeit hadden een hoger risico om beoordeeld te worden met beperkte duurbelastbaarheid. Ook vonden we verschillen tussen de (ICD10) ziektegroepen; aanvragers met bloedziekten, aandoeningen van de luchtwegen en neoplasma (kanker) hadden een hoger risico, terwijl aanvragers met ziekten van het botspierstelsel en bindweefsel een lager risico hadden om beoordeeld te worden met beperkte duurbelastbaarheid.

In **hoofdstuk 5** richtten we ons op een groep van aanvragers met kanker als primaire diagnose (n=3757, 9%) van het totale cohort. Van de studie sample had 57% benutbare mogelijkheden, en hiervan werd 61% beoordeeld met beperkte duurbelastbaarheid. Aanvragers met lymfoïde en haematopoietische kankers hadden een hoger risico, en aanvragers met kankers van het bewegingsapparaat hadden een lager risico op beperkte duurbelastbaarheid. Een hogere leeftijd en vrouwelijk geslacht waren significant geassocieerd met een hoger risico voor beperkte duurbelastbaarheid.

In **hoofdstuk 6** richtten we ons op aanvragers met een primaire diagnose van psychische en gedragsstoornissen, de grootste groep (n=12901, 32%) in het totale cohort. Van de studie sample, had 78% benutbare mogelijkheden, en hiervan werd 41% beoordeeld met beperkte duurbelastbaarheid. Aanvragers met ziekten uit de diagnosegroep (post)traumatische stressstoornissen, stemmings- en affectieve stoornissen en schizofrenie en waanstoornissen hadden hogere risico's, en aanvragers in de diagnosegroepen aanpassings-, persoonlijkheids- en angststoornissen hadden lagere risico's om beoordeeld te worden met beperkte duurbelastbaarheid. Een hogere leeftijd en vrouwelijk geslacht waren significant geassocieerd met een hoger risico op beperkte duurbelastbaarheid.

In **hoofdstuk 7** werd het verband tussen beperkte duurbelastbaarheid en (het behoud van) betaald werk een jaar na de arbeidsongeschiktheidsbeoordeling onderzocht. Tevens werd de invloed van socio-demografische en ziekte-gerelateerde factoren op dit mogelijke verband onderzocht. De analyses werden separaat uitgevoerd voor aanvragers die wel en niet (gedeeltelijk) betaald werk hadden ten tijde van de beoordeling. Voor de aanvragers die wel betaald werk hadden, vonden we een significant verband tussen beperkte duurbelastbaarheid en betaald werk hebben één jaar na de beoordeling, gecorrigeerd voor socio-demografische factoren. Echter, wanneer ziekte gerelateerde factoren aan de analyses werden toegevoegd, was het verband niet langer significant. Voor de aanvragers zonder werk ten tijde van de beoordeling werd geen significant verband gevonden. Voor aanvragers die werkten ten tijde van de beoordeling en gediagnosticeerd waren met een ziekte van het botspierstelsel en bindweefsel, bleek beperkte duurbelastbaarheid positief gerelateerd te zijn met het hebben van betaald werk een jaar later. Voor aanvragers die niet werkten en meerdere diagnoses hadden, verlaagde een beoordeling met beperkte duurbelastbaarheid de kans op betaald werk een jaar na de arbeidsongeschiktheidsbeoordeling.

In **hoofdstuk 8** worden de belangrijkste bevindingen van dit proefschrift samengevat, gevolgd door een reflectie op de bevindingen. Tevens werden methodologische overwegingen beschreven, en tenslotte de implicaties en aanbevelingen voor beleid, praktijk en onderzoek. Uit de studies blijkt dat beperkte duurbelastbaarheid een complex en in de tijd variërend concept is. De aard van de ziekte, leeftijd, geslacht en opleidingsniveau zijn geassocieerd met beperkte duurbelastbaarheid. Ziekten die resulteren in vermoeidheid, cognitieve beperkingen en beperkingen in functioneren in het dagelijks leven hebben in het algemeen sterkere positieve associaties met beperkte duurbelastbaarheid. Er werd geen verband gevonden tussen beperkte duurbelastbaarheid en het hebben van betaald werk een jaar later. Op basis van deze bevindingen werden een aantal implicaties voor beleid en praktijk geformuleerd, zoals het toe te voegen van de opgedane kennis in richtlijnen en protocollen en deze kennis te gebruiken bij de ontwikkeling van trainingen en opleidingen om de evidence-based praktijk te verbeteren. Een belangrijke aanbeveling was dat de complexiteit, individualiteit en variabiliteit van het concept duurbelastbaarheid bij de beoordeling in ogenschouw moet worden genomen en dat o.a. het meten ervan bij voorkeur niet moet worden uitgevoerd met één methode op een enkel tijdstip, maar over een langere periode met behulp van meerdere methoden. Tevens zijn verschillende aanbevelingen geformuleerd voor toekomstig onderzoek. Zo is er meer onderzoek nodig naar methoden om vermoeidheid, cognitieve stoornissen en verminderd functioneren in het kader van de arbeidsongeschiktheidsbeoordeling te monitoren, zodat er

meer betrouwbare en valide informatie wordt verkregen om de beoordeling op te baseren. Daarnaast dient voor onderzoek met registerdata meer gedetailleerde gegevens over de diagnose en het individueel ziekteniveau gebruikt te worden om de verbanden met het beperkte duurbelastbaarheid diepgaander te bestuderen en om daarmee beoordelaars te helpen bij de identificatie van degenen die risico lopen op beperkte duurbelastbaarheid. Daarnaast is er ook meer kennis nodig om de mechanismen te verkennen van de relatie tussen beperkte duurbelastbaarheid en de toekomstige werkstatus, om te begrijpen hoe en voor wie dit effect optreedt.

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ABOUT THE AUTHOR

Henk-Jan Boersema was born in Leeuwarden, the Netherlands, on October 26th 1956. After completing high school at the Stedelijk Gymnasium in Leeuwarden in 1975, he studied at the University of Groningen and obtained his medical degree in 1985.

He started working as an insurance physician for the BVG (a predecessor of the Dutch Institute for Employee Benefit Schemes (UWV)) in 1986. He specialized in insurance medicine and became a registered insurance physician in 1993. In the period 1997 to 2013 he was a member of the works council of Cadans (successor of the BVG and predecessor of the UWV) and UWV. From 2003 he worked as an insurance physician at the Objections and Appeals Department of UWV.

With the positive experience of combining executive work as an insurance physician and other tasks, and interest in research that contributes to the profession, Henk-Jan applied for the position of junior researcher at the Dutch Research Center for Insurance Medicine (KCVG). KCVG is a collaboration between UWV, the University Medical Center Groningen (UMCG), The Academic Medical Center (AMC) and VU Medical Center in Amsterdam. He started his PhD research at the UMCG in November 2013.

His research project on exploring the concept 'Inability to Work Fulltime' resulted in several international publications which form the basis of this thesis. He also published a number of national publications and performed many (inter)national presentations on the subject of his thesis.

During his work as a junior researcher at the KCVG, he continued to work parttime in practice as an insurance physician at the Objections and Appeals Department of UWV. Additionally, in the last two years he also performed tasks of a senior researcher at the KCVG and UMCG. Henk-Jan retired from UWV in August 2023.

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