Concepts and Social Variations of Disability in Working-Age Populations

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Abstract

Disability has been conceptualized in different ways, either as a notion confined to a minority group characterized by permanent bodily impairment and social exclusion or as a universal human condition of functional decline that is becoming more prevalent with increasing age. This latter notion seems more appropriate if applied to working-age populations, in particular as disability is analyzed on a continuum of varying severity and duration. This chapter deals with the prevalence and social distribution of disability in middle-aged to early-old-age working populations in modern societies, using evidence from three cohort studies, the Health and Retirement Study (USA), the English Longitudinal Study of Ageing, and the Survey of Health, Ageing and Retirement in Europe. It demonstrates consistent social gradients of disability, leaving those with lower socioeconomic

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U. Bültmann, J. Siegrist (eds.), *Handbook of Disability, Work and Health*, Handbook Series in Occupational Health Sciences, https://doi.org/10.1007/978-3-030-24334-0_36

positions at higher risk. Moreover, we analyze consequences of disability for health-related work exit, most often in terms of disability retirement. Again, social disparities are observed, and adverse physical and psychosocial work environments contribute to an accumulation of disadvantage. The chapter concludes with a discussion of policy implications of available knowledge, pointing to different entry points for interventions that aim at promoting health and improving the quality of work and employment.

Keywords

Disability · Work ability · Social inequalities · Adverse working conditions · Disability retirement · Activity limitations · Cohort studies

Introduction

Disability has been conceptualized in different ways, and the social norms, attitudes, and practices toward people with disabilities underwent profound changes in history (Stiker 1999). In modern societies, a major shift occurred during the second half of the twentieth century. Disability has no longer been viewed as an individual's impairment that evokes societal reactions of social deviance, exclusion, or even discrimination, denying basic human rights to them. Rather, it has now been conceived as the result of "complex interactions between health conditions and features of an individual's physical, social, and attitudinal environment that hinder their full and effective participation in society" (Officer and Groce 2009, p. 1795). In terms of human rights, societies are now obliged to offer equal opportunities of participation in social life to people with disabilities, and these rights have been advocated and contested by civil rights movements, most successfully in the United States and in Europe. As a result, since the early 2000s, these rights have been affirmed and endorsed in the United Nations' Convention on the Rights of Persons with Disabilities (United Nations 2007), and many national legal developments as well as social, labor, and health policy initiatives since resulted in successful strategies to improve the lives of people with disabilities (WHO 2011).

At the same time, physicians and other health professionals started to broaden their view of disability that traditionally was dominated by an overly medicalized model of impairment and capacity limitation, largely ignoring socio-structural and psychosocial aspects. Most importantly, with the publication and implementation of the World Health Organization's International Classification of Functioning, Disability and Health (ICF), a universal descriptive tool of classification for data collection and clinical practice has been established that analyzes disability along three interconnected areas of human functioning within distinct social, natural, and built environments: (1) bodily functions and structures, (2) human activities, and (3) social participation (WHO 2001). Moreover, with its distinction between a person's capacity to perform actions and the actual performance of activities, the ICF emphasizes the important role of environmental barriers against full social participation among people with disabilities. Despite this comprehensive approach with its focus on the lived experience of persons, at least two different, far-reaching interpretations of disability seem to prevail up to now, both in the medical world and in those parts of everyday life that are influenced by medical knowledge and practice. In a recent seminal paper, these interpretations were labeled the "minority approach" and the "universal approach" (Bickenbach et al. 2017).

Starting with a short description of these two interpretations, this chapter will analyze disability within a restricted frame of reference, dealing with its occurrence, social distribution, and consequences for labor market participation among working-age populations in modern Western societies. Finally, we discuss some policy implications of the main finding of this review, i.e., the prevalence of consistent social inequalities of disabilities and their consequences for labor market participation.

Understanding Disability: A Minority Perspective or a Universal Perspective?

Is disability recognized as a universal human condition occurring in all populations, specifically with increasing age, or is its notion confined to a minority group within total populations, characterized by a permanent and severe bodily impairment and restricted social participation? Answers to this question matter because of the different societal and political strategies related to either definition. If considered a universal phenomenon reflecting a basic vulnerability of the human body and a lack of control over health shocks and injuries, disability manifests itself as a continuum with varying severity, duration, or course of progression and with varying options of reducing bodily impairment and functional decrement. In fact, major disabilities occurring among old-age populations are defined by these features. Being a universal phenomenon as part of the human condition, disability requires universal social and health-related policies that are applicable to everyone experiencing this condition. If considered a permanent and severe bodily impairment, disability mainly concerns a minority group of people whose life is characterized by distinct limitations of functioning and restrictions of social participation. As argued by Bickenbach et al. (2017), disability in this perspective is conceived as a dichotomy, distinguishing those with disability from those without this experience. Accordingly, as these restrictions contradict basic human rights, the primary policy goal for persons with disability is advocacy for legal and social change, aiming at reducing discrimination and increasing participation in social life.

It is evident that estimates of the prevalence of disability greatly vary according to the underlying definition. For instance, the World Report on Disability, applying the minority perspective, maintains that some 15% of the population in each country are persons with disabilities (WHO 2011). In contrast, at least in rapidly aging societies, much larger proportions of the population are experiencing disability to some extent (Lopez et al. 2006). The minority perspective of disability has also been useful in developing an advocacy agenda calling for rights and against social disadvantage and discrimination. Along these lines the World Report on Disability argues that persons with disabilities “face widespread barriers to accessing services, and experience poorer health outcomes, lower education achievement, less economic participation and higher rates of poverty than people without disabilities” (Bickenbach et al. 2017, p. 544). Therefore, the primary focus is on policies that improve the conditions of a disadvantaged minority rather than on efforts to promote health and reduce disabilities among total populations, within and beyond the range of health-care services (Lollar and Crews 2003). Historically, the minority perspective has been highly successful in promoting the rights of persons with disabilities and extending their opportunities of social participation, by removing barriers and by modifying societal attitudes and practices (United Nations 2007). Yet, despite its merits, this minority approach may not be the leading perspective of dealing with functional limitations, its determinants, and its consequences in a longer-term perspective, given an increase in chronic diseases and unhealthy aging (Zola (1989). As Bickenbach et al. (2017) argue, “a universal policy would match the level of resource, service, or support to the level of need, recognizing that impairments, though dynamic over the life course, tend . . .to be increasing in both number and severity” (p. 547). Therefore, it seems justified to adopt a universal perspective of disability, without disregarding the special needs and priorities of a minority group with enduring acquired or developmental disabilities. Specifically, with a focus on adult populations, the prevalence of mild to moderate disabilities resulting from age-related functional decline and spread of chronic diseases is increasing, calling for its analysis as conditions that vary on a continuum of severity, duration, and activity limitations.

Analyzing Disability in Working-Age Populations

Different approaches were used to assess the prevalence of disability in working-age populations. One such approach is based on administrative data of the frequency of chronic diseases with impact on work ability, resulting in longer-term sickness absence, use of rehabilitation services, or assignment of disability pension (OECD 2013). However, given the diversity of frequency and severity of chronic diseases, and given the variation of statutory regulations of access to sick pay, rehabilitation, and disability pension between different national health and social policies, any estimate of disability frequency based on administrative data remains highly uncertain (OECD 2013). Another approach is based on primary data collected in longitudinal cohort studies on aging, where the occurrence of disability is measured by established indicators of reduced physical and cognitive functioning and where its major determinants and its further consequences (e.g., morbidity, early exit from labor market, mortality) are analyzed. Here, we restrict the analysis to a review of major findings on the prevalence and social distribution of disability derived from primary data of three large epidemiologic cohort studies on middle-aged to early-old-age working populations in modern Western societies. We explore what is known about the prevalence and social distribution of disability and the consequences of disability for continued labor force participation. The three studies cover populations from the United States (Health and Retirement Study (HRS, Juster and Suzman 1995)) and from Europe (English Longitudinal Study on Ageing (ELSA, Marmot et al. 2003) and Survey of Health, Ageing and Retirement in Europe (SHARE, Börsch-Supan et al. 2005)). At its onset, this latter study included 11 European countries (Sweden, Denmark, the Netherlands, Belgium, France, Germany, Austria, Switzerland, Spain, Italy, Greece), but their number was increased in later waves. Importantly, the investigators of these three studies harmonized their measurement to some extent, thus enabling several comparisons across countries.

HRS is one of the earliest panel studies on middle-aged and elderly persons with regular survey intervals, at least in the United States (Juster and Suzman 1995). It started in 1992, with a sample of 18,496 participants aged 51 onward, with regular 2-year survey intervals, collecting rich data on work and employment, health, healthcare utilization, income and wealth, pension, and family and social relationships. The assessment of disability in HRS is complex, reflecting major changes in conceptualizing disability, such as the move from a traditional disablement model to the more comprehensive ICF model (Agree and Wolf 2018). The most often used measures include the activities of daily living (ADL) and the instrumental activities of daily living (IADL) list of items, complemented by a set of items on physical functioning (mobility restrictions). This information relies on self-reports and does not address issues of dependency on help from another person. To reduce heterogeneity of responses to these items, anchoring vignettes on disability were introduced more recently, and detailed measures of cognitive functioning and of social participation were included in an attempt to reflect core ICF dimensions of disability (Agree and Wolf 2018).

ELSA contains a representative sample of the community-dwelling English population aged 50 and over. Starting in 2002 with a total sample of 12,100 participants, it covers a broad range of topics on living and working conditions of individuals and households, assessed in interviews, and it additionally collects data from distinct tests of functioning (Marmot et al. 2003). More recently, biomedical data and detailed tests of functioning were included. The data collection is repeated on a 2-year interval, as is the case with HRS. At baseline, the measurement of disability was restricted to physical function (ADL, IADL, mobility measures related to the leg and arm, walking speed, falls) and cognitive function (memory, executive function, and a summary index).

SHARE is the first cross-national investigation of work, health, retirement, and socioeconomic conditions of elderly people (50 years and older) in Europe, largely based on measurements included in HRS and ELSA. It started in 2004 with a baseline sample of 32,442 participants, and data collection has been repeated in a 2-year interval. In 2008, extensive life history micro data were additionally collected (SHARELIFE), covering core domains of the life course: children, partners, employment, health, and accommodation (Börsch-Supan et al. 2011). Disability was assessed with a broad range of measures, including ADL, IADL, Global Activity Limitation Indicator (GALI), mobility limitations, grip strength, walking speed, balance, and cognitive tests (Börsch-Supan et al. 2005). As in the previous studies, different operational definitions of disability are used in scientific publications, but the relatively highest consistency and comparability were achieved with regard to ADL and IADL (Chan et al. 2012). It is of interest to note that one study developed a measure of disability that distinguished impairment from restriction in activity and participation, in line with the ICF model. Based on confirmatory factor analysis, two scales measuring "impairment" and "activity and participation limitations," respectively, were developed (Reinhardt et al. 2013).

The next section reviews major findings on the prevalence of disability and its social distribution in the three studies. This section is followed by a summary of findings on the impact of disability on early exit from labor market, mainly assessed by assignment of a disability pension.

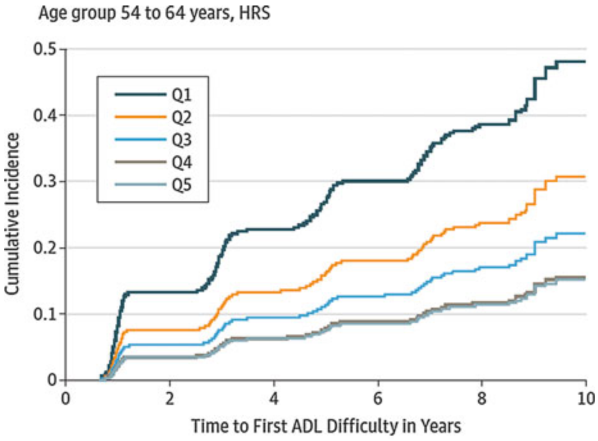
Prevalence and Social Distribution of Disability

Given a relatively long observation period of HRS, the prevalence and time trend of disability have been extensively analyzed. For instance, the prevalence of disability remained at a low level from 2001 to 2009, ranging from 10% to 12% of any ADL disability and from 7% to 9% of any IADL disability (Verbrugge and Liu 2014). This phenomenon was in accordance with an earlier investigation of HRS for a similar observation time (Freedman et al. 2013). Though the overall prevalence of disability remained stable, one study indicated an increase in the age group 53–64 years, distinct from older groups. Here, significant increases on ADL/IADL limitations, mobility, large muscle, and gross motor function indices were observed (Chen and Sloan 2015). Education was examined in several studies in its association with disability. In an observational study from 1994 to 2010, there was a strong negative correlation of education with the prevalence of disability, including minor and major ADL and IADL limitations (Rehkopf et al. 2017), and longitudinally, educational attainment was an important predictor of disability changes (Chen and Sloan 2015) as well as accelerated disability onset (Latham 2012; see also Verbrugge et al. 2017). These latter findings are in line with the observation of Stenholm et al. (2014) that low education is associated with poorer levels of physical functioning. In a study by van Zon et al. (2016) with HRS longitudinal data, similar results were observed using wealth as an indicator of socioeconomic position. As efforts toward reducing the prevalence and the social inequality of early-old-age disability may be compromised by the US health-care system that disadvantages socioeconomically deprived population groups, it is of interest to compare the situation in the United States with the one in Europe where universal access to health care is common in a large majority of countries. What is the prevalence and social distribution of disability in England and in continental Europe, as represented by ELSA and SHARE?

In baseline data from *ELSA*, the prevalence of disability in terms of one or more difficulties in ADL was about 10% in the age group 50–59. Yet, clear social variations were observed as this prevalence was 17.8% among participants in routine and manual occupational classes as compared to 7.7% among those in managerial and professional occupational classes. Similar social inequalities were observed for IADL. Concerning difficulty with mobility, 50.3% of routine and manual workers in this age group reported some difficulty, compared to 35.1% among managers and professionals. A further disability indicator, the mean summary index of cognitive function, was calculated for women and men in this age group (ranging from 5 to 55, with higher scores reflecting better function). Overall, this score was 37.7, but among those with higher education, including degrees, it was as high as 41.0, whereas it reached 33.6 among those with low or no qualification (Marmot et al. 2003). Another study used data from wave 6 (2012–2013), where disability was defined as having limitation in one or more activities, including ADL and IADL. The prevalence in this sample (mean age 66 years) was 20.9%, and disabled persons were significantly poorer, had a weaker social network, and suffered three times more often from depressive symptoms than those without disability (Lustosa Torres et al. 2016). Availability of data from multiple waves allows a dynamic analysis of processes between socioeconomic, behavioral, and psychosocial factors and the incidence of disability. One such study reported an incident disability rate between any two out of five consecutive waves of 20.3%, defined as one or more IADL limitations. This incidence was associated with lower socioeconomic position, lack of labor market participation, and poorer physical and social activities (d’Orsi et al. 2014). Finally, an important recent investigation compared wealth-associated disparities of incident disability over 10 years between the United States (HRS) and England (ELSA), where disability was defined as experiencing one or more ADL activity limitations (Makaroun et al. 2017). In the age group 54–64 years, the gradient of cumulative incidence of the first ADL difficulty according to wealth quintiles was steeper in the United States than in England, and it was also steeper than the gradient observed in the older-age group. Importantly, in the age group 54–64, 48% of those in the lowest wealth quintile were at risk of developing disability within 10 years, compared to 15% among those in the highest wealth quintile. Detailed comparative results between the two studies are given in Fig. 1 (Makaroun et al. 2017).

Information from *SHARE* indicates that, at baseline, 9.2% and 11.8% of men reported one or more ADL and IADL difficulties, respectively, and these figures were 12.5% and 21.1% among women. As expected, there was a pronounced age gradient in all measures of disability. Lower socioeconomic status was consistently associated with more functioning limitations, where similar contributions of education and income (as two main indicators of socioeconomic status) were observed. For instance, odds ratios of one or more IADL limitations for those in the lower two quintiles of income distribution compared to those in the upper two quintiles were 1.70 (95% CI 1.45; 2.00) among men and 1.46 (95% CI 1.30; 1.65) among women. Similar findings are reported for mobility limitations, eyesight problems, grip strength, and fear of falling (Börsch-Supan et al. 2005). Furthermore, the social distribution of activity limitations was obvious from longitudinal analyses on incident functional limitations long before retirement age (Nilsson et al. 2010).

Another analysis based on the ICF model of disability compared the variation of mean impairment scores and mean activity and participation scores according



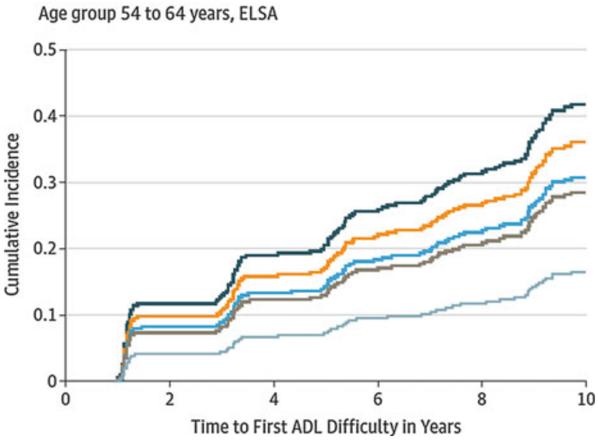


Fig. 1 Cumulative incidence of the first ADL difficulty by wealth quintile. ADL indicates activity of daily living; ELSA, the English Longitudinal Study of Ageing. (Source: Makaroun et al. 2017; printed with copyright permission from JAMA Internal Medicine)

to income (as the main indicator of socioeconomic status) in the eleven countries under study, where three groups of high, medium, and low income were distinguished. With regard to impairment, income differences were particularly large in Spain, France, and Germany, and overall levels were lowest in Switzerland, Sweden, and Denmark. Concerning activity and participation limitation, income differences were largest in Spain and Belgium, and overall levels were lowest in Switzerland and Greece. Across all countries, education and income (three groups each) were associated with significantly increased incidence rate ratios of the two disability measures between wave 1 and wave 2. For instance, the incidence rate ratio of activity and participation limitation was 2.02 (95% CI 1.45; 2.80) for the lowest education group and 1.93 (95% CI 1.42; 2.62) for the medium education group compared to the highest educational group. A similar pattern was observed for income. These findings indicate a higher burden of disability among older employed men and women in lower socioeconomic positions (Reinhardt et al. 2013).

There is limited information available comparing socioeconomic inequalities of disability across populations of the three studies HRS, ELSA, and SHARE. In an analysis of two measures of disability, mobility limitations and IADL limitations, assessed in 48,225 adults aged 50–85 years, associations of wealth with disability according to age were analyzed using fractional polynomials of age and controlling for sociodemographic characteristics and important risk factors (Wahrendorf et al. 2013). Wealth was measured as household total net worth (accumulated savings), adjusted for household size, categorized into country-specific tertiles. In each country or region, wealth was significantly associated with both indicators of disability, but gradients in working-age populations were steeper in the United States and in England than in the countries of continental Europe. The discrepancy between low and high wealth was highest in case of mobility limitation in the US sample. A further investigation of a large US sample of men and women aged 55–64 confirmed this steep social gradient, with particular reference to income (Minkler et al. 2006). Those below the administrative poverty line were six times more likely to experience functional limitations compared to the wealthiest group, but a gradient along all income categories was documented. These findings indicate that social inequalities of disability do exist in countries with universal access to health care as well as in the United States with its restricted health-care system, although to a lesser extent. Therefore, extending access to health care, while important, may not be sufficient to reduce the social gradient of limitations of activity and social participation among middle-aged and early-old-age populations (see below). Obviously, these consistent social inequalities have their roots in differential health-related, behavioral, psychosocial, and socioeconomic vulnerability in earlier stages of life (e.g., Landös et al. 2018). While it is beyond the current contribution to analyze these risk and protective factors, the question of interest here concerns the longer-term consequences of incident midlife disability for work ability and premature exit from labor market.

Consequences of Disability for Health-Related Work Exit

Disability pension (DP) is an established measure of social protection in advanced societies, and its regulations vary widely between the different countries (OECD 2013). Generally, DP is based on a medically certified diagnosis that indicates the inability to continue regular work as previously, due to a physical or mental impairment. DP provides some compensation of income loss in case of early exit from the labor market, either on a temporary or permanent basis. The frequency of receiving a DP and the level of compensation heavily depend on institutional characteristics of national pension systems, the demographic composition of the workforce, and the economic performance of a country. Overall, work inability due to long-standing ill health or disability defines the major pathway of early exit from labor market, but several other determinants were documented (Carr et al. 2018). Among these, adverse physical and psychosocial working conditions and socially disadvantaged living circumstances seem to play a prominent role. What is known from the three aging studies about the interplay of reduced health, adverse work, and low socioeconomic position as determinants of early exit from paid work?

Researchers dealing with *HRS* so far mainly preferred to analyze associations of disabling health conditions with early exit from paid work rather than the role of adverse working conditions or low socioeconomic position in the pathways triggering premature retirement. There is now robust evidence that poor health at baseline increases the risk of health-related exit from work, whether measured as self-rated general or physical poor health, as prevalence of multiple chronic conditions, or as severe insomnia (McDonough et al. 2017; Roy 2018; Dong et al. 2017). Some of these studies controlled for the effect of sociodemographic or work-related factors, whereas other reports found independent effects of socioeconomic or work-related conditions. For instance, in an analysis of trajectories from employment to work disability among women, higher risks of being work-disabled were observed among black and Hispanic women, compared to white women, and these risks were associated with social disadvantage in earlier stages of the life course (Brown and Warner 2008). Long-term effects of adverse socioeconomic and psychosocial childhood conditions on elevated occurrence of health-related work exit were found for men and women in the context of HRS (Bowen and González 2010). A further investigation showed that recurrent work-to-family conflicts increased disability risks over an observation period of 10 years (Cho and Chen 2018). Yet, a particularly strong impact of low education and low occupational position on elevated risks of DP comes from a recent longitudinal analysis comprising seven aging studies, including HRS. In the US sample, low occupational position and low level of education were associated with a twofold risk of DP both among men and women (Carr et al. 2018).

Several European studies on aging put special emphasis on the combined effects of disabling health- and work-related factors on early exit from work. In *SHARE*, in addition to poor self-rated health, lack of physical activity and having a job with low control or with an imbalance between high efforts spent and low rewards received in turn predicted an increased risk of DP (Robroek et al. 2013). High demand in combination with low control at work (or “job strain”) is a stress-theoretical model of health-adverse job characteristics that has been related to a broad range of ill health outcomes (Karasek and Theorell 1990; Theorell et al. 2015). As a complementary theoretical model, effort-reward imbalance defines health-adverse employment conditions where effortful jobs are not adequately compensated by rewards in terms of material, status-related, nonmaterial, and socioemotional rewards (Siegrist 1996). Again, this model was shown to predict a range of health outcomes, including health-related work exit (Siegrist and Wahrendorf 2016). These factors of a stressful psychosocial work environment were observed in relation to DP in an earlier report from SHARE (van den Berg et al. 2010). It is of interest to note that the prevalence of low job control and effort-reward imbalance follows a social gradient in SHARE, such that lower occupational positions are associated with a higher level of work-related stress (Wahrendorf et al. 2013). Along these lines, two findings from *ELSA* deserve attention. One finding indicates that adverse working conditions, in terms of low control at work (a component of the demand-control model) and low recognition (a component of the effort-reward imbalance model), predict early exit from paid work (Carr et al. 2016). The other finding confirms a significantly elevated risk of being granted a DP among English working men and women with low educational level or low occupational position (Carr et al. 2018). For instance, the hazard ratio of disability retirement among employed older men and women in the lowest of three occupational categories compared to those in the highest occupational group is 2.38 (95% CI 1.48; 3.81) and 2.04 (95% CI 1.36; 3.07), respectively, if adjusted for self-rated health and birth cohort (Carr et al. 2018).

These results indicate that social inequalities in the consequences of disabling health resulting in early exit from paid work are a robust fact across different countries. A research network in Scandinavian countries contributed additional insights into the interplay of poor health, adverse work, low socioeconomic position, and early retirement. For instance, according to a register linkage study from Finland, the risk of disability retirement was particularly high if persons suffered from cardiovascular disease and were simultaneously located in a low socioeconomic position (Virtanen et al. 2017). Further investigations showed that associations of low socioeconomic status with DP varied by type of disabling disease, with strongest relationships for musculoskeletal disorders and cardiovascular diseases but weaker association with depression (Polvinen 2016, Leinonen et al. 2011, Pietiläinen et al. 2018). These associations were largely mediated by adverse physical working conditions, in particular if DP was granted due to musculoskeletal disorders or injuries. However, complementary studies from Finland demonstrate that adverse psychosocial working conditions are important predictors of DP as well, for general DP (such as low job control, Knardahl et al. 2017) and for DP due to depression (Juvani et al. 2018). In this latter case, the study linked three theoretical concepts of psychosocial stress at work, assessed in 2008 among 41,862 employees, to national records of disability pensions until 2011: job strain, effort-reward imbalance, and organizational injustice. Compared to employees without exposure to any of these stressors, those exposed to all three stressors simultaneously had a 4.7-fold increased risk of disability pension from depressive disorders. Moreover, this risk was particularly high among employees aged 35–50 if they simultaneously suffered from job strain and effort-reward imbalance. The study also documented significantly elevated risks of DP due to musculoskeletal disorders and all-cause DP among employees experiencing a clustering of work stressors (Juvani et al. 2018).

A Synthesis

This contribution supports the argument that disability is best conceptualized as a universal human condition rather than a phenomenon defining specifically those minority groups within total populations that are characterized by a permanent and severe bodily impairment and restricted social participation. Although ensuring rights and extending social participation among these latter groups remains an important policy aim, disability, defined as the result of widespread functional limitations starting in midlife and culminating among the oldest groups, has to be addressed at the level of total populations. A brief summary of results from cohort studies in modern Western societies has shown that the frequency of restrictions in basic everyday activities varies between 10% and 20% in early old age, with an even higher percentage in case of mobility limitations. The consequences of disabling health conditions are particularly severe among employed men and women in midlife and early old age. We learned that the risk of early exit from paid work is critically elevated in persons with poor health, including limitations of physical or mental functioning. Despite the fact that disability pensions to some extent compensate for work-related income loss, for many of those people, a premature exclusion from the labor market is associated with multiple socioeconomic and psychosocial disadvantages.

Conceptualizing disability as a universal human condition has enabled researchers to study human life within an extended perspective of functioning, as defined by the World Health Organization's ICF classification. Accordingly, disability is analyzed along three interconnected areas of human functioning within distinct social, natural, and built environments: bodily functions and structures, human activities, and social participation. The combined study of these areas has produced a wealth of new knowledge. For instance, in the context of working life, it became evident that impaired bodily functioning can adversely affect cognitive and affective functioning, reduce commitment to work and work ability, and increase the risk of social isolation and exclusion. Or take the case of organizational measures of enhanced employability where people with disability can maintain their jobs, thus avoiding exclusion from the labor market. The far-reaching impact of environmental factors on the development and course of disability has been illustrated above with our main focus on social inequality.

Prospective findings indicate that people who live and work in less advantaged conditions have a higher probability of developing disabling functional limitations and that such limitations manifest themselves at an earlier stage in life compared to people who live in more privileged circumstances. Although a potential influence of social selection cannot be ruled out – claiming that persons with poorer health are more likely to suffer from downward social mobility, thus clustering in low socioeconomic positions, – it is more likely that adverse socioeconomic conditions play an important role in causal pathways leading to increased disability risks. Two complementary explanations developed in the frame of life course research support this notion. The "pathway" model posits that children born and growing up in families with restricted socioeconomic and psychosocial resources may perform less successfully in their educational attainment, thus having fewer options of accessing a high-quality job. Once this pathway into a lower occupational position has been achieved, there are limited chances of upward mobility, and continued exposure to a physically strenuous or psychologically demanding job in the long run will impair physical functioning and promote ill health. The model of "cumulative disadvantage" claims that the restricted socioeconomic and psychosocial resources of parents are transmitted to and "embodied" by their children during the process of socialization, rendering them more vulnerable when coping with the challenges of life in early adulthood and placing them more often in less advantaged social positions. These lower social positions are often associated with more physical or psychosocial stressors that in turn increase people's vulnerability. Thus, chains of stressful experiences accumulate in these people, increasing their risk of functional impairment and ill health (Graham and Power 2004). The model of cumulative disadvantage may also help explain why people in lower socioeconomic positions who once developed a disability are at higher risk of suffering from more serious consequences, e.g., in terms of early health-related exit from work. Successful coping with disability requires a strong mobilization of personal and socio-environmental protective factors. These protective factors may be available to a lesser extent in socially deprived groups, thus aggravating their burden of coping and its adverse consequences for health and well-being. To conclude, both models, "differential pathways" and "cumulative disadvantage," help in explaining the socially unequal burden of disability, its antecedents, and its consequences.

Implications for Policy

Given a robust basis of evidence on social inequalities in the prevalence and further course of disability, and given a relevant role of working conditions in associations of socioeconomic positions with disabilities, are there obvious policy implications of this scientific knowledge? As these inequalities result from processes occurring in a life course perspective, it is difficult to decide when and where to intervene. However, at least the following three entry points offer some opportunity of change. First, the observation of a higher prevalence and earlier onset of functional limitations among working people with lower socioeconomic positions calls for intensified efforts of providing worksite medical screening and company-based monitoring of health-damaging working conditions as part of occupational health and safety programs. To avoid potential discrimination, these measures should be offered to all employees in respective organizations but should be stratified according to need. By strictly observing data protection regulations, the screening and monitoring data obtained from occupational health and safety officials could be used to identify groups of employees with the highest need of support in terms of promoting their health and of reducing the adversity at their work, and respective programs could then be implemented. Obviously, this strategy requires the establishment of well-equipped occupational health and safety services as well as the existence of national regulations prescribing routine monitoring of quality of work and employment. Unfortunately, in a majority of countries, these requirements are currently far from being met. Yet, models of good practice are offered by several European countries, in particular Scandinavian countries, the Netherlands, France, and the United Kingdom, and by Australia, Japan, and Canada. Even within these countries, there seems to be a preference of offering worksite health promotion programs to better educated groups of employees. For instance, a meta-analysis of health effects of randomized controlled worksite interventions revealed that twice as many of the 40 reports included in this review were conducted in higher-skilled occupational groups than was the case in lower-skilled groups. This holds particularly true for interventions addressing overweight, musculoskeletal pain, and stressful working conditions (Montano et al. 2014). Thus, the double burden of poorer quality of work and higher risk of ill health among less-privileged occupational groups has not yet been adequately addressed. This conclusion is supported by a study forecasting the impact of disability on labor force development in the United States (Rehkopf et al. 2017). The authors argue that early support of socially disadvantaged working groups, specifically those with certain types of functional limitations, is needed, both in terms of providing health services and offering improved work environments to ensure a sustainable aging workforce in the near future.

A second opportunity of intervention concerns the improvement of work ability among all those middle-aged or early-old-age employed people who suffer from some manifest disability. Rather than excluding them from paid work by granting a disability pension – a procedure that is still common in a number of countries – comprehensive programs of medical and vocational rehabilitation should be put in place to improve health status and work ability. The German system is a well-known example of this approach.

Germany offers extensive medical rehabilitation services to all persons covered by the national statutory pension insurance following onset of a medically certified disabling condition or chronic disease. These services are offered in specialized rehabilitation clinics or in out-hospital training and treatment settings for several weeks, and costs are covered by the national pension funds. The underlying argument maintains that costs of rehabilitation are by far less expensive than costs of long-term provision of disability pensions, given the evidence of increased rates of successful return to work. As an example, a large study of cancer patients undergoing medical rehabilitation in Germany demonstrates that three quarters of all patients were able to return to work within 6 weeks following completion of the rehabilitation program (Mehnert and Koch 2013). Again, investments in comprehensive rehabilitation and reintegration services require an active national labor and social policy that is currently realized in a minority rather than a majority of countries.

The scientific reports mentioned above document a relevant impact of adverse physical and psychosocial working conditions on the development of disability and on elevated risks of early health-related exit from paid work. These conditions are not randomly distributed across working populations, but tend to cluster among groups with lower levels of skills and among those in low-ranking positions within occupational hierarchies. Therefore, a third entry point of interventions relates to policies that address social inequalities in exposure to health-adverse working conditions. These policies are best realized in the frame of national worksite health promotion programs enforced by legislation and adopted by employer organizations. During the past decades, in economically advanced societies, progress was achieved in reducing occupational diseases and occupational injuries, but, despite a solid scientific knowledge base, the burden of stressful psychosocial work environments has not yet received similar attention. As the prevalence of this burden follows a social gradient, with higher levels among those with lower positions (Wahrendorf et al. 2013), additional labor policies need to be implemented that address the special needs of socially disadvantaged workers. As an example, distinct integration policies were developed in some countries that provide training skills and continued education and supported employment or access to less physically demanding jobs and provision of incentives (e.g., more equitable wages and salaries) to those with the highest need. In Europe, Denmark, Sweden, the Netherlands, Germany, and Switzerland are countries with advanced levels of labor market integration policies. A comparative study analyzing the social gradient of stressful psychosocial work environments according to the extent of implementation of these integration policies documented that this gradient was steepest in countries with a weak integration policy and least pronounced in countries with strong respective developments (Lunau et al. 2015). Although these findings should be interpreted with caution, they point to smaller educational inequalities in the burden of work-related stress among working populations of countries with well-developed active labor market programs.

These three entry points of interventions toward improving the work ability and toward reducing the burden of disability in an aging workforce are far from being sufficient in view of persisting social inequalities of working people's health. In times of a globalized economy, restrictions of policies to the national context need to be overcome by establishing effective supranational regulations that ensure an extension of health-conducive work across all occupational groups.

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