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# Building a Healthy Working Life: Life Course Inequalities and the Role of Working Conditions

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# Background

- The retirement age is being raised gradually to counteract the financial consequences of an aging population.
- A political priority in many countries is therefore to find ways to keep older workers in the labor market.
- However, with increasing age, and especially after 50 years of age, many people are excluded due to health problems.

## Background (cont.)

- Social insurance reforms have led to drastically reduced opportunities for older workers to exit the labor market on a disability pension.
- Postponed retirement ages and more restrictive disability benefits may create difficulties in parts of the labor market, especially for the low-educated.

## Labour market exit routes in high- and low-educated older workers before and after social insurance and retirement policy reforms in Sweden

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### Abstract

Few previous studies have investigated how socioeconomic differences in labour market exit have changed after restrictions in social insurance policies. The aim of this register-based study is to investigate how early labour market exit pathways among older men and women with different levels of education changed after major restrictive social insurance and retirement policy reforms in Sweden. Cohort 1 (pre-reform) consisted of individuals who were 60 or 61 years old in 2005 (N = 186,145) and Cohort 2 (post-reform) consisted of individuals who were 60 or 61 years old in 2012 (N = 176,216). Educational differences in four labour market exit pathways were investigated using Cox proportional hazards regression; the exit pathways were disability pension, early old-age pension with and without income respectively, and no income for two consecutive years. As expected, exits through disability pension were rarer in Cohort 2. Lower education was also more strongly associated with disability pension in Cohort 2. Parallel to this, lower education showed a stronger association with both early old-age pension types in Cohort 2. Additionally, a tendency towards a relatively higher likelihood of earning no income was seen among the less educated. Increases in inequalities tended to be greater for women. Our results indicate that educational inequalities in labour market exit have grown significantly after restrictions in social insurance and changes in retirement policies, which can have negative financial repercussions for those already in a vulnerable position. These results indicate that careful analyses of effects on disparities are needed before making major changes in welfare systems.

**Keywords:** early retirement; inequality; longitudinal data analysis; public policy; pension

**Table 2.** Hazard ratios (HR) and 95 per cent confidence intervals (95% CI) for exit routes according to attained education among men: models adjusted for age only

Education level	Cohort 1		Cohort 2		Interaction term <sup>1</sup>
	N cases (%)	HR (95% CI)	N cases (%)	HR (95% CI)	
<b>Disability pension:</b>					
Tertiary	1,094 (4)	1	359 (1)	1	0.1143
Secondary	2,615 (6)	1.58 (1.47–1.70)	876 (2)	1.84 (1.63–2.08)	
Primary	2,276 (8)	1.97 (1.84–2.12)	520 (3)	2.20 (1.92–2.51)	
Total	5,985 (6)		1,755 (2)		
<b>Early pension with income:</b>					
Tertiary	3,290 (12)	1	3,671 (12)	1	<0.0001
Secondary	4,153 (10)	0.82 (0.78–0.86)	5,663 (14)	1.16 (1.12–1.21)	
Primary	2,517 (9)	0.70 (0.67–0.74)	3,045 (15)	1.26 (1.20–1.33)	
Total	9,960 (10)		12,379 (14)		
<b>Early pension without income:</b>					
Tertiary	3,143 (12)	1	4,183 (14)	1	<0.0001
Secondary	5,697 (14)	1.19 (1.14–1.24)	7,081 (18)	1.29 (1.24–1.34)	
Primary	3,811 (13)	1.13 (1.07–1.18)	3,587 (18)	1.31 (1.25–1.37)	
Total	12,651 (13)		14,851 (17)		
<b>No income:</b>					
Tertiary	4,882 (20)	1	4,682 (17)	1	0.0388
Secondary	8,898 (24)	1.22 (1.18–1.26)	7,502 (21)	1.24 (1.19–1.28)	
Primary	5,834 (22)	1.11 (1.07–1.15)	3,583 (20)	1.19 (1.14–1.24)	
Total	19,614 (22)		15,767 (19)		

Notes: 1. *p*-Value corresponding to Wald test for interaction term. Models are adjusted for age.

**Table 3.** Hazard ratios (HR) and 95 per cent confidence intervals (95% CI) for exit routes according to attained education among women: adjusted for age only

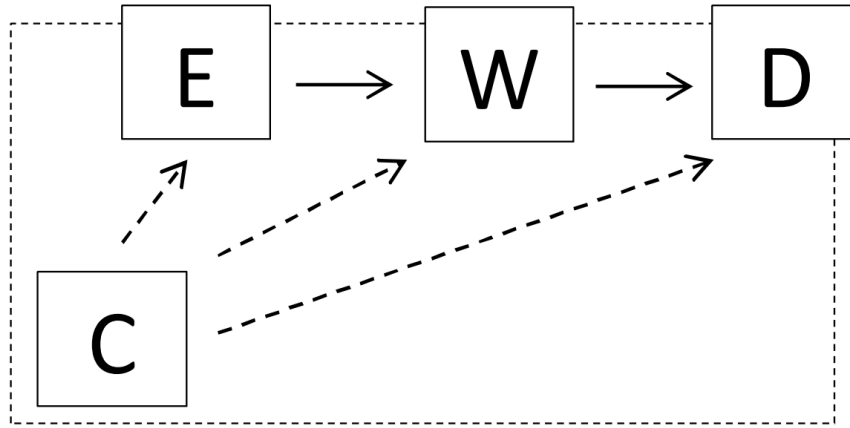
Education level	Cohort 1		Cohort 2		Interaction term <sup>1</sup>
	N cases (%)	HR (95% CI)	N cases (%)	HR (95% CI)	
<b>Disability pension:</b>					
Tertiary	2,094 (8)	1	541 (2)	1	<0.0001
Secondary	3,203 (9)	1.10 (1.04–1.16)	942 (3)	1.50 (1.35–1.66)	
Primary	1,872 (9)	1.18 (1.11–1.26)	417 (4)	2.21 (1.94–2.51)	
Total	7,169 (9)		1,900 (2)		
<b>Early pension with income:</b>					
Tertiary	3,723 (14)	1	3,924 (12)	1	<0.0001
Secondary	3,614 (10)	0.69 (0.66–0.72)	4,807 (13)	1.05 (1.01–1.10)	
Primary	1,442 (7)	0.50 (0.47–0.53)	1,167 (10)	0.84 (0.78–0.89)	
Total	8,779 (11)		9,898 (12)		
<b>Early pension without income:</b>					
Tertiary	2,889 (11)	1	4,352 (14)	1	<0.0001
Secondary	4,812 (13)	1.20 (1.14–1.25)	6,934 (19)	1.39 (1.34–1.44)	
Primary	2,821 (14)	1.28 (1.21–1.35)	2,406 (21)	1.60 (1.53–1.69)	
Total	10,522 (13)		13,692 (17)		
<b>No income:</b>					
Tertiary	4,344 (18)	1	4,309 (14)	1	<0.0001
Secondary	8,104 (24)	1.45 (1.40–1.50)	7,284 (21)	1.54 (1.48–1.60)	
Primary	4,552 (26)	1.57 (1.50–1.63)	2,360 (24)	1.81 (1.72–1.90)	
Total	17,000 (23)		13,953 (19)		

Notes: 1. *p*-Value corresponding to Wald test for interaction term. Models are adjusted for age.

## Background (cont.)

- Studying the effects of physically and mentally demanding working conditions on low-educated people's chances of prolonged labor-market participation is therefore warranted.
- However, we know that these working conditions are most prevalent where educational requirements are lowest.
- This may be another explanation.

# Education, working conditions, disability pension



**Figure 1.** The association between level of education (E), mediating working conditions (W), and disability pension (D) may be confounded by characteristics already present in childhood (C).

# Background (cont.)

- Working conditions of interest:
  - Heavy physical workload
  - Low decision authority
  - Low skill discretion/utilization
  - Noise, vibrations
  - Chemicals, particles

# Background (cont.)

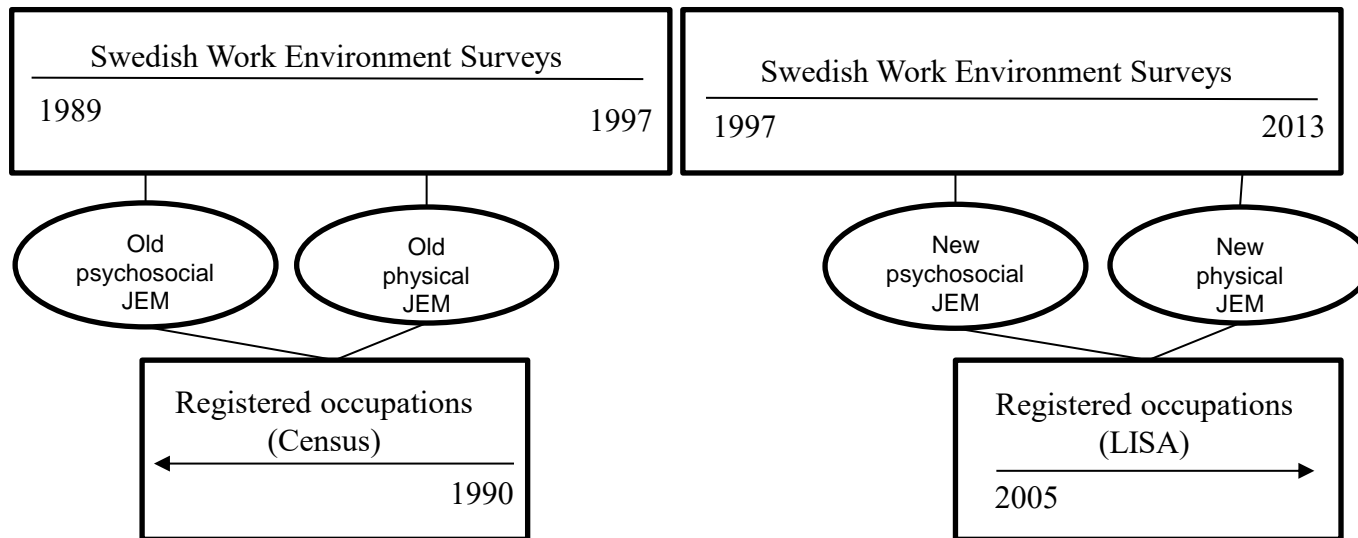
- Measurement of working conditions for (total) population studies:
  - Job exposure matrices
- How a job-exposure looks:
  - Physical workload/ergonomic JEM

# Physical workload JEM: in practice

- Simple Excel File:

1	ISCO88COM	ISCO88COM_title	Heavy_lift	Fast_br	Forward_BP	Kneeling	Hands_above_shoulder_level
207	6129	Animal producers and related workers not el	2	2	2	2	2
208	6130	Crop and animal producers	2	2	2	2	2
209	6141	Forestry workers and loggers	2	2	3	2	1
210	6142	Charcoal burners and related workers	2	2	2	1	1
211	6151	Aquatic life cultivation workers	2	2	2	2	1
212	6152	Inland and coastal waters fishery workers	3	3	3	2	1
213	6153	Deep-sea fishery workers	3	3	2	1	0
214	6154	Hunters and trappers	4	2	3	3	1
215	7111	Miners and quarry workers	2	2	2	2	2
216	7112	Shotfirers and blasters	2	2	2	2	2
217	7113	Stone splitters, cutters and carvers	3	3	3	3	2
218	7121	Builders	3	3	3	3	3
219	7122	Bricklayers and stonemasons	3	3	3	4	3
220	7123	Concrete placers, concrete finishers and re	3	3	3	4	2
221	7124	Carpenters and joiners	3	3	3	3	3
222	7129	Building frame and related trades workers n	2	3	2	3	3
223	7131	Roofers	3	3	4	4	3
224	7132	Floor layers and tile setters	4	3	3	4	4
225	7133	Plasterers	3	3	3	3	2
226	7134	Insulation workers	2	3	3	3	3
227	7135	Glaziers	2	3	3	3	3
228	7136	Plumbers and pipe fitters	2	3	3	4	3
229	7137	Building and related electricians	1	2	2	3	3
230	7139	Building finishers and related trade worker	3	2	3	3	3
231	7141	Painters and related workers	2	2	3	4	4
232	7142	...	...	...	...	...	...

# Job Exposure Matrices



JEMs also available for temperature, particles/chemicals, and noise/vibration



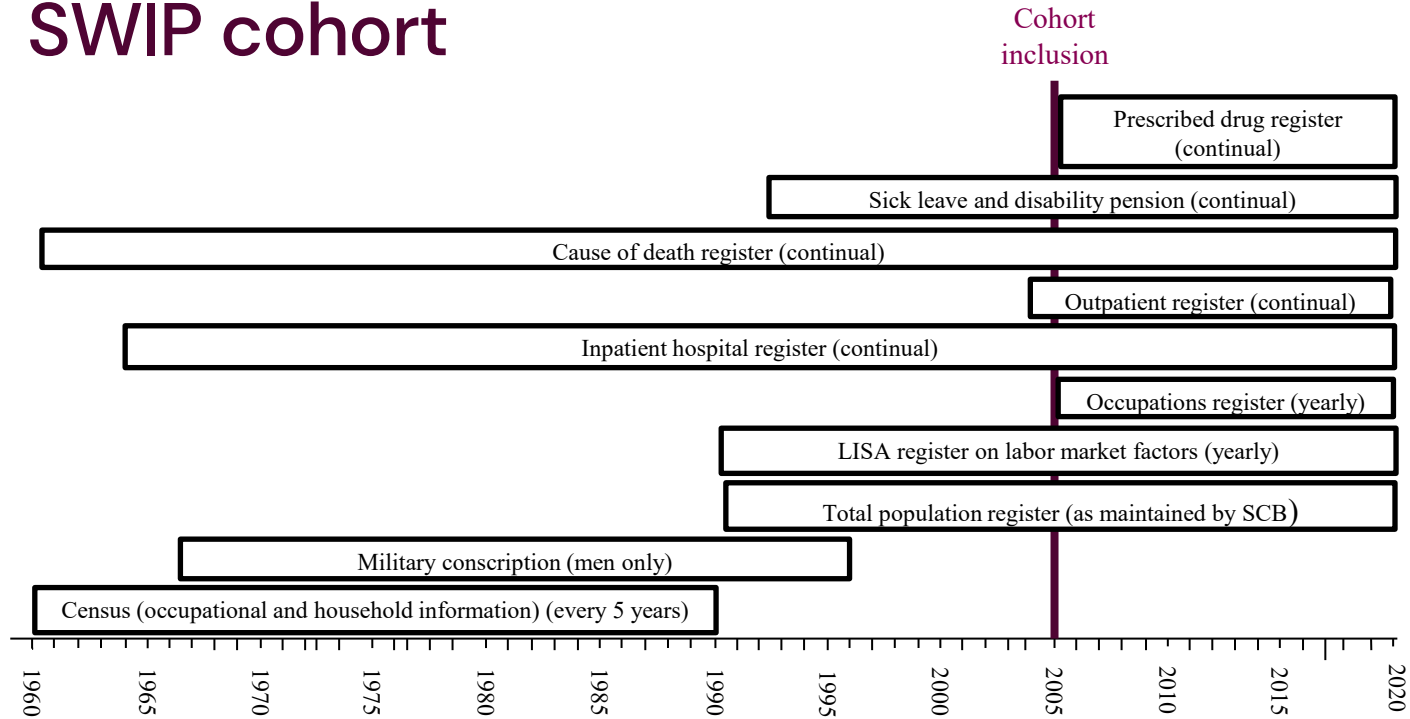
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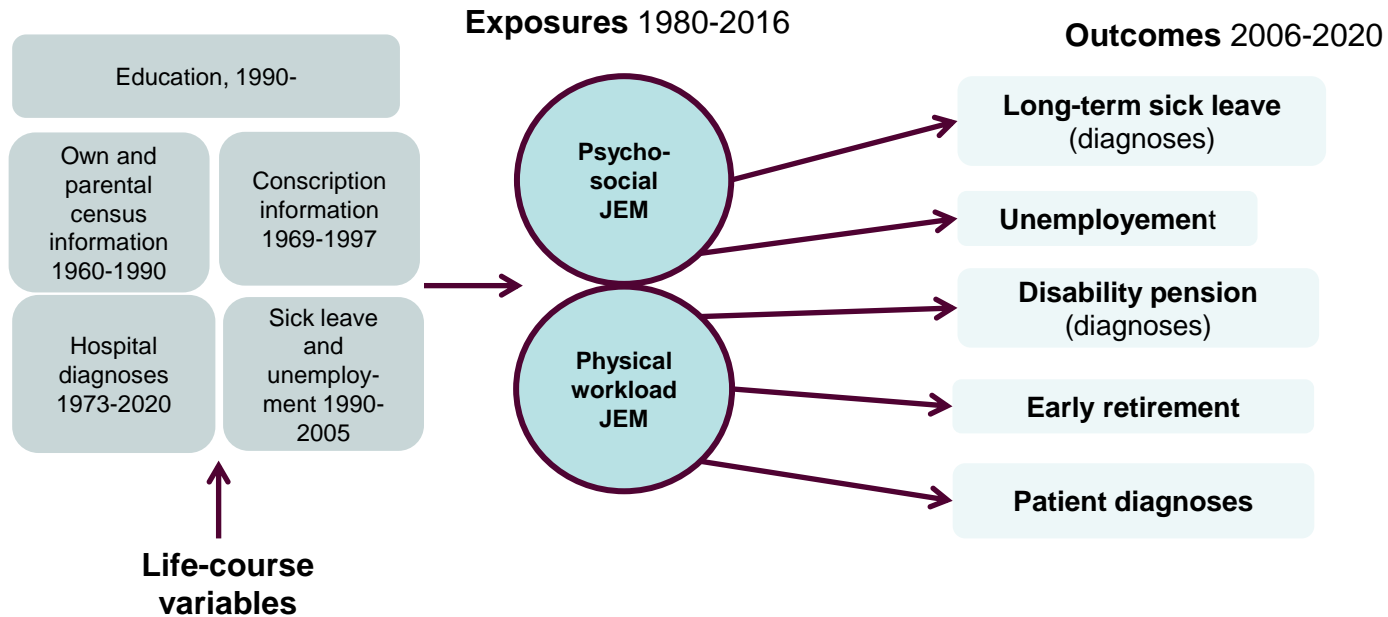
# Empirical studies

# SWIP cohort (used in WP1–3)

- Swedish Work, Illness, and Labor–Market Participation cohort
- Individuals registered as living in Sweden in 2005
- Born 1941–1989 (16–64 in 2005)
- Around 5.4 million individuals
- Index persons with linkage to their parents

# SWIP cohort







## Disability pensions related to heavy physical workload: a cohort study of middle-aged and older workers in Sweden

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### Abstract

**Objectives** The aim of the study was to examine the associations between heavy physical workload among middle-aged and older workers and disability pension due to any diagnosis, as well as musculoskeletal, psychiatric, cardiovascular or respiratory diagnoses. The population-based design made it possible to examine dose–response and potential gender differences in the associations.

**Methods** About 1.8 million men and women aged 44–63 years and registered as living in Sweden in 2005 were followed regarding disability pension during 2006–2016, until ages 55–65 years. Mean values of physical workload and job control, estimated through gender-specific job-exposure matrices (JEMs), were assigned to individuals through their occupational titles in 2005. Exposure values were ranked separately for women and men and divided into quintiles. Associations were analyzed with Cox proportional-hazards regression.

**Results** The analyses showed robust, dose–response associations between physical workload and disability pension with a musculoskeletal diagnosis in both genders: the adjusted hazard ratio and 95% confidence interval for those with the heaviest exposure was 2.58 (2.37–2.81) in women and 3.34 (2.83–3.94) in men. Dose–response associations were also seen in relation to disability pension with a cardiovascular or a respiratory diagnosis, though the hazard ratios were smaller. Physical workload was not associated with disability pension with a psychiatric diagnosis after adjustment for job control.

**Conclusion** This study of the entire Swedish population of middle-aged and older workers suggests that higher degrees of physical workload may increase the risk of disability pension overall, and specifically with musculoskeletal, cardiovascular or respiratory diagnosis, in both women and men.

**Keywords** Job-exposure matrix · Work ability · Retirement · Musculoskeletal · Cardiovascular · Respiratory

# Disability pensions related to heavy physical workload: a cohort study of middle-aged and older workers in Sweden (Falkstedt et al 2021)

- **Objective:** The study aimed to explore how heavy physical workload impacts the likelihood of receiving a disability pension due to various diagnoses, including musculoskeletal, psychiatric, cardiovascular, and respiratory conditions.
- **Method:** The researchers followed approximately 1.8 million Swedish men and women aged 44–63 years from 2006 to 2016. They used job-exposure matrices to estimate physical workload and job control based on occupational titles.
- **Conclusion:** The study suggests that higher levels of physical workload significantly increase the risk of disability pension, particularly for musculoskeletal, cardiovascular, and respiratory diagnoses.


**Table 3** Physical workload and disability pensions in the population of female middle-aged Swedish workers; crude and adjusted hazard ratios

Physical workload	Cases		Cox' regression models					
			Crude		Adjusted <sup>a</sup>		Adjusted <sup>b</sup>	
	No	%	HR	95% CI	HR	95% CI	HR	95% CI
Any diagnosis								
Low	9258	5.03	1.00		1.00		1.00	
Low/mid	11,924	6.04	1.26	1.22–1.29	1.19	1.15–1.22	1.03	1.00–1.07
Middle	13,088	7.34	1.46	1.42–1.50	1.43	1.39–1.46	1.11	1.07–1.14
Mid/high	18,275	9.27	1.95	1.90–2.00	1.67	1.62–1.72	1.27	1.22–1.31
High	18,512	9.77	1.98	1.93–2.03	1.71	1.66–1.76	1.31	1.26–1.36
Musculoskeletal								
Low	1876	1.02	1.00		1.00		1.00	
Low/mid	3104	1.57	1.61	1.52–1.70	1.34	1.27–1.42	1.19	1.12–1.27
Middle	3830	2.15	2.09	1.98–2.21	1.97	1.86–2.08	1.62	1.52–1.73
Mid/high	7586	3.85	3.95	3.75–4.15	2.68	2.54–2.83	2.22	2.07–2.38
High	8382	4.42	4.38	4.17–4.61	2.97	2.81–3.14	2.45	2.29–2.62

**Table 4** Physical workload and disability pensions in the population of male middle-aged Swedish workers; crude and adjusted hazard ratios

Physical workload	Cases		Cox' regression models					
			Crude		Adjusted <sup>a</sup>		Adjusted <sup>b</sup>	
	No	%	HR	95% CI	HR	95% CI	HR	95% CI
Any diagnosis								
Low	4284	2.43	1.00		1.00		1.00	
Low/mid	5509	3.10	1.28	1.23–1.34	1.19	1.14–1.24	0.97	0.92–1.01
Middle	8580	4.87	2.05	1.97–2.12	1.73	1.66–1.80	1.29	1.22–1.35
Mid/high	10,701	5.91	2.49	2.40–2.58	1.90	1.82–1.97	1.40	1.33–1.47
High	11,977	6.77	2.86	2.76–2.96	2.11	2.03–2.19	1.56	1.48–1.64
Musculoskeletal								
Low	522	0.30	1.00		1.00		1.00	
Low/mid	973	0.55	1.86	1.67–2.06	1.59	1.43–1.77	1.33	1.17–1.51
Middle	1983	1.13	3.84	3.49–4.23	2.88	2.61–3.18	2.31	2.04–2.60
Mid/high	3358	1.85	6.35	5.79–6.97	4.03	3.65–4.45	3.23	2.86–3.65
High	4228	2.39	8.17	7.46–8.95	5.02	4.55–5.54	3.96	3.50–4.47

## Labour market exit routes in high- and low-educated older workers before and after social insurance and retirement policy reforms in Sweden

Melody Almroth<sup>1,2</sup> , Daniel Falkstedt<sup>1</sup>, Tomas Hemmingsson<sup>1,2</sup>, Maria Albin<sup>1,3</sup>, Kathryn Badarin<sup>1</sup>, Jenny Selander<sup>1</sup>, Per Gustavsson<sup>1,3</sup>, Theo Bodin<sup>1,3</sup>, Emelie Thern<sup>1,2</sup>, Kuan-Yu Pan<sup>1</sup> and Katarina Kjellberg<sup>1,3</sup>

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### Abstract

Few previous studies have investigated how socioeconomic differences in labour market exit have changed after restrictions in social insurance policies. The aim of this register-based study is to investigate how early labour market exit pathways among older men and women with different levels of education changed after major restrictive social insurance and retirement policy reforms in Sweden. Cohort 1 (pre-reform) consisted of individuals who were 60 or 61 years old in 2005 (N = 186,145) and Cohort 2 (post-reform) consisted of individuals who were 60 or 61 years old in 2012 (N = 176,216). Educational differences in four labour market exit pathways were investigated using Cox proportional hazards regression; the exit pathways were disability pension, early old-age pension with and without income respectively, and no income for two consecutive years. As expected, exits through disability pension were rarer in Cohort 2. Lower education was also more strongly associated with disability pension in Cohort 2. Parallel to this, lower education showed a stronger association with both early old-age pension types in Cohort 2. Additionally, a tendency towards a relatively higher likelihood of earning no income was seen among the less educated. Increases in inequalities tended to be greater for women. Our results indicate that educational inequalities in labour market exit have grown significantly after restrictions in social insurance and changes in retirement policies, which can have negative financial repercussions for those already in a vulnerable position. These results indicate that careful analyses of effects on disparities are needed before making major changes in welfare systems.

**Keywords:** early retirement; inequality; longitudinal data analysis; public policy; pension

# Labour market exit routes in high- and low-educated older workers before and after social insurance and retirement policy reforms in Sweden (Almroth et al 2024)

- **Objective:** The study aimed to investigate how early labor market exit routes among older workers with different educational levels changed after major policy reforms.
- **Method:** The researchers analyzed data from two cohorts of individuals aged 60 or 61 years old, one from 2005 (pre-reform) and one from 2012 (post-reform), totaling over 360,000 participants.
- **Conclusion:** Educational inequalities in labor market exit have grown significantly after the policy changes, potentially leading to negative financial repercussions for those already in vulnerable positions.

### Do working conditions explain the increased risks of disability pension among men and women with low education? A follow-up of Swedish cohorts

by Daniel Falkstedt, PhD,<sup>1,2</sup> Mona Backhans, PhD,<sup>1,3</sup> Andreas Lundin, PhD,<sup>4</sup> Peter Allebeck, PhD,<sup>1</sup> Tomas Hemmingsson, PhD<sup>4,5</sup>

Falkstedt D, Backhans M, Lundin A, Allebeck P, Hemmingsson T. Do working conditions explain the increased risks of disability pension among men and women with low education? A follow-up of Swedish cohorts. *Scand J Work Environ Health*. 2014;50(5):483–492. doi:10.5271/sjweh.3441

**Objectives** Rates of disability pension are greatly increased among people with low education. This study examines the extent to which associations between education and disability pensions might be explained by differences in working conditions. Information on individuals at age 13 years was used to assess confounding of associations.

**Method** Two nationally representative samples of men and women born in 1948 and 1953 in Sweden (22 889 participants in total) were linked to information from social insurance records on cause (musculoskeletal, psychiatric, and other) and date (from 1986–2008) of disability pension. Education data were obtained from administrative records. Occupation data were used for measurement of physical strain at work and job control. Data on paternal education, ambition to study, and intellectual performance were collected in school.

**Results** Women were found to have higher rates of disability pension than men, regardless of diagnosis, whereas men had a steeper increase in disability pension by declining educational level. Adjustment of associations for paternal education, ambition to study, and intellectual performance at age 13 had a considerable attenuating effect, also when disability pension with a musculoskeletal diagnosis was the outcome. Despite this, high physical strain at work and low job control both contributed to explain the associations between low education and disability pensions in multivariable models.

**Conclusion** Working conditions seem to partly explain the increased rate of disability pension among men and women with lower education even though this association does reflect considerable selection effects based on factors already present in late childhood.

**Key terms** cohort study; confounding; intellectual performance; JEM; job control; job exposure matrix; musculoskeletal diagnosis; musculoskeletal disorder; physical strain; psychiatric diagnosis; study ambition; Sweden.

# Do working conditions explain the increased risks of disability pension among men and women with low education? A follow-up of Swedish cohorts (Falkstedt et al 2014)

- **Objective:** The study aimed to determine if the association between low education and increased disability pension rates is due to differences in working conditions.
- **Method:** The researchers followed two cohorts of Swedish men and women born in 1948 and 1953, totaling 22,889 participants. They linked data on education, occupation, and disability pension from various records.
- **Conclusion:** Physical workload and other working conditions, such as low job control, partially explain the higher rates of disability pension among individuals with low education, although other factors present from late childhood also play a role.

**Table 3.** Multivariable-adjusted associations between level of education and disability pension (DP) among men. [95% CI=95%confidence interval; HR=hazard ratio]

Education	N	Model 1 <sup>a</sup>			Model 2 <sup>b</sup>			Model 3 <sup>c</sup>			Model 4 <sup>d</sup>			Model 5 <sup>c,d</sup>			Model 6 <sup>e</sup>		
		HR	95% CI	%	HR	95% CI	%	HR	95% CI	%	HR	95% CI	%	HR	95% CI	%	HR	95% CI	%
DP: total	811																		
Tertiary	106	1.00			1.00			1.00			1.00			1.00			1.00		
Secondary	359	2.08	1.68–2.59		1.79	1.42–2.26		1.85	1.47–2.32		1.85	1.49–2.31		1.83	1.46–2.30		1.69	1.33–2.15	
Primary	346	2.84	2.28–3.53		2.15	1.68–2.76		2.39	1.88–3.04		2.26	1.80–2.85		2.25	1.76–2.87		1.92	1.48–2.50	
Attenuation †						38						24						32	50
DP: musculoskeletal	288																		
Tertiary	17	1.00			1.00			1.00			1.00			1.00			1.00		
Secondary	125	4.58	2.76–7.60		3.30	1.95–5.59		3.21	1.89–5.42		3.89	2.33–6.48		3.17	1.87–5.37		2.63	1.53–4.54	
Primary	146	7.66	4.63–12.65		4.48	2.60–7.72		4.59	2.68–7.86		5.62	3.35–9.41		4.35	2.54–7.48		3.22	1.83–5.69	
Attenuation †						48						46						31	67
DP: psychiatric	167																		
Tertiary	32	1.00			1.00			1.00			1.00			1.00			1.00		
Secondary	79	1.57	1.04–2.37		1.57	1.01–2.44		1.69	1.10–2.60		1.41	0.93–2.15		1.66	1.08–2.56		1.64	1.04–2.59	
Primary	56	1.56	1.01–2.41		1.51	0.91–2.51		1.79	1.10–2.90		1.26	0.79–2.01		1.61	0.99–2.64		1.56	0.91–2.65	
Attenuation †						9			+41 <sup>g</sup>			54					+9 <sup>g</sup>		0
DP: other	356																		
Tertiary	57	1.00			1.00			1.00			1.00			1.00			1.00		
Secondary	155	1.71	1.26–2.31		1.51	1.09–2.10		1.59	1.15–2.18		1.55	1.14–2.11		1.58	1.14–2.18		1.48	1.05–2.08	
Primary	144	2.26	1.66–3.07		1.79	1.25–2.55		2.05	1.45–2.89		1.86	1.35–2.58		1.94	1.37–2.74		1.68	1.15–2.45	
Attenuation †						37						17						32	46

<sup>a</sup> Adjusted for year of birth.

<sup>b</sup> Adjusted for year of birth, paternal education, ambition to study and intellectual performance at 13 years of age.

<sup>c</sup> Adjusted for year of birth and physical strain at work.

<sup>d</sup> Adjusted for year of birth and job control.

<sup>e</sup> Adjusted for year of birth, paternal education, ambition to study, intellectual performance at 13 years of age, physical strain at work and job control.

† % attenuation calculated as  $(HR_{\text{primary}} - HR_{\text{tertiary}}) / (HR_{\text{primary}} - 1) \times 100$  using HR for primary education

**Table 4.** Multivariable-adjusted associations between level of education and disability pension (DP) among women. [95% CI=95% confidence interval; HR=hazard ratio]

Education	N	Model 1 <sup>a</sup>			Model 2 <sup>b</sup>			Model 3 <sup>c</sup>			Model 4 <sup>d</sup>			Model 5 <sup>c,d</sup>			Model 6 <sup>e</sup>		
		HR	95% CI	%	HR	95% CI	%	HR	95% CI	%	HR	95% CI	%	HR	95% CI	%	HR	95% CI	%
DP: total	1372																		
Tertiary	324	1.00		1.00		1.00		1.00		1.00		1.00		1.00		1.00		1.00	
Secondary	566	1.23	1.07–1.41	1.03	0.89–1.20	1.09	0.94–1.26	1.12	0.97–1.29	1.07	0.92–1.24	1.07	0.92–1.24	0.95	0.82–1.12				
Primary	482	1.96	1.70–2.26	1.50	1.28–1.76	1.62	1.40–1.89	1.72	1.47–2.00	1.59	1.36–1.86	1.33	1.12–1.58						
% attenuation †					48			27			19			39					66
DP: musculoskeletal	618																		
Tertiary	103	1.00		1.00		1.00		1.00		1.00		1.00		1.00		1.00		1.00	
Secondary	257	1.74	1.38–2.18	1.29	1.01–1.64	1.46	1.15–1.85	1.50	1.18–1.90	1.44	1.13–1.85	1.17	0.91–1.52						
Primary	258	3.30	2.63–4.15	2.11	1.64–2.72	2.49	1.95–3.17	2.64	2.06–3.38	2.42	1.88–3.12	1.79	1.37–2.36						
% attenuation †					52			35			29			38					66
DP: psychiatric	335																		
Tertiary	108	1.00		1.00		1.00		1.00		1.00		1.00		1.00		1.00		1.00	
Secondary	129	0.85	0.66–1.10	0.85	0.64–1.12	0.83	0.64–1.09	0.81	0.62–1.06	0.80	0.61–1.05	0.81	0.61–1.08						
Primary	98	1.28	0.98–1.69	1.23	0.90–1.68	1.22	0.91–1.63	1.20	0.89–1.62	1.17	0.86–1.59	1.16	0.83–1.62						
% attenuation †					18			21			29			39					43
DP: other	419																		
Tertiary	113	1.00		1.00		1.00		1.00		1.00		1.00		1.00		1.00		1.00	
Secondary	180	1.13	0.90–1.43	0.95	0.74–1.23	1.00	0.78–1.28	1.09	0.85–1.39	1.00	0.77–1.29	0.88	0.67–1.15						
Primary	126	1.55	1.20–1.99	1.20	0.90–1.60	1.29	0.98–1.69	1.46	1.11–1.92	1.32	0.99–1.75	1.10	0.81–1.49						
% attenuation †					64			47			16			42					82

<sup>a</sup> Adjusted for year of birth.

<sup>b</sup> Adjusted for year of birth, paternal education, ambition to study and intellectual performance at 13 years of age.

<sup>c</sup> Adjusted for year of birth and physical strain at work.

<sup>d</sup> Adjusted for year of birth and job control.




<sup>e</sup> Adjusted for year of birth, paternal education, ambition to study, intellectual performance at 13 years of age, physical strain at work and job control.

† % attenuation calculated as  $(HR_{\text{tertiary}} - HR_{\text{primary}}) / (HR_{\text{primary}} - 1) \times 100$  using HRs for primary education



Original research

# Mediating effect of working conditions on the association between education and early labour market exit: a cohort study of Swedish men

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## ABSTRACT

**Objectives** It is not fully known what explains educational inequalities in early labour market exits. This study aims to examine the mediating effect of exposure to unfavourable working conditions, measured by low job control and high physical workload, on the association between education and early labour market exit among men.

**Methods** This register-based study included all men born 1951–1953, who underwent Swedish military conscription in late adolescence and had a registered educational level in 2005 (n=115 998). These men were followed from ages 53–55 to 64 regarding early labour market exit (disability pension, long-term sickness absence, long-term unemployment, early old-age retirement with and without income). Mediation analysis was used to examine the role of job control and physical workload in explaining the educational differences in early exit. Factors measured in childhood and late adolescence were included as confounders.

**Results** The proportion mediated by job control was around 17% and for physical workload around 22% for the least educated men for exit through disability

## WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Lower educational attainment is a risk factor for leaving the labour market earlier than normative retirement age. However, the mechanisms behind the educational inequalities seen in early labour market exits are not fully known.

## WHAT THIS STUDY ADDS

⇒ This study found job control and physical workload to be important mediating factors for educational differences in early labour market exit through five different exit routes.

## HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ The results indicate the importance of improving working conditions to decrease inequalities in early labour market exit and increase later-life labour force participation.

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# Mediating effect of working conditions on the association between education and early labour market exit: a cohort study of Swedish men (Carlsson et al 2024 [online])

- **Objective:** The study aimed to determine if unfavorable working conditions, such as low job control and high physical workload, mediate the association between education and early labor market exit.
- **Method:** The researchers conducted a register-based study including all men born the years 1951-1953 who underwent Swedish military conscription and had a registered educational level in 2005. These 116,000 men were followed up from age 55 to 64.
- **Conclusion:** Physical workload and job control are important factors explaining educational differences in most early exit routes, even after accounting for early life factors. Improving working conditions could help reduce inequalities in early labor market exit and extend working life.

**Table 5** Mediation analysis with decomposition of the effect of level of education (in years) and early exit through disability pension, long-term sickness absence, long-term unemployment and old-age retirement without income, into total effect, direct effect and indirect effect using physical workload as mediator

Years of education	13–14 RR (95% CI)	%Δ	12 RR (95% CI)	%Δ	10–11 RR (95% CI)	%Δ	≤ 9 RR (95% CI)	%Δ
Disability pension (5 772 events, 4.98%)								
Model 1—crude								
Total effect	1.21 (1.08 to 1.35)		1.53 (1.38 to 1.70)		2.11 (1.93 to 2.31)		2.35 (2.14 to 2.57)	
Natural direct effect	1.19 (1.07 to 1.33)		1.44 (1.29 to 1.60)		1.90 (1.73 to 2.08)		2.06 (1.87 to 2.26)	
Natural indirect effect	1.01 (1.01 to 1.02)	8	1.06 (1.05 to 1.08)	17	1.11 (1.09 to 1.14)	19	1.14 (1.11 to 1.17)	22
Model 2—adjusted								
Total effect	1.17 (1.05 to 1.31)		1.41 (1.27 to 1.58)		1.73 (1.57 to 1.90)		1.75 (1.58 to 1.94)	
Natural direct effect	1.16 (1.04 to 1.30)		1.34 (1.21 to 1.50)		1.60 (1.45 to 1.76)		1.60 (1.44 to 1.77)	
Natural indirect effect	1.01 (1.01 to 1.02)	8	1.05 (1.04 to 1.07)	17	1.08 (1.06 to 1.10)	18	1.10 (1.07 to 1.12)	20
Long-term sickness absence (9 442 events, 8.14%)								
Model 1—crude								
Total effect	1.26 (1.16 to 1.37)		1.52 (1.41 to 1.65)		2.08 (1.94 to 2.22)		2.12 (1.98 to 2.28)	
Natural direct effect	1.25 (1.15 to 1.36)		1.44 (1.33 to 1.56)		1.88 (1.75 to 2.02)		1.88 (1.74 to 2.02)	
Natural indirect effect	1.01 (1.01 to 1.02)	6	1.06 (1.05 to 1.07)	16	1.11 (1.09 to 1.12)	18	1.13 (1.11 to 1.16)	22
Model 2—adjusted								
Total effect	1.21 (1.11 to 1.31)		1.40 (1.29 to 1.52)		1.73 (1.61 to 1.86)		1.66 (1.53 to 1.79)	
Natural direct effect	1.19 (1.10 to 1.30)		1.33 (1.22 to 1.45)		1.60 (1.48 to 1.73)		1.51 (1.39 to 1.64)	
Natural indirect effect	1.01 (1.01 to 1.02)	7	1.05 (1.04 to 1.06)	17	1.08 (1.06 to 1.10)	18	1.10 (1.08 to 1.12)	22

Long-term unemployment (4 764 events, 4.11%)									
Model 1—crude									
Total effect	1.33 (1.19 to 1.48)		1.48 (1.32 to 1.64)		1.76 (1.60 to 1.93)		1.57 (1.42 to 1.73)		
Natural direct effect	1.32 (1.18 to 1.47)		1.41 (1.26 to 1.57)		1.62 (1.47 to 1.78)		1.41 (1.28 to 1.57)		
Natural indirect effect	1.01 (1.01 to 1.01)	4	1.05 (1.03 to 1.06)	14	1.08 (1.06 to 1.11)	18	1.11 (1.07 to 1.14)	27	
Model 2—adjusted									
Total effect	1.34 (1.20 to 1.50)		1.45 (1.30 to 1.62)		1.60 (1.45 to 1.77)		1.35 (1.21 to 1.51)		
Natural direct effect	1.33 (1.19 to 1.48)		1.39 (1.25 to 1.56)		1.51 (1.36 to 1.67)		1.26 (1.12 to 1.41)		
Natural indirect effect	1.01 (1.01 to 1.01)	4	1.04 (1.02 to 1.05)	12	1.06 (1.04 to 1.08)	15	1.07 (1.05 to 1.10)	26	
Early old-age retirement without income (31 089 events, 28.11%)									
Model 1—crude									
Total effect	1.34 (1.29 to 1.39)		1.44 (1.39 to 1.49)		1.44 (1.40 to 1.49)		1.51 (1.46 to 1.56)		
Natural direct effect	1.34 (1.29 to 1.39)		1.43 (1.38 to 1.49)		1.43 (1.39 to 1.48)		1.49 (1.44 to 1.55)		
Natural indirect effect	1.00 (1.00 to 1.00)	0	1.00 (1.00 to 1.01)	2	1.01 (1.00 to 1.02)	3	1.01 (1.00 to 1.02)	3	
Model 2—adjusted									
Total effect	1.33 (1.28 to 1.38)		1.43 (1.37 to 1.48)		1.43 (1.38 to 1.48)		1.49 (1.44 to 1.55)		
Natural direct effect	1.32 (1.28 to 1.37)		1.42 (1.37 to 1.47)		1.41 (1.36 to 1.46)		1.48 (1.42 to 1.53)		
Natural indirect effect	1.00 (1.00 to 1.00)	1	1.01 (1.00 to 1.01)	2	1.01 (1.00 to 1.02)	3	1.01 (1.00 to 1.02)	3	

The reference group consists of individuals with 15 or more years of education (at least 3 years of university).

Crude (model 1) and adjusted (model 2) RR with 95% CI. Adjusted models are adjusted for all variables measured in childhood and late adolescence. The proportion of the total effect that is due to the indirect effect is presented as proportion mediated (% $\Delta$ ). The natural direct effect captures the effect of education on the outcome without passing through the mediator, while the natural indirect effect captures the effect of education on the outcome through the mediator.

# Conclusions

- Physically heavy work is an obstacle to work at an older age and is more common among the low-educated.
- We can measure physically heavy work in population studies.
- More physically heavy work among low-educated people is part of the explanation for their earlier exit from working life on average.
- However, there are other obstacles for the low-educated, such as a lack of jobs that do not require academic education.
- This may also be a cause of early exit from the labor market.

# Discussion points

- Are the conclusions on working conditions valid? Underestimated?
- Other important explanations (life course)?
- What policies could help low-educated people work longer?
- Other policy issues?



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# Building a Healthy Working Life: Life Course Inequalities and the Role of Working Conditions

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