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The contribution of age, gender and occupational group to the higher risk of disability retirement among Finnish public sector employees

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Abstract

Background. The aim of this study was to examine the differences in disability retirement between public and private sector employees and to examine the contribution of age, gender and occupational group to the differences between the sectors.

Methods: Our Finnish register data comprised about two million non-retired men and women aged 30–62. Cox proportional hazard models were used to calculate hazard ratios for any, full and partial disability retirement in the public sector compared to the private sector.

Results: The risk of any disability retirement was higher in the public sector than in the private sector in all occupational groups. The unadjusted hazard ratio ranged from 1.29 (95% CI 1.16-1.44) among teaching professionals to 2.25 (95% CI 1.95-2.58) among skilled agricultural, forestry and fishery workers. Adjustment for age and gender attenuated the differences between the sectors. After adjusting for age, gender and occupational group, the hazard ratio was 1.29 (95% CI 1.27-1.32) for any disability retirement and 2.02 (95% CI 1.96-2.08) for partial disability retirement, but for full disability retirement there were no differences between the public sector and private sector.

Conclusions: Adjustment of age and gender attenuated the higher risk of disability retirement in the public sector, while adjustment for occupational group widened the sector differences in any and full disability retirement. The risk of partial disability retirement was higher in all occupational groups in the public sector compared to the private sector. For full disability retirement, the differences between the sectors were small or non-existent.

Keywords:

occupational group, disability retirement, partial disability pension, full disability pension, public sector, private sector

Introduction

Previous studies have shown that the risks of sickness absence and disability retirement are higher in the public sector than in the private sector. Most of the evidence comes from the Nordic countries [1-10], but similar findings have also been reported elsewhere [11-13]. In Finland, the risk of disability retirement is almost 30% higher in the public sector than in the private sector [6]. The reasons for this difference are not entirely clear.

One possible reason may be the fundamental differences in occupational structures in the public and private sectors. For example, occupations in health care and teaching are very common in the public sector but relatively rare in the private sector. Many studies have found an elevated risk of long-term sickness absence and disability retirement in typical public sector occupations, such as nurses, kindergarten teachers and social workers [4,7-10]. In contrast, occupations in industry and construction are virtually non-existent in the public sector but account for a large share of private sector occupations.

Another reason may relate to differences in the gender balance and age structure. The majority of public sector employees are women, among whom the risk of disability retirement is higher than among men [6,14]. Also, the risk of disability retirement is known to strongly increase with age [15,16], and the older age structure in the public sector may therefore contribute to the differences.

The features of the pension system may also come into play. In Finland, there are two types of disability pension, full and partial. A partial disability pension is granted if it is estimated that the individual's work

ability is reduced by at least 40% for more than one year, and a full disability pension if the reduction in work ability amounts to at least 60%. The assessment is made by an insurance physician and is based on medical indicators and other factors affecting the applicant's ability to earn a living. The share of partial disability pensions has increased in recent decades [17] and today up to one in three new disability pensions is granted as a partial pension. Partial disability pensions are more common among women, those aged over 55 years and those working in the public sector [18,19], and they have been found to be especially common in some specific occupations such as nurses and kindergarten teachers [9,10]. Partial disability pensions may thus largely contribute to the overall sector differences.

Disability pension regulations differ to some extent between the public and the private sector, which possibly leads to sector differences in disability retirement. In the public sector the definition of occupational disability is applied to all employees, whereas in the private sector it only concerns those over the age of 60. There are also differences in how disability pensions are financed [20]. Under the regulations in force during the study period, partial disability retirement in the public sector did not affect the costs incurred to employers. In the private sector, however, the costs of partial disability pensions were 50% of the costs of full disability pensions.

The aims of this study were twofold: 1) to examine how the risk of disability retirement varies between the public and private sectors by occupational group and 2) to explore how age, gender and occupational class contribute to the differences between the sectors. The differences are studied separately among those retiring on a partial and a full disability pension.

Methods

Compiled by the Finnish Centre for Pensions and Statistics Finland, our total register data (100% of Finns) comprised about two million non-retired men and women aged 30–62 at the end of 2013 who had been pension insured in the public or the private sector. The analyses were restricted to those aged 30 and over, because most of them have graduated and are at least in their first occupation.

Furthermore, the self-employed were excluded from the private sector (N=163,865) because there are no self-employed persons in the public sector. The sector of employment and self-employment were determined based on the pension law under which the employee had been insured for the longest period of time by the end of 2013. In total, 30% of the study population were public sector employees and 70% worked in the private sector. The follow-up ended on disability retirement, reaching the age for old-age retirement, death, or the end of 2018. During the follow-up period 2014–2018, a total of 64,907 persons retired on a disability pension, of whom 42,601 on a full disability pension and 22,306 on a partial disability pension.

Age

Age was classified into five groups: 30–39 years, 40–49 years, 50–54 years, 55–59 years and 60–62 years.

Occupational groups

Occupations were grouped using the International Standard Classification of Occupations (ISCO-08) that is based on skill level and skill specialization [21]. The occupational groups were mainly categorized using the 1-digit classification, but more detailed 2- and 3-digit information was also used. The purpose of the categorization was to allow us to identify the largest occupational groups in the public sector. The following major groups of occupations were used: managers (ISCO code 1), professionals (2), technicians and associate professionals (3), clerical support workers (4), services and sales workers (5), skilled

agricultural, forestry and fishery workers (6), craft and related trades workers (7), stationary plant and machine operators and assemblers (8), and elementary occupations (including occupations in the armed forces) (9,0). In addition, professionals were divided into health professionals (ISCO subcode 22), teaching professionals (23) and other professionals (21,24,25,26). Technicians and associate professionals were divided into health associate professionals (32) and other associate professionals (31,33,34,35). Service and sales workers were divided into childcare workers and teachers' aides (531), personal care workers in health services (532) and other service and sales workers (51,52,54). Information on occupation was for 2013, but information from earlier years was used if 2013 data were missing or unknown.

The occupational group structure of the public and private sector employees is presented in Supplementary Table I. The distribution of occupational groups is quite different between the sectors.

Supplementary Table I also presents the gender distribution and mean age for the occupational groups in the public and private sectors. In the public sector, 71% of employees were women, compared to 45% in the private sector. The share of women varied by occupational group. Women were overrepresented in health care, among teaching professionals, clerical support workers and service and sales workers in both sectors. Furthermore, public sector-employees were older than private sector employees in every occupational groups.

Supplementary Table II presents the mean age at the time of disability retirement in each occupational group and by sector. The mean age at the time of disability retirement varied from 51.0 years among health associate professionals in the private sector to 56.2 years among managers in the public sector.

Statistical analysis

The incidence of disability retirement was calculated by dividing the number of disability retirees by the size of the risk group (per 100 person-years) in each occupational group in the public and the private sector separately. Incidence rates were also calculated separately for disability retirement on a full and a partial disability pension.

The Cox proportional hazard models [22] were used to calculate the hazard ratios (HR) and their 95% confidence intervals (95% CI) for disability retirement in the public sector compared to the private sector. The models are based on a survival function which tells the probability of a certain event (disability retirement) at a particular time. It also takes into account censored events (e.g., death or old-age retirement). The Cox proportional hazard models have been used in various studies concerning disability retirement [8,16,23-24]. Firstly, we calculated unadjusted hazard ratios and 95% CIs for disability retirement in different occupational groups. Secondly, we calculated age and gender adjusted hazard ratios for disability retirement in different occupational groups. Thirdly, we constructed models adjusting for age, gender and occupational group of the total study population in any, full and partial disability retirement.

We checked the Cox proportional hazard assumptions. First, we produced graphs of survival function versus survival time by sector. The graphs showed that the proportional hazard assumption was not violated because the sector-specific lines were parallel. Second, we generated the time dependent covariates and included them in the model. Also in this case, we found no indications that the models could be violated. The analyses were performed by SAS Enterprise Guide 8.2.

Results

The incidence rates for any, full and partial disability retirement by occupational group are presented in Table I. In almost every occupational group, the incidence of any, full and partial disability retirement was higher in the public sector than in the private sector. However, due to different distributions of occupational groups, there was no difference in the overall incidence of full disability retirement between the sectors. The incidence rates by gender are shown in Supplementary Table III.

Table I. Incidence of any, full and partial disability retirement in the public and private sectors, %

	Any DR			Full DR			Partial DR		
	Public	Private	p-value	Public	Private	p-value	Public	Private	p-value
Managers	0.44	0.30	<.001	0.27	0.23	0.08	0.17	0.07	<.001
Professionals	0.47	0.28	<.001	0.23	0.19	<.001	0.24	0.08	<.001
Health professionals	0.56	0.35	<.001	0.22	0.20	0.55	0.33	0.15	<.001
Teaching professionals	0.47	0.36	<.001	0.24	0.25	0.43	0.23	0.11	<.001
Other professionals	0.43	0.26	<.001	0.22	0.19	<.001	0.21	0.08	<.001
Technicians and associate professionals	0.89	0.44	<.001	0.37	0.31	<.001	0.51	0.13	<.001
Health associate professionals	0.95	0.60	<.001	0.35	0.34	0.79	0.60	0.26	<.001
Other associate professionals	0.84	0.42	<.001	0.40	0.30	<.001	0.44	0.12	<.001
Clerical support workers	1.17	0.63	<.001	0.59	0.40	<.001	0.58	0.23	<.001
Service and sales workers	1.46	0.84	<.001	0.69	0.57	<.001	0.77	0.27	<.001
Childcare workers and teachers' aides	1.18	0.79	<.001	0.59	0.55	0.27	0.58	0.24	<.001
Personal care workers in health services	1.77	1.24	<.001	0.74	0.76	0.32	1.03	0.48	<.001
Other service and sales workers	1.24	0.76	<.001	0.72	0.54	<.001	0.52	0.22	<.001
Skilled agricultural, forestry and fishery workers	1.76	0.78	<.001	0.99	0.61	<.001	0.77	0.18	<.001
Craft and related trades workers	1.74	0.93	<.001	0.96	0.71	<.001	0.78	0.22	<.001
Stationary plant and machine operators, assemblers	1.41	0.93	<.001	0.98	0.68	<.001	0.43	0.24	<.001
Elementary occupations (incl. armed forces)	1.74	1.13	<.001	0.86	0.83	0.35	0.88	0.29	<.001
All	0.91	0.65	<.001	0.46	0.48	<.001	0.45	0.17	<.001

Table II shows the hazard ratios (HR) and their 95% confidence intervals (95% CI) for any disability retirement in the public sector compared to the private sector by occupational group. The unadjusted hazard ratios for any disability retirement ranged from 1.29 (95% CI 1.16-1.44) among teaching professionals to 2.25 (95% CI 1.95-2.58) among skilled agricultural, forestry and fishery workers. Adjustment for age reduced the differences in disability retirement between the sectors more than adjustment for gender. After adjusting for both age and gender, the sector differences disappeared among managers, health professionals and teaching professionals. In the other occupational groups, the excess risk in the public sector remained.

Table II. Hazard ratio (HR) and 95% confidence intervals (95% CI) for any disability retirement by occupational class in the public sector compared to the private sector

	Unadjusted HR (95% CI)	Age adjusted HR (95% CI)	Gender adjusted HR (95% CI)	Age and gender adjusted HR (95% CI)
Managers	1.46 (1.28-1.67)	1.09 (0.96-1.25)	1.33 (1.15-1.52)	0.99 (0.86-1.14)
Professionals	1.69 (1.61-1.78)	1.40 (1.34-1.48)	1.57 (1.50-1.66)	1.28 (1.22-1.35)
Health professionals	1.57(1.27-1.95)	1.17 (0.94-1.45)	1.56 (1.26-1.93)	1.15 (0.93-1.43)
Teaching professionals	1.29 (1.16-1.44)	1.05 (0.95-1.18)	1.27(1.14-1.42)	1.02 (0.91-1.14)
Other professionals	1.65 (1.54-1.77)	1.40 (1.30-1.50)	1.56 (1.46-1.68)	1.29 (1.21-1.39)
Technicians and associate professionals	2.02 (1.94-2.10)	1.76 (1.69-1.83)	1.88 (1.80-1.96)	1.64 (1.57-1.71)
Health associate professionals	1.56 (1.43-1.71)	1.35 (1.24-1.47)	1.54 (1.41-1.68)	1.34 (1.22-1.46)
Other associate professionals	1.99 (1.89-2.09)	1.62 (1.54-1.70)	1.89 (1.80-1.99)	1.55 (1.48-1.63)
Clerical support workers	1.83 (1.72-1.95)	1.46 (1.36-1.55)	1.84 (1.73-1.96)	1.48 (1.38-1.58)
Service and sales workers	1.72 (1.67-1.78)	1.42 (1.37-1.46)	1.66 (1.60-1.71)	1.37 (1.33-1.42)
Childcare workers and teachers' aides	1.49 (1.33-1.66)	1.32 (1.19-1.48)	1.47 (1.31-1.64)	1.31 (1.18-1.47)
Personal care workers in health services	1.42 (1.35-1.50)	1.29 (1.11-1.36)	1.40 (1.33-1.48)	1.28 (1.22-1.35)
Other service and sales workers	1.63 (1.54-1.72)	1.31 (1.24-1.39)	1.66 (1.57-1.75)	1.33 (1.26-1.41)
Skilled agricultural, forestry and fishery workers	2.25 (1.95-2.58)	1.92 (1.67-2.21)	2.24(1.95-2.58)	1.90 (1.65-2.19)
Craft and related trades workers	1.84 (1.71-1.99)	1.35 (1.25-1.46)	1.85 (1.71-2.00)	1.35 (1.25-1.46)
Stationary plant and machine operators, assemblers	1.51 (1.37-1.65)	1.13 (1.03-1.24)	1.50 (1.37-1.65)	1.13 (1.03-1.24)
Elementary occupations (incl. armed forces)	1.53 (1.46-1.61)	1.38 (1.32-1.45)	1.39 (1.32-1.45)	1.31 (1.25-1.38)

Sector differences in full disability retirement were largest among skilled agricultural, forestry and fishery workers and among clerical support workers, but in most managerial and professional

occupational groups the differences were relatively small or non-existent (Table III). Age and gender adjustment mainly decreased the differences between the sectors. After adjustments, the occupational groups of technicians and associate professionals, clerical support workers, other service and sales workers, and skilled agricultural, forestry and fishery workers had a higher risk of full disability retirement in the public sector than in the private sector. By contrast, managers, teaching professionals and personal care workers in health services and elementary occupations had a lower risk of full disability retirement in the public sector than in the private sector.

Table III. Hazard ratios (HR) and 95% confidence intervals (95% CI) for full disability retirement (DR) by occupational class in the public sector compared to the private sector

	Unadjusted HR (95% CI)	Age adjusted HR (95% CI)	Gender adjusted HR (95% CI)	Age and gender adjusted HR (95% CI)
Managers	1.16 (0.98-1.37)	0.80 (0.75-1.04)	1.10 (0.93-1.31)	0.84 (0.70-1.00)
Professionals	1.18 (1.11-1.26)	1.01 (0.94-1.07)	1.15(1.08-1.23)	0.96 (0.90-1.03)
Health professionals	1.10 (0.82-1.46)	0.84 (0.63-1.13)	1.09 (0.82-1.46)	0.84 (0.63-1.13)
Teaching professionals	0.95 (0.83-1.09)	0.80 (0.70-0.92)	0.94 (0.83-1.08)	0.79 (0.69-0.91)
Other professionals	1.18 (1.08-1.30)	1.01 (0.93-1.11)	1.16 (1.05-1.27)	0.98 (0.90-1.08)
Technicians and associate professionals	1.22 (1.16-1.29)	1.08 (1.03-1.14)	1.22 (1.15-1.30)	1.09 (1.03-1.15)
Health associate professionals	1.02 (0.90-1.15)	0.91 (0.81-1.03)	1.03 (0.91-1.16)	0.93 (0.82-1.05)
Other associate professionals	1.31 (1.23-1.40)	1.09 (1.01-1.16)	1.30 (1.22-1.40)	1.09 (1.02-1.17)
Clerical support workers	1.46 (1.34-1.59)	1.21 (1.11-1.32)	1.49 (1.37-1.62)	1.24 (1.14-1.36)
Service and sales workers	1.19 (1.14-1.25)	1.02 (0.98-1.07)	1.19 (1.14-1.24)	1.02 (0.98-1.07)
Childcare workers and teachers' aides	1.08 (0.94-1.24)	0.99 (0.87-1.14)	1.07 (0.94-1.23)	0.99 (0.87-1.14)
Personal care workers in health services	0.96 (0.90-1.04)	0.90 (0.84-0.97)	0.97 (0.90-1.04)	0.91 (0.85-0.98)
Other service and sales workers	1.33 (1.24-1.43)	1.11(1.03-1.19)	1.34 (1.24-1.44)	1.11 (1.03-1.19)
Skilled agricultural, forestry and fishery workers	1.63 (1.37-1.93)	1.42 (1.20-1.68)	1.62 (1.37-1.93)	1.41 (1.19-1.67)
Craft and related trades workers	1.33 (1.20-1.48)	1.00 (0.90-1.10)	1.34 (1.21-1.48)	1.00 (0.90-1.10)
Stationary plant and machine operators, assemblers	1.42 (1.27-1.59)	1.09 (0.97-1.22)	1.43 (1.27-1.59)	1.08 (0.97-1.21)
Elementary occupations (incl. armed forces)	1.03 (0.97-1.10)	0.94 (0.88-1.00)	0.97 (0.91-1.03)	0.92 (0.87-0.98)

The risk of partial disability retirement differed considerably between the public and private sectors (Table IV). The unadjusted hazard ratios ranged from 1.75 (95% CI 1.47-2.07) among stationary plant

and machine operators and assemblers to 4.38 (95% CI 3.36-5.71) among skilled agricultural, forestry and fishery workers. Adjustment for both age and gender reduced the sector differences notably but did not eliminate them entirely. After adjustments, the risk of partial disability retirement was still higher in the public sector than in the private sector in all occupational groups.

Table IV. Hazard ratios (HR) and 95% confidence intervals (95% CI) for partial disability retirement (DR) by occupational class in the public sector compared to the private sector

	Unadjusted HR (95% CI)	Age adjusted HR (95% CI)	Gender adjusted HR (95% CI)	Age and gender adjusted HR (95% CI)
Managers	2.52 (1.99-3.18)	1.82 (1.43-2.30)	2.02 (1.58-2.59)	1.45 (1.12-1.86)
Professionals	2.88 (2.66-3.13)	2.32 (2.13-2.52)	2.52 (2.31-2.74)	1.97 (1.81-2.15)
Health professionals	2.21 (1.61-3.05)	1.60 (1.16-2.21)	2.17 (1.58-2.99)	1.55 (1.12-2.14)
Teaching professionals	2.05 (1.70-2.47)	1.60 (1.33-1.93)	1.99 (1.65-2.41)	1.51 (1.25-1.82)
Other professionals	2.79 (2.50-3.11)	2.30 (2.06-2.57)	2.49 (2.20-2.78)	2.03 (1.81-2.27)
Technicians and associate professionals	3.85 (3.61-4.10)	3.27 (3.06-3.48)	3.21 (3.01-3.43)	2.74 (2.57-2.93)
Health associate professionals	2.28 (2.00-2.59)	1.91 (1.68-2.17)	2.20 (1.94-2.51)	1.85 (1.63-2.11)
Other associate professionals	3.70 (3.42-4.00)	2.91 (2.69-3.15)	3.27 (3.02-3.55)	2.60 (2.39-2.82)
Clerical support workers	2.48 (2.25-2.73)	1.85 (1.68-2.03)	2.44 (2.22-2.69)	1.84 (1.67-2.03)
Service and sales workers	2.86 (2.72-3.01)	2.22(2.11-2.34)	2.61 (2.48-2.74)	2.04 (1.94-2.15)
Childcare workers and teachers' aides	2.41 (1.99-2.92)	2.06 (1.70-2.49)	2.35 (1.95-2.85)	2.03 (1.67-2.46)
Personal care workers in health services	2.15 (1.98-2.33)	1.90 (1.75-2.06)	2.08 (1.92-2.26)	1.85 (1.71-2.01)
Other service and sales workers	2.33 (2.13-2.55)	1.76 (1.61-1.93)	2.46 (2.25-2.69)	1.83 (1.67-2.00)
Skilled agricultural, forestry and fishery workers	4.38 (3.36-5.71)	3.59 (2.75-4.69)	4.37 (3.35-5.71)	3.55 (2.72-4.64)
Craft and related trades workers	3.48 (3.09-3.93)	2.38 (2.11-2.69)	3.47 (3.08-3.92)	2.38 (2.11-2.69)
Stationary plant and machine operators, assemblers	1.75 (1.47-2.07)	1.23 (1.04-1.46)	1.72 (1.46-2.05)	1.27 (1.07-1.51)
Elementary occupations (incl. armed forces)	2.96 (2.74-3.20)	2.61 (2.41-2.82)	2.48 (2.29-2.68)	2.30 (2.15-2.49)

Finally, the risk of disability retirement was examined in the total study population, with adjustment also made for occupational group (Table V). Adjustment for age and gender reduced the differences between the sectors in any and partial disability retirement. Furthermore, adjustment for age widened the difference in the risk of full disability retirement, which was higher in the private sector. Adjustment for occupational group widened the sector differences in any disability retirement. In full disability

retirement, the sector difference was reversed to an excess risk in the public sector. Finally, after adjusting for all three factors, the risk of any disability retirement was about one-third higher in the public sector than in the private sector; there was no difference in full disability retirement; and the risk of partial disability retirement was twofold in the public sector.

Table V. Hazard ratios and 95% confidence intervals (95% CI) for any, full and partial disability retirement in the public sector compared to the private sector.

	Unadjusted HR (95% CI)	Age adjusted HR (95% CI)	Gender adjusted HR (95% CI)	Occupational class adjusted HR (95% CI)	All adjusted HR (95% CI)
Any DR	1.40 (1.37-1.42)	1.23 (1.21-1.25)	1.33 (1.31-1.35)	1.52 (1.50-1.55)	1.29 (1.27-1.32)
Full DR	0.95 (0.93-0.97)	0.86 (0.84-0.87)	0.96 (0.95-0.98)	1.12 (1.09-1.14)	1.00 (0.97-1.01)
Partial DR	2.68 (2.61-2.75)	2.30 (2.24-2.36)	2.29 (2.23-2.34)	2.64 (2.56-2.72)	2.02 (1.96-2.08)

The results concerning disability retirement due to mental disorders and somatic diseases separately are given in Supplementary Table IV. The results are fairly similar in both disease groups. However, health professionals, childcare workers and teachers' aides, personal care workers in health services, and skilled agricultural, forestry and fishery workers in the public sector seem to have an excess risk of disability retirement due to somatic diseases but not so much due to mental disorders.

Discussion

The aim of this study was to examine the differences in disability retirement between the public and the private sector within different occupational groups, and to examine how age, gender and occupational group contribute to the sector differences. The differences between the public and the private sector were larger in partial than in full disability retirement. For partial disability retirement, the overall risk in the public sector was roughly twice as large as in the private sector, and the risk varied by occupational group, being higher in the public sector in all occupational groups. Also in full disability retirement, the

risk was larger in the public sector in nearly all occupational groups. However, when occupational groups were combined, the difference between the sectors disappeared. This is because the managerial and upper white-collar occupations with a relatively low risk of full disability retirement are relatively common in the public sector while manual occupations with a high risk are rare.

The adjustment for age and gender mainly attenuated the sector differences in any and partial disability retirement. Higher age is strongly associated with a higher risk of disability retirement [15,16]. Public sector employees are older than private sector employees, and thus age may be one reason for the higher risk of disability retirement in the public sector. Another reason for the higher risk of disability retirement may be that employees in the public sector are mostly women, who have a higher risk of disability than men [14].

Adjustment for occupational group widened the sector differences in any and full disability retirement. If the public and the private sector had similar occupational structures, the excess risk for disability retirement in the public sector would be even higher.

In addition to age, gender and occupational group, many other factors may contribute to the sector differences seen in disability retirement. Previous studies have found that partial disability retirement is more common in larger than in smaller workplaces [6,25]. In the public sector, work units tend to be relatively large, making it easier to provide for part-time work. On the other hand, sector differences in disability retirement may also have to do with differences in the financing of disability pensions [20]. One possible reason for the higher incidence of partial disability retirement in the public sector is that partial disability retirement has no cost implications for public sector employers. Also, the definition of occupational disability used in the public sector may elevate the risk of disability retirement among those aged under 60 years. A previous Finnish study found that in the age group 50–62, the risk of

partial disability retirement was higher in the municipal sector than in the private sector. The risk of full disability retirement was relatively similar until age 57, but among those aged 58 or over it was slightly higher in the private sector [6].

Differences in disability retirement between the public and the private sectors may also be related more broadly to the fact that different people end up working in different occupations and in different sectors. For example, personality traits and education are known to lead occupational choices [26-28]. Also, health and work ability may sort people to work in different sectors. Working careers in the public sector are known to be longer and redundancies are rarer than in the private sector, which may be due to people with lower work ability having more possibilities to work in the public sector. Furthermore, working conditions are strongly connected to disability retirement [23-24,29-30]. Nonetheless, it can be argued that physical working conditions in particular are more or less similar in the same occupational groups. Still, there might be differences in working conditions between the public and the private sector in terms of working atmosphere, for example.

Overall, our study showed only small differences in full disability retirement between the public and the private sector, but for partial disability retirement the risk in the public sector was roughly twice as high as the risk in the private sector. The proportion of partial disability pensions has been rising in recent years. It is possible, and to some degree plausible, that partial disability pensions have at least partly become a substitute for full disability pensions.

Strengths and limitations of the study

A major strength of our study was that the data came from reliable registers. We had access to total register data and exact occupational classifications and were therefore able to compare the public sector with the private sector by occupational group. We made the analyses in each occupational group

separately. While this controls for the age and gender differences between the sectors, age and gender differences between the occupational groups are not adjusted for in these separate models. The data did not include information on health or working conditions which are known to be risk factors for disability retirement [23,24]. More research is needed to determine which other factors may contribute to the differences in disability retirement between the public and the private sector, especially in partial disability retirement.

Conclusions

Our study indicated that differences in disability retirement between sectors are mostly due to the public sector's higher risk of partial disability retirement. In each occupational group, the risk of partial disability retirement was higher in the public sector than in the private sector. Adjustment of age, gender and occupational group lowered the risk of partial disability retirement from 2.66 to 2.02 in the public sector compared to the private sector. Instead, there was no difference in the overall risk for full disability retirement between the sectors after adjusting for age, gender and occupational group. In addition to those analysed, many other factors may contribute to the differences in partial disability retirement between the sectors. More policy actions are needed to maintain employees' working ability and to prevent disability retirement in many public sector occupations where there is a high risk of disability retirement.

Conflict of interest

The authors declare no conflict of interest.

Ethical standards

Ethical approval is not needed as the study is based on register data. The data has been anonymized.

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Supplementary material

Supplementary Table I. Occupational groups in the public and the private sectors, share of women (%) and mean age of employees by occupational group

	Public, %		Private, %		% of women		Mean age	
	Public, %	N	Private, %	N	Public	Private	Public	Private
Managers	2.4	13988	4.8	65208	55.9	24.8	50.0	45.9
Professionals	30.3	176418	15.1	205406	68.1	39.9	45.5	42.9
Health professionals	3.9	22555	0.4	5706	72.3	68.9	46.5	42.1
Teaching professionals	15.5	90336	1.7	23095	73.8	65.2	45.4	42.5
Other professionals	10.9	63527	13.0	176605	58.1	35.7	45.4	43.0
Technicians and associate professionals	21.7	126471	16.2	220077	78.9	48.4	45.9	44.0
Health associate professionals	9.8	57116	1.6	21736	91.7	85.2	44.4	42.6
Other associate professionals	11.9	69355	14.6	198341	68.1	44.4	47.1	44.2
Clerical support workers	4.8	27975	7.2	97812	83.7	75.0	49.3	45.2
Service and sales workers	19.0	110735	15.2	206085	83.9	68.1	46.5	43.8
Childcare workers and teachers' aides	5.7	33220	0.8	10596	97.1	93.2	46.1	44.1
Personal care workers in health services	8.5	49539	2.6	35185	93.8	87.9	46.9	45.4
Other service and sales workers	4.8	27975	11.8	160303	51.2	62.0	46.5	43.4
Skilled agricultural, forestry and fishery workers	1.1	6411	0.6	8151	49.1	41.3	46.4	44.0
Craft and related trades workers	1.6	9325	10.9	148077	13.0	10.1	49.0	44.9
Stationary plant and machine operators, assemblers	1.3	7577	10.2	138567	23.4	22.5	48.8	45.1
Elementary occupations (incl. armed forces)	6.7	39049	6.3	85586	73.2	55.3	47.2	45.3
Unknown	11.1	64692	13.6	184756	55.9	45.0	45.6	46.1
All	100.0	582815	100.0	1358503	71.1	44.0	46.3	44.6

Supplementary Table II. Mean age at time of disability retirement (DR)

	Any DR		Full DR		Partial DR	
	Public	Private	Public	Private	Public	Private
Managers	56.2	53.5	55.8	53.2	56.8	54.3
Professionals	53.6	51.5	52.4	51.2	54.7	52.4
Health professionals	54.5	51.9	53.6	52.1	55.2	51.7
Teaching professionals	53.6	51.7	52.3	51.0	54.8	53.4
Other professionals	53.2	51.5	52.2	51.2	54.3	52.2
Technicians and associate professionals	53.6	52.6	52.3	52.2	54.5	53.5
Health associate professionals	53.1	51.0	51.5	49.8	54.1	52.4
Other associate professionals	54.1	52.8	52.9	52.5	55.1	53.8
Clerical support workers	54.6	52.7	53.2	51.9	56.0	54.0
Service and sales workers	54.2	52.2	52.5	51.3	55.7	54.1
Childcare workers and teachers' aides	53.8	51.3	52.4	50.1	55.2	54.1
Personal care workers in health services	54.3	52.8	52.3	51.7	55.7	54.6
Other service and sales workers	54.5	52.0	53.1	51.2	56.4	53.9
Skilled agricultural, forestry and fishery workers	54.2	51.7	53.2	51.6	55.5	51.9
Craft and related trades workers	56.0	53.8	55.1	53.2	57.2	55.5
Stationary plant and machine operators, assemblers	54.7	53.7	53.9	53.1	56.5	55.3
Elementary occupations (incl. armed forces)	54.8	53.5	53.4	52.8	56.2	55.6
Unknown	51.8	52.9	51.7	52.9	53.6	53.0
All	54.0	52.9	52.7	52.4	55.4	54.4

Supplementary Table III. Incidence of any, full and partial disability retirement (DR) in the public and private sector by gender, %

Men	Any DR			Full DR			Partial DR		
	Public	Private	p-value	Public	Private	p-value	Public	Private	p-value
Managers	0.36	0.28	0.02	0.27	0.22	0.12	0.09	0.06	0.05
Professionals	0.37	0.26	<.001	0.21	0.19	0.12	0.16	0.07	<.001
Health professionals	0.43	0.26	0.31	0.22	0.20	0.70	0.20	0.06	0.01
Teaching professionals	0.39	0.38	0.79	0.22	0.27	0.08	0.17	0.11	0.01
Other professionals	0.33	0.25	<.001	0.19	0.18	0.73	0.14	0.06	<.001
Technicians and associate professionals	0.64	0.40	<.001	0.36	0.31	<.001	0.28	0.10	<.001
Health associate professionals	0.68	0.57	0.16	0.38	0.41	0.61	0.30	0.15	<.001
Other associate professionals	0.63	0.40	<.001	0.36	0.30	0.01	0.28	0.09	<.001
Clerical support workers	1.06	0.68	<.001	0.67	0.46	<.001	0.38	0.22	<.001
Service and sales workers	1.11	0.71	<.001	0.70	0.55	<.001	0.41	0.16	<.001
Childcare workers and teachers' aides	0.67	0.61	0.74	0.41	0.52	0.46	0.26	0.09	0.09
Personal care workers in health services	1.20	1.11	0.46	0.74	0.86	0.25	0.45	0.26	<.001
Other service and sales workers	1.12	0.68	<.001	0.71	0.53	<.001	0.41	0.15	<.001
Skilled agricultural, forestry and fishery workers	1.84	0.72	<.001	1.03	0.57	<.001	0.81	0.15	<.001
Craft and related trades workers	1.85	0.93	<.001	1.00	0.72	<.001	0.86	0.22	<.001
Stationary plant and machine operators, assemblers	1.33	0.91	<.001	1.00	0.70	<.001	0.33	0.21	<.001
Elementary occupations (incl. armed forces)	0.72	0.86	<.001	0.54	0.70	<.001	0.19	0.16	0.21
All	0.66	0.62	<.001	0.42	0.49	<.001	0.24	0.13	<.001

Women	Any DR			Full DR			Partial DR		
	Public	Private	p-value	Public	Private	p-value	Public	Private	p-value
Managers	0.50	0.37	<.001	0.27	0.27	0.94	0.23	0.10	<.001
Professionals	0.52	0.31	<.001	0.24	0.20	<.001	0.27	0.11	<.001
Health professionals	0.60	0.39	<.001	0.22	0.20	0.64	0.38	0.19	<.001
Teaching professionals	0.50	0.36	<.001	0.24	0.24	0.84	0.25	0.12	<.001
Other professionals	0.51	0.29	<.001	0.24	0.19	<.001	0.26	0.10	<.001
Technicians and associate professionals	0.95	0.48	<.001	0.38	0.30	<.001	0.58	0.17	<.001
Health associate professionals	0.97	0.61	<.001	0.35	0.33	0.51	0.63	0.28	<.001
Other associate professionals	0.94	0.45	<.001	0.41	0.30	<.001	0.52	0.15	<.001
Clerical support workers	1.19	0.62	<.001	0.57	0.38	<.001	0.61	0.24	<.001
Service and sales workers	1.52	0.90	<.001	0.69	0.58	<.001	0.84	0.32	<.001
Childcare workers and teachers' aides	1.19	0.80	<.001	0.60	0.55	0.24	0.59	0.25	<.001
Personal care workers in health services	1.81	1.26	<.001	0.74	0.75	0.61	1.07	0.51	<.001
Other service and sales workers	1.36	0.80	<.001	0.73	0.54	<.001	0.63	0.27	<.001

Skilled agricultural, forestry and fishery workers	1.68	0.87	<.001	0.95	0.66	0.01	0.74	0.21	<.001
Craft and related trades workers	1.02	0.94	0.54	0.70	0.65	0.67	0.32	0.29	<.001
Stationary plant and machine operators, assemblers	1.66	0.98	<.001	0.94	0.62	<.001	0.73	0.36	<.001
Elementary occupations (incl. armed forces)	2.12	1.36	<.001	0.99	0.95	0.30	1.14	0.41	<.001
All	1.00	0.68	<.001	0.48	0.47	0.15	0.53	0.21	<.001

Supplementary Table IV. Hazard ratio and 95 % confidence interval for disability retirement due to mental disorders and somatic diseases (DR) by occupational class in the public sector compared with the private sector

Mental disorders	Unadjusted	Age-adjusted	Gender-adjusted	Age and gender adjusted
	HR (95 % CI)	HR (95 % CI)	HR (95 % CI)	HR (95 % CI)
Managers	1.26 (0.99-1.60)	1.07 (0.84-1.37)	1.12 (0.87-1.44)	0.95 (0.74-1.22)
Professionals	1.69 (1.56-1.82)	1.49 (1.38-1.62)	1.51 (1.39-1.64)	1.32 (1.22-1.43)
Health professionals	1.14 (0.81-1.60)	0.96 (0.68-1.36)	1.12 (0.80-1.58)	0.95 (0.67-1.34)
Teaching professionals	1.27 (1.07-1.51)	1.10 (0.93-1.31)	1.25 (1.05-1.48)	1.06 (0.90-1.26)
Other professionals	1.80 (1.62-2.01)	1.63 (1.47-1.82)	1.63 (1.46-1.81)	1.46 (1.31-1.63)
Technicians and associate professionals	1.97 (1.84-2.11)	1.83 (1.70-1.96)	1.70 (1.58-1.83)	1.52 (1.47-1.70)
Health associate professionals	1.47 (1.27-1.72)	1.36 (1.16-1.58)	1.45 (1.24-1.69)	1.33 (1.14-1.55)
Other associate professionals	2.00 (1.83-2.18)	1.79 (1.64-1.95)	1.78 (1.63-1.94)	1.60 (1.46-1.75)
Clerical support workers	2.03 (1.82-2.27)	1.86 (1.66-2.08)	2.02 (1.80-2.26)	1.86 (1.66-2.08)
Service and sales workers	1.51 (1.41-1.61)	1.41 (1.32-1.51)	1.35 (1.27-1.45)	1.35 (1.27-1.45)
Childcare workers and teachers' aides	1.05 (0.87-1.27)	1.01 (0.84-1.23)	1.05 (0.87-1.27)	1.02 (0.84-1.23)
Personal care workers in health services	1.16 (1.04-1.30)	1.13 (1.01-1.26)	1.17 (1.05-1.31)	1.14 (1.02-1.27)
Other service and sales workers	1.29 (1.14-1.46)	1.19 (1.05-1.35)	1.32 (1.16-1.50)	1.22 (1.07-1.38)
Skilled agricultural, forestry and fishery workers	1.19 (0.87-1.64)	1.18 (0.86-1.64)	1.15 (0.83-1.58)	1.14 (0.82-1.57)
Craft and related trades workers	1.62 (1.31-2.00)	1.51 (1.21-1.87)	1.59 (1.28-1.70)	1.49 (1.20-1.84)
Stationary plant and machine operators, assemblers	2.00 (1.64-2.44)	1.90 (1.56-2.33)	2.00 (1.63-2.43)	1.90 (1.55-2.32)
Elementary occupations (incl. armed forces)	1.39 (1.26-1.55)	1.35 (1.21-1.49)	1.27 (1.14-1.41)	1.24 (1.12-1.38)
Somatic diseases				
	Unadjusted	Age-adjusted	Gender-adjusted	Age and gender adjusted
	HR (95 % CI)	HR (95 % CI)	HR (95 % CI)	HR (95 % CI)
Managers	1.56 (1.33-1.83)	1.10 (0.94-1.30)	1.44 (1.22-1.70)	1.01 (0.85-1.20)
Professionals	1.70 (1.59-1.81)	1.34 (1.26-1.43)	1.62 (1.52-1.73)	1.25 (1.17-1.34)
Health professionals	1.89 (1.43-2.49)	1.32 (1.00-1.74)	1.87 (1.42-2.6)	1.29 (0.98-1.70)
Teaching professionals	1.30 (1.13-1.50)	1.02 (0.89-1.18)	1.29 (1.12-1.48)	0.99 (0.86-1.14)
Other professionals	1.55 (1.42-1.70)	1.25 (1.14-1.37)	1.52 (1.38-1.66)	1.21 (1.10-1.33)
Technicians and associate professionals	2.05 (1.95-2.15)	1.73 (1.65-1.82)	1.97 (1.87-2.07)	1.67 (1.59-1.76)
Health associate professionals	1.61 (1.44-1.79)	1.35(1.21-1.50)	1.59 (1.43-1.77)	1.34 (1.20-1.49)

Other associate professionals	1.98 (1.87-2.11)	1.54 (1.45-1.63)	1.95 (1.84-2.08)	1.54 (1.44-1.63)
Clerical support workers	1.75 (1.62-1.89)	1.30 (1.20-1.41)	1.76 (1.63-1.91)	1.33 (1.23-1.44)
Service and sales workers	1.79 (1.73-1.86)	1.42 (1.37-1.48)	1.73 (1.66-1.79)	1.38 (1.33-1.43)
Childcare workers and teachers' aides	1.73 (1.51-1.98)	1.49 (1.30-1.71)	1.69 (1.48-1.94)	1.47 (1.29-1.69)
Personal care workers in health services	1.51 (1.42-1.61)	1.35 (1.27-1.43)	1.48 (1.39-1.58)	1.33 (1.25-1.42)
Other service and sales workers	1.73 (1.63-1.84)	1.34 (1.26-1.43)	1.76 (1.65-1.87)	1.36 (1.28-1.45)
Skilled agricultural, forestry and fishery workers	2.61 (2.23-3.05)	2.15 (1.83-2.51)	2.62 (2.24-3.07)	2.14 (1.82-2.50)
Craft and related trades workers	1.88 (1.73-2.05)	1.33 (1.22-1.44)	1.89 (1.74-2.06)	1.33 (1.22-1.44)
Stationary plant and machine operators, assemblers	1.41 (1.26-1.56)	1.01 (0.91-1.12)	1.40 (1.26-1.56)	1.01 (0.91-1.12)
Elementary occupations (incl. armed forces)	1.57 (1.49-1.66)	1.39 (1.32-1.47)	1.42 (1.34-1.50)	1.34 (1.27-1.41)