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The Relationship between Diabetes and Retirement from Work: A Ten-Year Follow-Up in National Registers

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Abstract

Objectives: To investigate the relationship between diabetes, mortality and exit from work using various Danish Pension schemes.

Methods: We linked the Danish National Diabetes register with socioeconomic and population-based registers and followed prevalent and incident cases of diabetes for ten years, adjusting for gender, age and socio-occupational group. We analysed the proportion of individuals with diagnosed diabetes before and after entering a normal retirement pen-sion, voluntary early retirement pension or disability pension. Risk ratios for entering pensions, emigration and mortali-ty were calculated using Poisson regression.

Results: Among 1,628,087 adults between the ages of 30 and 59, the relative risk for mortality was increased for those with incident and prevalent diabetes by 11-145%, compared to individuals without diabetes. Voluntary early retirement pension was the most common path out of the workforce, especially for individuals with diabetes. Compared to those without diabetes, the relative risk of disability retirement for individuals with prevalent and incident diabetes was 2.98 (95% CI, 2.89 – 3.07) and 2.40 (95% CI, 2.34 – 2.45), respectively. More than one fifth of participants were diagnosed with diabetes after retirement. There was a marked negative socio-occupational gradient for mortality, voluntary early retirement and disability pension.

Conclusions: Increasing the retirement age will increase the proportion of workers who develop diabetes while still in the workforce. Since the number and severity of complications are related to longer disease duration, it is likely that, under proposed retirement reforms, more employees will experience health problems managing their jobs, especially among the most vulnerable socioeconomic groups.

Introduction

Actual and proposed increases to the retirement age in many Western countries, combined with the ongoing diabetes epidemic [1], raise the possibility that the prevalence of diabetes among the working population will increase considerably in the coming years. The most recent (2012) data from the Danish National Diabetes Register (DNDR) [2] indicate that the respective prevalence of diabetes for Danish females and males between 50 and 59 years of age is 6.7% and 8.5%; the respective prevalence of diabetes for females and males aged 60-69 years is 11.1% and 15.3%. Type 2 diabetes has generally been overlooked in the context of occupational safety and health, not least because it has traditionally been perceived as primarily affecting people's health after retirement [3]. Nevertheless, diabetes is influencing retirement choices today [4,5] and it is therefore expected to become more important as the retirement age increases. However, there is only scarce knowledge of how the incidence and prevalence of diabetes are distributed among different pension schemes.

In Denmark, pension benefits are obtained in three ways: normal retirement, voluntary early retirement and disability. All Danes are administratively assigned a normal retirement pension at the current qualifying age of 65 years, although some individuals may voluntarily continue to work. The Danish voluntary early retirement pension was implemented in 1979 and combines individual payment to an unemployment fund with a supplemental public welfare payment, currently beginning at age 60. The original argument for voluntary early retirement was to incentivize employee attrition in crowded occupations and in general, to favour employment of younger people when jobs are scarce. To obtain this benefit, employees must be healthy and able to work full time until the first day of eligibility for a voluntary early pension. A disability pension is granted when an employee's working capacity is permanently reduced to the extent that no work of any kind can be performed.

As part of a multi-partisan retirement agreement, the Danish Ministry of Finance estimated that normal retirement age will be 70.5 by the year 2045, compared with the current age of 65 [6]. However, by 2022 both early voluntary and normal retirement ages will have already increased by two years. In addition, the duration of early voluntary pension gradually decreases from five to three years by 2023; beginning in 2045, this benefit will be available only when people are 67.5 years old.

Delayed retirement is directly related to diabetes because disease duration is correlated with the risk of complications affecting fitness for work. Among complications potentially impacting the ability of individuals with diabetes to continue working are ischaemic heart disease [7,8], stroke [9] and increased mortality [10]. Due to a negative social gradient in diabetes incidence [11,12], employees working in the lowest socioeconomic occupations may be more affected by these complications.

The aim of this study is to investigate how diabetes is related to exit from work, particularly through three Danish pension schemes, and to examine the proportion of diabetes that is diagnosed before and after entering each pension scheme.

Methods

Diabetes incidence is derived from the DNDR, which provides

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incident data from 1995 onwards. The DNDR comprises linked records from the National Patient Register, National Insurance Service Register and Register of Medical Product Statistics [13-15]. To be registered as having diabetes, individuals must have a record of one or more of six criteria [2]. Patients diagnosed with diabetes before 1995 are registered as prevalent cases, but there is no information on disease duration for these individuals. The DNDR does not distinguish between type 1 and type2 diabetes.

Study population and data sources

Using a unique person identification number, we linked DNDR with the Central Person Register and the Employment Classification Module to collect information on gender, age, date of birth, death, voluntary early retirement or migration [16,17]. Socio-occupational status at register entry was coded according to Statistics Denmark's classification system [18]. Because of the small number of people employed in the military and agricultural sectors, these occupations were excluded from the study population.

Selection of the study population is shown in figure 1. In all, 1,628,087 Danish adults between the ages of 30 and 59 years who were in the labour market on January 1, 2001 were followed for ten years or until the occurrence of one of five exit options: death, first emigration or entry into normal retirement, voluntary early retirement or disability retirement.z

Statistical analysis

We calculated the proportion of individuals in the each of the five exit categories. Ten-year incidence of diabetes is calculated for the transitions between continue in work, normal retirement,

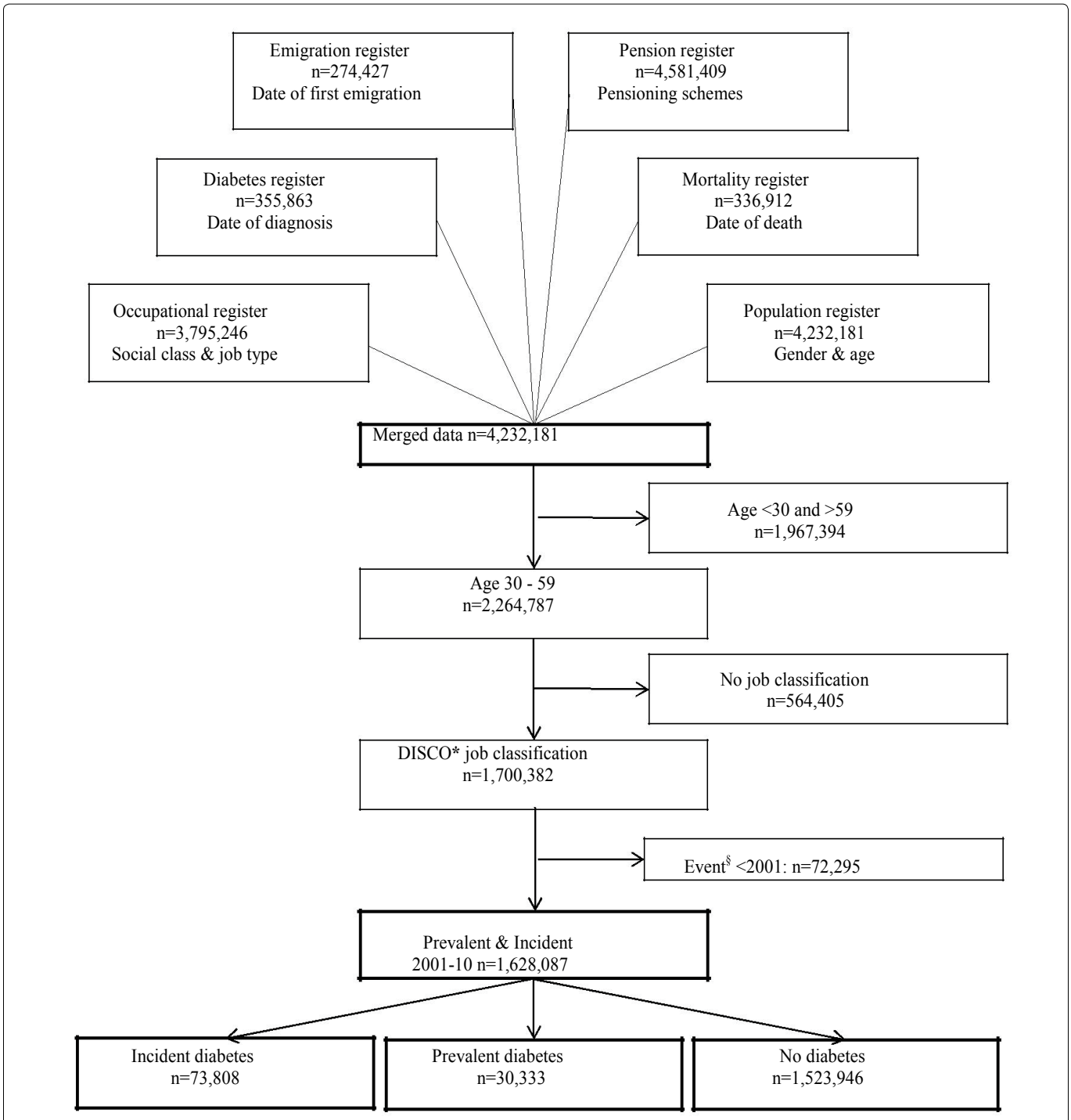

Figure 1: Diabetes and career path

*DISCO Danish International Standard Classification of Occupations

§Events are death, emigration or pension

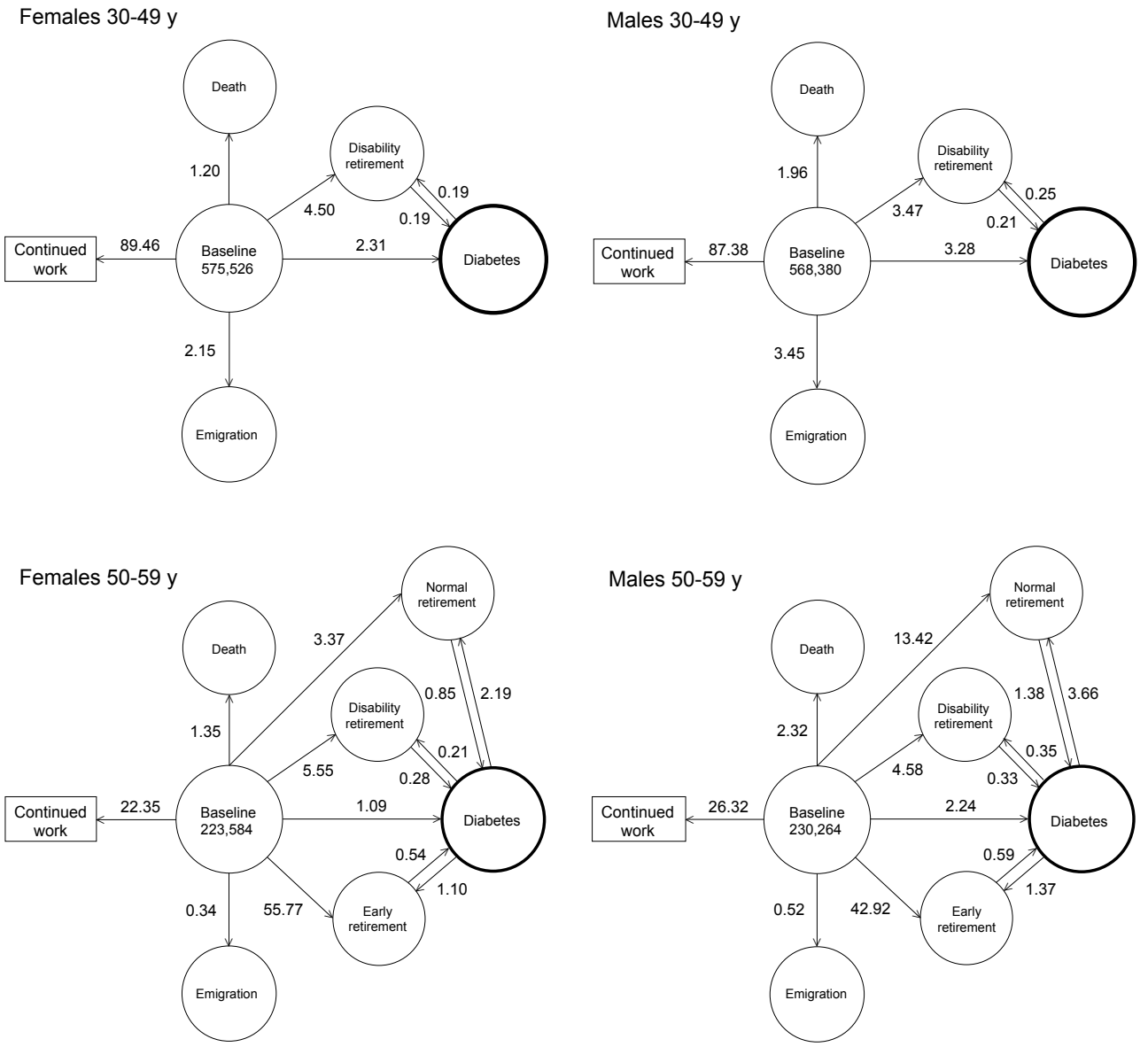

Figure 2: Labour market transitions among the male and female Danish population aged 30-49 and 50-59: Work; Incident Diabetes; Normal retirement; Voluntary early retirement; Disability retirement; Emigration; and Death

voluntary early retirement and disability retirement. The population was stratified on sex and age (Figure 2). Poisson regression was used to estimate relative risk (RR) with 95% confidence limits for each of the five exit options during the ten-year follow-up period. Proc Genmod in SAS version 9.3 (SAS Institute; Cary NC, USA) was used to implement the analysis, stratified on gender, age group, diabetes status and socio-occupational class. Females, workers aged 30-49, people without diabetes and professionals were used as reference groups.

Results

Table 1 shows the unadjusted distributions of ten-year incidence for each of the five exit categories stratified on diabetes status, sex and age. Mortality was higher among workers with incident diabetes, compared to people without diabetes, but only for younger members of the study population. If diabetes was present at entry into the study, then all groups had increased ten-year mortality. In contrast, emigration was lower for people with prevalent or incident diabetes. The normal retirement pension option was more common for males; females more often used the voluntary early retirement option, and the rate of early retirement was even higher for women with diabetes. Although the disability pension was used least frequently, the proportion of the incident population receiving a disability pension was 1.8-3.0 times greater than the comparable proportion of the population without diabetes. Similarly, the proportion of the prevalent population receiving a disability pension was 2.5-3.8 times greater than the comparable proportion of the population without diabetes.

To explore if diabetes was diagnosed before or after people entered a pension scheme, we calculated the proportion for each option (Figure 2). In the younger age group, it is only possible to receive a disability pension, which was more common for females (4.5% vs. 3.5% for males). Of females aged 30-49, 2.3% developed diabetes and 8.2% of these (0.2% of all females in this age group) subsequently entered a disability pension. Similarly, 0.2% of females in this age group with a disability pension subsequently developed diabetes. The total rate of ten-year diabetes prevalence among workers aged 30-49 was 3.7% for males and 2.7% for females.

Table 1: Relationship between diabetes status and work status after ten years

Status	Gender	Age group	N	Status after ten years (%)					
				Employed	Death	Emigration	Normal retirement	Voluntary early retirement	Disability retirement
No diabetes	F	30-49	560,004	92.40	0.94	2.03	0.0	0.0	4.63
		50-59	209,563	24.05	1.27	0.33	8.93	59.50	5.93
	M	30-49	546,984	91.57	1.59	3.24	0.0	0.0	3.61
		50-59	207,395	29.64	2.21	0.51	14.90	47.65	5.08
Incident diabetes	F	30-49	15,522	83.92	1.33	0.61	0.0	0.0	14.14
		50-59	14,021	16.37	0.98	0.10	8.60	63.00	10.95
	M	30-49	21,396	83.96	2.36	1.45	0.0	0.0	12.21
		50-59	22,869	20.67	1.78	0.26	14.52	52.60	10.18
Prevalent diabetes	F	30-49	7,844	83.78	2.10	1.30	0.0	0.0	12.81
		50-59	4,900	15.96	1.82	0.14	9.65	57.39	15.04
	M	30-49	8,313	78.72	5.65	1.92	0.0	0.0	13.70
		50-59	9,276	16.97	3.70	0.30	15.83	49.45	13.76

Table 2: Relative risk (RR) for labour market exit outcomes during ten-year follow up

		Death		Migration		Normal retirement		Early retirement		Disability retirement	
	N*	RR	CI 95%	RR	CI 95%	RR	CI 95%	RR	CI 95%	RR	CI 95%
Female (reference)	811,864	1.00	-	1.00	-	1.00	-	1.00	-	1.00	-
Male	816,233	1.61	1.57 – 1.66	1.66	1.62 – 1.70	1.67	1.64 – 1.71	0.77	0.77 – 0.78	0.71	0.70 – 0.73
30 – 49 y (reference)	1,160,063	1.00	-	1.00	-	1.00	-	1.00	-	1.00	-
50 - 59 y	468,024	1.77	1.73 – 1.82	0.21	0.20 – 0.22	0.0	-	0.0	-	1.76	1.73 – 1.78
No diabetes (reference)	1,523,946	1.00	-	1.00	-	1.00	-	1.00	-	1.00	-
Incident diabetes	73,808	1.11	1.04 – 1.17	0.46	0.42 – 0.51	2.11	2.05 – 2.18	2.13	2.10 – 2.16	2.40	2.34 – 2.45
Prevalent diabetes	30,033	2.45	2.30 – 2.60	0.68	0.61 – 0.77	2.25	2.15 – 2.36	1.88	1.83 – 1.92	2.98	2.89 – 3.07
Professionals (reference)	256,147	1.00	-	1.00	-	1.00	-	1.00	-	1.00	-
Managers	54,697	0.98	0.91 – 1.07	0.82	0.76 – 0.87	1.30	1.26 – 1.34	1.31	1.27 – 1.34	0.82	0.77 – 0.87
Technicians	334,153	1.12	1.07 – 1.18	0.69	0.66 – 0.71	0.56	0.55 – 0.58	1.09	1.07 – 1.10	1.34	1.30 – 1.38
Clerical support	222,240	1.40	1.33 – 1.48	0.51	0.49 – 0.53	0.59	0.57 – 0.61	1.56	1.54 – 1.59	1.97	1.91 – 2.04
Service & sales	207,176	1.36	1.28 – 1.43	0.45	0.43 – 0.47	0.49	0.48 – 0.51	1.44	1,41 – 1.46	2.63	2.55 – 2.71
Craft & trades	189,220	1.47	1.40 – 1.55	0.42	0.41 – 0.45	0.47	0.46 – 0.49	1.69	1.66 – 1.71	2.45	2.37 – 2.54
Plant & machine	142,834	1.61	1.52 – 1.69	0.33	0.32 – 0.35	0.37	0.36 – 0.38	1.61	1.59 – 1.64	3.39	3.28 – 3.50
Elementary	205,151	1.94	1.85 – 2.04	0.47	0.45 – 0.49	0.55	0.53 – 0.56	1.84	1.82 – 1.87	4.97	4.83 – 5.12

*Because of low numbers Armed forces (N=11,320) and Agriculture (N=5,149) are excluded from the stratified analyses on socio-occupational groups, but they are included in the analyses on gender, age and diabetes status.

Among study participants aged 50-59, exit from the workforce most frequently occurred through voluntary early retirement, which was chosen by 55.8% of females and 42.9% of males. The majority of workers aged 50-59 who developed diabetes either remained in the workforce, exited the workforce via a normal retirement pension, or left through voluntary early retirement. The total ten-year diabetes prevalence for men and women aged 50-59 was 9.9% and 6.3%, respectively.

People with prevalent diabetes had the highest relative risk of mortality (RR 2.45; 95% confidence interval (CI), (2.30-2.60) and of receiving a disability pension (RR 2.98; 95% CI, 2.89 – 3.07), although incident diabetes was also associated with increased retirement risk (Table 2). Compared to women, men were less likely to receive a disability pension (RR 0.71: 95% CI, 0.70 – 0.73) or voluntary early retirement pension (RR 0.77; 95% CI, 0.77 – 0.78) and more likely to die (RR 1.61; 95% CI, 1.57 – 1.66) and emigrate (RR 1.66: 95% CI, 1.62 – 1.70). After adjusting for sex, age, and diabetes, a clear negative socio-occupational gradient existed for mortality, voluntary early retirement and disability pension. Members of the highest socio-occupational groups, e.g., managers and professionals, remained in the labour market until reaching normal retirement age. The relative risk for emigration was highest for men, lower for all socio-occupational groups compared to professionals, and lower for those with diabetes and aged 50-59.

Discussion

Our findings demonstrate that people with diabetes more frequently entered both voluntary early retirement and disability pensions than did people without diabetes. People with diabetes also had an increased relative risk of mortality compared to those without diabetes. The reason for the relative risk of normal retirement to be almost equal between incident and prevalent diabetes, might be explained by the much higher risk of dying for prevalent cases. Another part of the explanation is the inverse directions of the socio-occupational gradients. In addition, the risk of entering both voluntary early retirement and a disability pension was highest for females and for those with the lowest socio-occupational positions.

Diabetes is not an "after retirement" disease

Our results also indicate that the greatest proportion of diabetes was diagnosed before normal retirement. Most people with type 2 diabetes are expected to live for many years without major problems after being diagnosed, and diabetes is also regarded as the condition with the least influence on workability compared to musculoskeletal, severe headaches, circulatory, respiratory, digestive and psychological chronic health problems, investigated in the Netherlands [19], which has a retirement age comparable to that of Denmark [20]. However, in general, people with diabetes have increased absenteeism [21], especially around the time of diagnosis [22], and other authors have found that they retire earlier than do people without diabetes [23]. Furthermore, people with diabetes report disabilities three times more often [24] than do people without diabetes; psychological and emotional problems like distress and depression are also associated with diabetes [25,26].

Unfortunately, even though previous reports may lack details about diabetes type, disease severity and complications, they are often generalised to all employees with diabetes, when a much more nuanced understanding is needed. To the best of our knowledge, complications with the most significant influence on attachment to the labour market are cardiovascular disease, renal disease, amputations [27], neuropathy and impaired vision [28]. Although many complications are silent for years and may not be diagnosed until disease is advanced [29], they are nevertheless an important factor in remaining fit for work [30]. Complications have the highest impact on the individual risk of job loss due to diabetes [31] and on the economic costs of diabetes [32]. The implications of the new pension reforms being implemented in most OECD countries [20] will therefore need to be considered carefully.

The timing of diabetes diagnoses and entering pensions

The majority of participants who developed diabetes were diagnosed before entering one of the three pension schemes. However, 27% of females and 20% of males aged 50-59 were diagnosed after retirement; comparable figures among workers aged 30-49 were 7% and 6%. Since more than one fifth of the diabetes cases were diagnosed after retirement, substantially increasing retirement age over a relatively short period will increase the number of people with a longer duration of disease who is active in the workforce.

Voluntary early retirement has been very popular in Denmark. The Danish Welfare Commission asked people receiving a voluntary early retirement pension about their reasons for withdrawing from the workforce. One fifth of respondents reported they gave up work because of poor health, and one tenth reported being afraid of developing poor health if they continued working [33]. However, it is unknown how much diabetes, in particular, influenced their decisions. We also found an elevated risk of receiving a disability pension among people with both incident and prevalent diabetes. However, diabetes is seldom the identified cause of disability retirement; common medical reasons are psychological or musculoskeletal in origin. Most of the senior workforce already has at least one chronic condition by approximately 60 years of age [34], and the additional development of diabetes may trigger entering a disability pension. However, we expect that, with impending retirement reforms requiring workers to remain in the workforce longer, workability will be affected for many more employees with diabetes.

Inequity factors in diabetes and work life

How would the diabetes epidemic influence a general pension scheme that does not differentiate according to socio-demographic factors? As shown in table 2, a significant difference existed in the patterns with which males and females applied to the three pension schemes. For instance, since females currently leave work earlier through voluntary early retirement, they will need to remain in the workforce even longer than will their male colleagues [35]. We can expect a relative increase in workers with diabetes in jobs that traditionally employ women. Because the incidence of diabetes peaks later in women than in men [36], the largest increase will happen within the extended timeframe of the reform.

In addition, a significant negative socio-occupational gradient existed with respect to the options for exiting the workforce, even after adjusting for sex, age and diabetes. Diabetes is also distributed along a similar negative socio-occupational gradient [11,12,37,38], compounding the issue and highlighting the importance of effective strategies to address obesity, a major cause of diabetes [39] that is of great concern in occupational health [40].

Strengths and weaknesses

All data came from administrative registers covering the entire population, minimising selection bias [41]. On the other hand, a diagnostic bias likely occurred because type 2 diabetes may be undiagnosed in a significant number of adults in the workforce. Similarly, diagnostic delays are common; many individuals have had diabetes for some time, perhaps several years, before they are diagnosed. However, the DNDR has been validated as a reliable source of information on diabetes in Denmark for epidemiological purposes [42].

A limitation of our study is that we cannot distinguish between type 1 and type 2 diabetes. However, since only roughly one in ten cases of diagnoses diabetes is of type 1, most of which are diagnosed during adolescence or in early adulthood, we excluded people under the age of 30 years to minimise bias arising from this limitation. Another potential limitation is that legislation changed slightly during the ten-year follow up because of a global economic crisis. However, we do not expect that this would substantially influence our conclusions. Finally, although it is possible that some members of the study population changed socio-occupational groups, we do not believe that this significantly affected our results [43], especially as it is a large register based survey following up for only ten years.

Implications for the labour market

Our results fuel the argument that the proportion of workers who will develop diabetes while still at work will increase significantly if demographic trends and diabetes incidence continue their current trajectories over the next three decades. Furthermore, many more people will also have had diabetes of sufficiently long duration to be at increased risk of developing complications before retirement.

With regard to diabetes, applying a universal retirement scheme for all socio-occupational groups may ultimately be neither fair nor practical, since the lowest socio-occupational groups have a higher mortality rate, more frequently use disability benefits, and, as noted earlier, acquire diabetes more frequently. In addition to its direct effects, diabetes also amplifies the effects of many other physical and psychological conditions, forcing people out of work earlier than society requires.

Conclusion

As diabetes is predicted to continue as an epidemic, the extended retirement age will result in more people in the workforce having diabetes of longer duration. By 2050 most of the OECD-member countries will raise the retirement age to at least 67 years [20]. Most of these countries have similar systems as the one we have described from Denmark and how to construct our future pension schemes is important to get on the international agenda. A fair approach will also need to take inequalities in health into consideration. In the future, most cases of diabetes will be diagnosed while people are still active in the labour market. A negative social gradient exists in which, compared to professionals, elementary workers have more diabetes and a higher relative risk of mortality and more often use disability pensions and voluntary early retirement. The exact role of diabetes in relation to work fitness and retirement in the future labour market needs to be further investigated.

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