

Mechanical and psychosocial work exposures: the construction and evaluation of a gender-specific job exposure matrix (JEM) ¹

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1. *Supplementary material*

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Table S1 Detailed description of work exposure questions

Mechanical work exposures	Response categories and their value labels
1. Heavy lifting > 20kg (1 item)	
Do you have to lift anything that weighs more than 20 kg on a daily basis?	1=20 times a day or more, 2=5-19 times, 3=1-4 times or 4=no
2. Work with neck flexion (1 item)	
Do you work with your head bent forward?	Yes responders: 1=almost the whole time, to 5=very little of the work-day
3. Hands above shoulder height (1 item)	
Do you work with your hands raised to your shoulder height or higher?	Yes responders: 1=almost the whole time, to 5=very little of the work-day
4. Squatting/kneeling (1 item)	

Do you need to squat or kneel in the course of your work?	Yes responders: 1=almost the whole time, to 5=very little of the work-day
5. Forward bending (1 item)	
Do you work in positions where you are leaning forward without supporting yourself on your hands or arms?	Yes responders: 1=almost the whole time, to 5=very little of the work-day
6. Awkward lifting (1 item)	
Do you have to lift things in uncomfortable positions?	Yes responders: 1=almost the whole time, to 5=very little of the work-day
7. Heavy physical work (1 item)	
Does your work involve so much effort that it causes you to breath more rapidly?	Yes responders: 1=almost the whole time, to 5=very little of the work-day
8. Standing/Walking (1 item)	
Do you work standing/walking?	Yes responders: 1=almost the whole time, to 5=very little of the work-day

Psychosocial work exposures		Response categories and their value labels
1.Psychological demands (3 dimensions, 5 items)		
Quantitative demands (1 item)	Do you sometimes have so much to do that you have to skip lunch, work longer than your normal working hours or take work home with you?	1=every day to 5=less often or not at all
Role conflict (3 items)	1) How often do you receive contradictory requests from two or more different people? 2) How often are you given tasks without being given sufficient tools and resources to complete	1=very seldom or never to 5=quite often or always

	them? 3) How often do you have to do things that you think should be done in a different way?	
Emotional demands (1 item)	In your work, to what extent do you need to deal with strong feelings such as sorrow, anger, desperation, frustration and so on from customers, clients or other people who are not employed at your workplace?	1=to a very great extent to 5=not at all
2.Decision latitude (2 dimensions, 5 items)		
Decision authority (3items)	To what extent can you 1) decide pace 2) influence decisions that are important to your work? 3) decide how to go about doing your work	1=very seldom or never to 5=quite often or always
Skill discretion (2 items)	In your job, how good are your... 1) opportunities to make use of the skills, knowledge and experience that you have gained through your education and past work? 2) Opportunities to develop your skills in the areas that interest you?	1=very good to 4=very poor very poor
3.Supportive leadership (1 dimension, 3 items)		
	1) If needed, how often can you get support and help from your immediate superior with your work? 2) Does your immediate superior appreciate your achievements at work? and 3) Does your immediate superior treat employees fair and impartially?	1=very seldom or never to 5=quite often or always
4.Monotonous work (1 dimension, 1 item)		
	Does your job consist of constantly repeated tasks, meaning that you do the same thing hour after hour?	1=almost the whole time to 5=seldom or never

Table S2. The construction of the JEM groups, grouping of occupations for mechanical and psychosocial job exposure matrix.

JEM Group nr	STYRK98 Code	Occupational title	Sex*	Merged**	N	Age Range (Median)
1	1110	Legislators				
	1120	Senior government officials				
	1141	Senior officials of political party organisations				
	1142	Senior officials of employers, workers and other economic organisations				
	1143	Senior officials of humanitarian and other interest organisations	M	X	54	18-66 (40)
2	=	=	F	X	19	23-66 (49)
3	1210	Directors and chief executives	M		135	18-66 (51)
4	1210	Directors and chief executives	F		38	19-62 (44)
5	1222	Production and operations department managers in manufacturing, mining and quarrying, electricity, gas and water supply	M/F	X	116	27-65 (47)
6	1221	Production and operations department managers in agriculture, forestry and fishing				

	1223	Production and operations department managers in construction	M/F	X	28	28-61 (47)
7	1224	Production and operations department managers in whole-sale and retail trade, hotels and restaurants	M/F		100	20-62 (40)
8	1225	Production and operations department managers in transport and communications	M/F		39	25-59 (44)
9	1226	Production and operations department managers in business services	M		65	29-63 (46)
10	1226	Production and operations department managers in business services	F		28	33-61 (45)
11	1227	Production and operations department managers in public administration	M		88	35-65 (54)
12	1227	Production and operations department managers in public administration	F		61	23-63 (48)
13	1228	Production and operations department managers in education, health and social security	M		51	31-65 (49)
14	1228	Production and operations department managers in education, health and social security	F		83	34-62 (49)
15	1229	Production and operations department managers in	M/F		23	24-65 (44)

		personal care, cleaning and related services				
16	1231	Finance and administration department managers	M		46	32-66 (52)
17	1231	Finance and administration department managers	F		68	22-60 (43)
18	1232	Personnel department managers	M		24	23-66 (54)
19	1232	Personnel department managers	F		24	21-61 (45)
20	1233	Sales department managers	M/F		70	28-66 (43)
21	1234	Advertising and public relations department managers	M/F		75	27-66 (45)
22	1235	Supply and distribution department managers	M/F		38	28-63 (44)
23	1236	Computing services department managers	M/F		25	27-63 (48)
24	1237	Research and development department managers				
	1239	Other department managers not elsewhere classified	M/F	X	22	31-59 (45)
25	1310	General managers in unspecified industries				
	1319	General managers not elsewhere classified	M	X	60	30-64 (52)
26	=	=	F	X	52	23-65 (45)
27	1315	General managers in restaurants and hotels				

	1318	General managers in personal care, cleaning and related services	M/F	X	20	23-61 (41)
28	1312	General managers in manufacturing, mining and quarrying, electricity, gas and water supply	M/F		49	24-69 (50)
29	1313	General managers in construction	M		52	24-64 (44)
30	1314	General managers in wholesale and retail trade	M		108	
31	1314	General managers in wholesale and retail trade	F		73	
32	1316	General managers in transport and communications	M		56	25-64 (42)
33	1317	General managers in business services	M/F		103	26-69 (47)
34	2111	Physicists and astronomers				
	2112	Meteorologists				
	2113	Chemists				
	2121	Mathematicians and related professionals				
	2122	Statisticians	M/F	X	24	26-62 (38)
35	2114	Geologists and geophysicists	M/F		20	30-59 (36)
36	2130	Computer systems designers and computer programmers	M		287	19-66 (38)
37	2130	Computer systems designers and computer programmers	F		79	23-64 (40)
38	2141	Architects, town and traffic planners	M		56	24-69 (48)

39	2141	Architects, town and traffic planners	F		23	26-63 (42)
40	2142	Civil engineers	M/F		68	25-66 (44)
41	2143	Electrical engineers				
	2146	Chemical engineers	M/F	X	20	25-66 (39)
42	2144	Electronics and telecommunications engineers	M/F		28	25-62 (39)
43	2145	Mechanical engineers	M/F		22	27-68 (42)
44	2147	Mining engineers, metallurgists and related professionals				
	2148	Cartographers and surveyors	M/F	X	69	25-66 (41)
45	2149	Other engineers and related professionals not elsewhere classified	M		79	20-66 (41)
46	2149	Other engineers and related professionals not elsewhere classified	F		35	26-63 (29)
47	2211	Biologists, botanists, zoologists and related professionals				29-60 (52)
	2212	Agronomists and related professionals	M/F	X	24	
48	2221	Medical doctors	M		91	25-69 (43)
49	2221	Medical doctors	F		64	22-58 (35)

50	2222	Dentists	M/F		34	25-68 (43)
51	2223 2224 2225	Veterinarians Pharmacists Nutritionists	M/F	X	41	25-63 (38)
52	2230	Nursing and midwifery professionals	M/F		191	20-6 (46)
53	2310	College, university and higher education teaching professionals	M		78	22-68 (47)
54	2310	College, university and higher education teaching professionals	F		95	25-65 (47)
55	2320	Secondary education teaching professionals	M		98	20-66 (50)
56	2320	Secondary education teaching professionals	F		90	19-64 (46)
57	2340	Special education teaching professionals	M/F		62	30-66 (48)
58	2351 2352 2359	Education methods specialists School inspectors Other teaching professionals not elsewhere classified	M	X	27	23-68 (57)
59	=	=	F	X	26	22-64 (45)
60	2411 2412	Economic and social planning Juridical deliberation and planning	M	X	21	26-66 (49)
61	=	=	F	X	38	24-62 (40)

62	2413	Technical and scientific deliberation and planning	M/F	41	25-66 (49)	
63	2419	Other public service administrative professionals	M	48	26-66 (45)	
64	2419	Other public service administrative professionals	F	131	22-66 (43)	
65	2511	Accountants	M	31	26-66 (44)	
66	2511	Accountants	F	22	29-66 (41)	
67	2512	Personnel and careers professionals	M	86	23-66 (43)	
68	2512	Personnel and careers professionals	F	126	25-66 (46)	
69	2519	Market analysts and business professionals not elsewhere classified	M	50	20-66 (45)	
70	2519	Market analysts and business professionals not elsewhere classified	F	23	26-60 (38)	
71	2521	Lawyers	M	54	26-66 (54)	
72	2521	Lawyers	F	20	24-66 (35)	
73	2522 2523	Judges Prosecuting legal professionals	M/F	X	30	28-63 (47)
74	2541	Economists	M	57	25-63 (42)	
75	2541	Economists	F	54	24-61 (44)	

76	2531	Archivists and curators	M/F		31	28-66 (56)
77	2532 2542	Librarians Sociologists, social anthropologists, human geographers and political scientists				
	2543	Historians, archaeologists and philosophers	M/F	X	20	27-60 (45)
78	2544	Philologists, translators and interpreters	M/F		24	20-63 (40)
79	2545	Psychologists	M/F		67	24-65 (42)
80	2551	Authors and other writers	M/F		21	29-63 (43)
81	2552	Sculptors, painters and other figurative artists	M/F		19	24-62 (41)
82	2560	Religious professionals	M/F		31	31-66 (49)
83	3480	Religious associate professionals	M/F		27	20-65 (47)
84	3111	Civil engineering technicians	M/F		114	24-66 (43)
85	3112	Electrical engineering technicians	M/F		30	25-64 (45)
86	3113	Electronics and telecommunications engineering technicians	M/F		109	22-66 (40)
87	3114	Mechanical engineering technicians	M/F		51	26-66 (40)
88	3115	Chemical engineering technicians				

	7450		M/F	X	33	21-62 (40)
		Laboratory assistants				
89	3116	Oil, mining and metallurgical technicians	M/F		84	25-66 (44)
90	3119	Engineering technicians not elsewhere classified	M/F		129	24-64 (45)
91	3120	Computer associate professionals	M		153	18-64 (39)
92	3120	Computer associate professionals	F		36	22-60 (34)
93	3131	Photographers and image and sound recording equipment operators				
	3132	Broadcasting and telecommunications equipment operators	M/F	X	36	21-44 (37)
94	3141	Ships engineers	M		36	18-65 (49)
95	3142	Ships deck officers and pilots	M/F		74	25-66 (45)
96	3143 3144	Aircraft pilots Air traffic controllers	M/F	X	37	23-63 (42)
97	3151 3152	Fire inspectors Safety inspectors	M/F	X	96	23-64 (45)
98	3211	Life science technicians	M/F		73	24-63 (49)
99	3212	Agronomy and forestry technicians				
	3213	Farming and forestry advisers				

	3417	Appraisers, valuers and auctioneers	M/F	X	29	31-60 (47)
100	3222	Sanitarians				
	3223	Dieticians				
	3229	Modern health associate professionals (except nursing) not elsewhere classified	M/F	X	25	29-62 (49)
101	3224	Opticians				
	3227	Veterinary assistants				
	3225	Dental assistants				
	3221	Radiographers and audiology associate professionals	M/F	X	42	22-66 (34)
102	3226	Physiotherapists and related associate professionals	M		28	23-54 (38)
103	3226	Physiotherapists and related associate professionals	F		74	24-62 (40)
104	3228	Pharmaceutical assistants				
	5137	Pharmacy technicians	M/F	X	40	19-62 (39)
105	3231	Nurses	M		52	23-58 (38)
106	3231	Nurses	F		406	18-66 (39)
107	3232	Learning disability nurse (RNMS)	M		20	23-56 (40)
108	3232	Learning disability nurse (RNMS)	F		49	24-60 (36)
109	3310	Primary education teaching associate professionals	M		197	19-68 (44)
110	3310	Primary education teaching associate professionals	F		487	19-66 (44)

111	3320	Pre-primary education teaching associate professionals	M/F		239	23-63 (37)
112	3341	Technical and subject teaching associate professionals (secondary education)	M		33	24-66 (48)
113	3341	Technical and subject teaching associate professionals (secondary education)	F		33	25-61 (45)
114	3349	Other teaching associate and pedagogical professionals not elsewhere classified	M		31	18-69 (43)
115	3349	Other teaching associate and pedagogical professionals not elsewhere classified	F		47	18-68 (41)
116	3411 3421 3429	Finance dealers and brokers Trade and shipbrokers Business services agents not elsewhere classified	M/F	X	54	23-64 (39)
117	3412	Insurance representatives	M		36	21-63 (51)
118	3412	Insurance representatives	F		43	21-65 (41)
119	3413	Estate agents	M/F		70	23-63 (43)
120	3415	Technical and commercial sales representatives	M		235	18-69 (41)
121	3415	Technical and commercial sales representatives	F		82	17-68 (36)
122	3416 3433	Buyers Chief housekeepers	M	X	44	23-59 (41)

123	=	=	F	X	37	23-63 (42)
124	3418	Bank associate professionals	M		65	22-64 (45)
125	3418	Bank associate professionals	F		123	22-65 (46)
126	3419	Marketing and advertising advisers	M		36	19-63 (45)
127	3419	Marketing and advertising advisers	F		49	21-64 (36)
128	3422	Clearing and forwarding agents	M/F		37	27-65 (42)
129	3423	Employment agents and labour contractors	M/F		26	22-54 (39)
130	3431	Administrative secretaries and related associate professionals	M		50	19-65 (41)
131	3431	Administrative secretaries and related associate professionals	F		94	24-63 (46)
132	3432	Accountant associate professionals and bookkeepers	M		95	24-65 (46)
133	3432	Accountant associate professionals and bookkeepers	F		168	21-66 (44)
134	3441 3442	Customs and border inspectors Government tax and excise officials	M/F	X	25	26-64 (41)
135	3444 3443	Government social benefits officials Government employment service officials	M/F	X	81	26-64 (47)
136	3449	Other public service administrative associate professionals	M		23	27-68 (48)

137	3449	Other public service administrative associate professionals	F		51	22-65 (53)
138	3450	Police officers	M		52	27-63 (42)
139	3450	Police officers	F		20	25-45 (33)
140	3460	Social workers (college- trained), childcare officers, etc.	M		53	18-65 (40)
141	3460	Social workers (college- trained), childcare officers, etc.	F		151	22-64 (41)
142	3471	Decorators and commercial designers	M		39	20-65 (39)
143	3471	Decorators and commercial designers	F		50	23-66 (38)
144	3472	Singers and musicians in the entertainment industry				18-65 (45)
	2553	Conductors, composers, musicians and singers	M/F	X	45	
145	3474	Inspisients, etc.				
	2554	Choreographers and dancers				21-63 (41)
	2555	Actors and directors	M/F	X	34	
146	3475	Athletes, sportspersons and coaches				
	7216	Underwater workers	M/F	X	47	20-60 (29)
147	3491	Journalists and information associate professionals				
	3492	Radio and television announcers	M	X	60	19-60 (43)

148	=	=	F	X	86	18-69 (38)
149	3493	Librarians	M/F		35	23-61 (43)
150	4141	Library and filing clerks	M/F		23	18-68 (49)
151	4112	Data processors, data entry opera- tors and related operators				
	4129	Other numerical clerks				
	4113	Secretaries	M/F	X	245	18-68 (49)
152	4114	Clerical officers	M		64	19-66 (45)
153	4114	Clerical officers	F		197	18-65 (44)
154	4121	Accounting and bookkeeping clerks	M		32	22-64 (38)
155	4121	Accounting and bookkeeping clerks	F		116	25-66 (45)
156	4131	Stock clerks				
	9330	Storing and goods handling labourers	M	X	165	18-65 (41)
157	=	=	F	X	24	19-63 (43)
158	4132	Logistical clerks	M/F		64	19-62 (43)
159	4133	Transport clerks	M/F		38	22-64 (47)
160	4142	Mail carriers and sorting clerks				
	9151	Messengers, package and luggage porters and deliverers				

	9153	Meter readers and related workers	M	X	62	18-65 (46)
161	=	=	F	X	42	18-65 (52)
162	4211	Cashiers and ticket clerks				
	4212	Tellers and other counter clerks				
	4213	Bookmakers and croupiers				
	4215	Debt-collectors				
	4221	Travel agency and related clerks	M/F	X	40	18-69 (43)
163	4222	Receptionists and information clerks				
	5121	Housekeepers and related workers	M	X	34	20-64 (42)
164	=	=	F	X	61	18-65 (38)
165	4223	Telephone switchboard operators	M/F		22	19-61 (43)
166	5111	Travel attendants and travel stewards				
	5112	Transport conductors	M/F	X	35	22-58 (47)
167	5113	Travel guides				
	3414	Travel consultants	M/F	X	44	19-60 (41)
168	5122	Cooks	M		66	18-63 (31)
169	5122	Cooks	F		108	17-66 (41)
170	5123	Head waiters, waiters, waitresses and bartenders	M		40	18-60 (33)

171	5123	Head waiters, waiters, waitresses and bartenders	F	100	17-63 (23)
172	5131	Child-care workers	M	67	18-65 (29)
173	5131	Child-care workers	F	492	18-68 (40)
174	5132	Nursing assistants and care assistants	M	50	19-65 (46)
175	5132	Nursing assistants and care assistants	F	613	17-69 (46)
176	5133	Home helpers	M/F	60	18-66 (48)
177	5134	Dentists secretaries	F	51	24-65 (47)
178	5135	Doctors secretaries	M/F	106	21-69 (45)
179	5136	Trainees, nursemaids, etc.	M/F	36	18-65 (37)
180	5139	Personal care and related workers not elsewhere classified	M	82	19-64 (34)
181	5139	Personal care and related workers not elsewhere classified	F	257	17-69 (40)
182	5141	Hairdressers, barbers, beauticians and related workers	M/F	132	18-65 (37)
183	5142	Undertakers and crematorium workers			
	5143	Reducing treatment hosts/ tesses and related workers			

	5149	Other personal services workers not elsewhere classified				
	9120	Odd jobs for private persons and households	M/F	X	19	18-63 (32)
184	5161	Fire-fighters	M/F		24	21-55 (43)
185	5162	Prison guards	M/F		49	23-64 (43)
186	5163	Caretakers	M		145	19-66 (51)
187	5163	Caretakers	F		19	18-66 (49)
188	5164	Security guards	M/F		61	19-63 (34)
189	9152	Doorkeepers, watchpersons and related workers				
	5169	Protective services workers not elsewhere classified	M/F	X	39	18-66 (25)
190	5221	Shop salespersons and other salespersons (retail)	M		343	17-68 (25)
191	5221	Shop salespersons and other salespersons (retail)	F		732	17-68 (30)
192	5223	Door-to door salesmen and related workers				
	5225	Interviewers	M	X	32	17-56 (28)
193	=	=	F	X	40	18-68 (29)
194	5224	Salespersons (wholesale)	M/F		90	19-64 (41)

195	6111	Field crop and vegetable growers	M/F		25	18-68 (53)
196	6112 5222	Market gardeners Flower decorators	M/F	X	34	19-66 (47)
197	6121	Dairy and livestock producers	M		136	17-66 (48)
198	6121	Dairy and livestock producers	F		38	18-62 (44)
199	6122 6129	Poultry producers Animal producers and related workers not elsewhere classified				
	6130	Crop and animal producers	M/F	X	115	19-69 (48)
200	6210	Forestry workers, etc.	M/F		25	19-66 (50)
201	1311	General managers in agriculture, forestry and fishing				
	6310	Fish farmers, etc.	M/F	X	23	18-64 (43)
202	6411	Fishery workers	M		49	18-66 (44)
203	7121	Bricklayers and stonemasons	M/F		31	20-65 (43)
204	7122	Concrete workers and site labourers				
	7123	Iron fixers	M	X	22	20-63 (43)
205	7124	Shutterers	M		35	17-62 (40)

206	7125	Carpenters and joiners	M/F		318	17-69 (38)
207	7126	Road workers and construction workers	M/F		50	20-63 (39)
208	7127	Tunnel, mountain and blasting workers				
	7110	Stone cutters and related workers				
	8111	Mining-plant operators				
	7132	Insulation workers				
	7133	Glaziers				
	7211	Founders				
	7221					17-66 (39)
	7222	Blacksmiths Gunsmiths, locksmiths and related trades workers	M	X	37	
209	7128	Scaffolding builders	M/F		20	20-59 (41)
210	7129	Landscape gardeners	M/F		28	17-55 (39)
211	7134	Plumbers	M		91	18-64 (38)
212	7141	Painters and related workers	M/F		57	18-66 (35)
213	7212	Welders	M		42	18-62 (42)
214	7213	Tinsmiths, etc.				
	7131	Roofers				
	7144	Chimney sweepers	M/F	X	52	18-64 (39)
215	7214	Sheet-metal workers	M/F		50	19-64 (40)

216	7217	Panelbeaters	M		25	25-63 (44)
217	7142	Building structure cleaners and varnishers				
	9142	Car and related cleaners	M/F	X	30	19-65 (33)
218	7231	Motor vehicle mechanics and fitters	M/F		122	17-63 (36)
219	7232	Aircraft engine mechanics and fitters	M		29	18-61 (28)
220	7233	Agricultural- or industrial- machinery mechanics and fitters	M		42	19-59 (38)
221	7234	Motor mechanics and fitters	M		25	20-66 (40)
222	7235	Automatic controls mechanics and fitters				
	7236	Precision mechanics and fitters	M/F	X	27	18-66 (47)
223	7237	Industrial mechanics and fitters	M/F		89	18-63 (40)
224	7241	Electricians, electrical and elec- tronic equipment mechanics and fitters.	M/F		293	17-65 (41)
225	7242	Telegraph and telephone installers and servicers	M/F		51	19-61 (40)
226	7243	Electronics mechanics and servicers	M/F		20	18-62 (28)
227	7244	Electrical line installers, repairers and cable jointers	M		34	18-57 (44)
228	7311	Precision-instrument makers and repairers				

	7312	Musical-instrument makers and tuners				
	7313	Jewellery and precious-metal workers				
	7321	Potters and ceramists	M/F	X	25	23-64 (49)
229	7341	Graphic artists	M/F		25	26-64(45)
230	7342	Photographers	M/F		20	21-64 (41)
231	7350	Technical illustrators	M/F		19	21-62 (44)
232	7411	Butchers, fishmongers and related food preparers	M/F		22	18-65 (43)
233	7412	Bakers and confectionery makers	M/F		25	18-51 (34)
234	8271	Fish-processing-machine operators				
	8264	Fishing tackles-machine operators	M/F	X	27	21-63 (48)
235	8275	Baked-goods, cereal and chocolate-products machine operators				21-64 (46)
	8274	Grain- and spice-milling-machine operators	M/F	X	19	
236	7421	Cabinet-makers				
	7422	Boat builders	M/F	X	93	18-66 (43)
237	7431	Weavers, knitters and related workers				
	7432	Tailors, dressmakers and hatters				

	7436	Upholsterers and related workers	M/F	X	19	33-66 (49)
238	8113	Oil- and gas-processing-plant operators				
	8114	Well service operators	M/F	X	46	19-61 (37)
239	8121	Ore and metal furnace operators	M/F		31	20-63 (42)
240	8159	Chemical-processing-plant operators not elsewhere classified				
	8151	Petroleum- and natural-gas-refining-plant operators	M/F	X	50	18-60 (35)
241	8122	Metal moulders				
	8131	Ceramics moulders and decorators				
	8212	Machine-tool operators				
	8281	Mechanical-machinery assemblers	M/F	X	21	19-66 (44)
242	8139	Glass, ceramics and related plant operators not elsewhere classified				
	8132	Glass production plant operators				
	8214	Cement and other mineral products machine operators	M/F	X	19	19-61 (40)
243	8141	Wood-processing-plant operators	M/F		30	21-61 (40)
244	8142	Paper-pulp and papermaking-plant operators	M/F		35	20-60 (39)
245	8161	Power-production plant operators				

	8162	Combustion-, refrigeration- and watercleaning plant operators	M/F	X	27	23-62 (48)
246	8211	Metal-products machine operators	M/F		27	20-60 (48)
247	8213	Machinists	M/F		36	25-62 (47)
248	8224	Plastic-products machine operators	M/F		20	19-59 (36)
249	8225	paint and varnishes-products machine operators				
	8266	Bleaching-, dyeing- and cleaning- machine operators				
	8229	Chemical-products machine operators not elsewhere classified	M/F	X	26	24-64 (47)
250	8221	Pharmaceutical- and toiletry- products machine operators				
	8222	Ammunition- and explosive- products machine operators				
	8223	Rubber-products machine operators				
	8253	Paper-products machine operators	M/F	X	20	20-61 (44)
251	8251	Graphic printing-machine operators				
	8254	Photo laboratory assistants	M/F	X	28	18-57 (39)
252	8262	Weaving- and knitting- machine operators				
	8263	Sewing-machine operators				

	8269	Textile-, fur- and leather-products machine operators not elsewhere classified	M/F	X	22	26-63 (50)
253	8272	Meat-processing-machine operators				
	8276	Fruit-, vegetable- and nut processing-machine operators				
	8277	Brewers-, and other beverage machine operators				
	8279	Food- and related products machine operators not elsewhere classified	M/F	X	23	18-63 (40)
254	8273	Dairy-products machine operators	M/F		23	19-63 (43)
255	8282	Electronic-equipment assemblers	M/F		30	19-64 (39)
256	8321	Car, taxi and van drivers	M/F		120	18-66 (43)
257	8323	Heavy truck and lorry drivers	M/F		165	18-68 (43)
258	8311	Locomotive-engine drivers and locomotive-inspectors				
	8312	Railway brakemen, signallers and shunters				
	8322	Bus- and tram drivers	M/F	X	101	23-66 (49)
259	8331	Earth-moving and related plant operators	M/F		117	17-68 (41)
260	8332	Crane, hoist and related plant operators	M		21	19-62 (38)
261	8333	Lifting-truck operators	M/F		28	20-57 (41)

262	8341 8342	Ships deck crews Ships machine crews	M/F	X	54	17-61 (46)
263	9132 9131	Helpers and cleaners in offices and other establishments Domestic helpers and cleaners				19-64 (36)
	9141	Window cleaners	M	X	49	
264	=	=	F	X	287	17-66 (45)
265	9133	Kitchen helps and related workers	M		20	18-66 (26)
266	9133	Kitchen helps and related workers	F		76	17-66 (46)
267	9160	Garbage collectors and related labourers	M/F		31	26-65 (39)
268	9210 9310 9320	Agricultural, fishery and related labourers Labourers in construction and maintenance, etc. Labourers in manufacturing	M/F	X	57	17-69 (38)

* Indicates if the JEM group are gender-specific or not M=only males, F= only females M/F= combining male and female workers.

** Indicates if the JEM group is merged using two or more occupational titles X=merged groups.

Table S3. Evaluation of the JEM using different cut-off levels for work exposures.

Mechanical work exposures		WOMEN					MEN				
	Cut-off level** %	Kappa	Sensit	Specif	AUC	Exposed	Kappa	Sensit	Specif	AUC	Exposed
Heavy physical work	20*	0.23 (0.20 - 0.25)	45.9	83.8	0.649	19.7	0.34 (0.33 - 0.36)	76.9	71.2	0.74	37.8
	30	0.20 (0.17 - 0.23)	20.9	95.1	0.58	6.8	0.37 (0.35 - 0.40)	59.3	83.0	0.71	25.0
	40	0.10 (0.07 - 0.12)	7.0	99.1	0.53	1.6	0.34 (0.32 - 0.37)	39.4	91.8	0.66	14.1
	50	0.07 (0.06 - 0.10)	5.2	99.5	0.52	1.1	0.28 (0.25 - 0.30)	26.5	95.4	0.61	8.7
Work with neck flexion	20	0.16 (0.14 - 0.18)	73.9	49.0	0.615	57.1	0.20 (0.18 - 0.22)	63.5	63.5	0.64	42.8
	30*	0.22 (0.20 - 0.25)	41.6	80.6	0.61	25.2	0.23 (0.21 - 0.26)	40.9	82.8	0.62	22.7
	40	0.15 (0.12 - 0.17)	16.6	94.9	0.56	8.2	0.14 (0.12 - 0.17)	15.4	95.4	0.55	6.9
	50	0.09 (0.07 - 0.11)	8.3	98.3	0.53	3.3	0.09 (0.07 - 0.11)	8.3	98.1	0.53	3.2
Hands above shoulder height	20*	0.25 (0.23 - 0.28)	49.6	83.6	0.67	20.3	0.42 (0.40 - 0.44)	73.6	80.3	0.77	28.9
	30	0.17 (0.14 - 0.20)	13.7	97.9	0.56	3.4	0.45 (0.43 - 0.47)	62.6	87.0	0.75	21.5
	40	0.14 (0.11 - 0.16)	10.4	98.6	0.55	2.5	0.45 (0.43 - 0.47)	48.8	93.1	0.71	14.0
	50	0.12 (0.10 - 0.15)	8.9	98.9	0.54	2.0	0.44 (0.41 - 0.46)	44.3	94.4	0.69	12.2

Squatting/kneeling	20	0.29 (0.28 - 0.31)	77.8	69.2	0.74	38.1	0.47 (0.45 - 0.49)	76.6	81.4	0.79	29.1
	30*	0.34 (0.31 - 0.36)	51.9	85.8	0.69	20.1	0.51 (0.49 - 0.53)	66.0	88.5	0.77	21.4
	40	0.30 (0.27 - 0.33)	29.9	94.9	0.6	8.9	0.51 (0.49 - 0.53)	58.8	91.7	0.75	17.5
	50	0.16 (0.14 - 0.19)	12.7	98.4	0.56	3.4	0.48 (0.46 - 0.51)	49.2	94.3	0.72	13.6
Forward bending	20	0.29 (0.26 - 0.31)	57.6	80.1	0.69	25.8	0.30 (0.28 - 0.33)	56.1	83.7	0.70	21.7
	30*	0.25 (0.22 - 0.28)	32.4	91.3	0.62	12.3	0.30 (0.27 - 0.34)	37.4	92.2	0.65	11.7
	40	0.13 (0.10 - 0.15)	11.3	97.4	0.54	4.0	0.25 (0.21 - 0.28)	23.3	96.1	0.60	6.5
	50	0.02 (0.01 - 0.03)	1.0	99.9	0.51	0.2	0.08 (0.05 - 0.10)	5.2	99.5	0.52	1.1
Awkward lifting	20	0.28 (0.26 - 0.30)	82.2	65.9	0.74	41.5	0.30 (0.28 - 0.32)	70.6	75.7	0.73	30.5
	30*	0.29 (0.27 - 0.32)	46.2	86.0	0.66	18.9	0.28 (0.26 - 0.31)	36.9	91.0	0.64	12.8
	40	0.01 (0.00 - 0.02)	1.0	99.8	0.50	0.3	0.16 (0.14 - 0.19)	13.7	97.7	0.56	3.9
	50	0.00 (-0.00 - 0.00)	0.1	99.9	0.50	0.0	0.07 (0.05 - 0.09)	4.7	99.6	0.52	1.0
Heavy lifting >20kg	20*	0.27 (0.24 - 0.29)	57.8	86.1	0.72	17.2	0.35 (0.32 - 0.37)	66.0	79.1	0.73	28.2
	30	0.06 (0.03 - 0.08)	4.8	98.7	0.52	1.5	0.36 (0.33 - 0.38)	48.3	88.7	0.69	17.3
	40	0.02 (0.00 - 0.03)	1.5	99.5	0.51	0.6	0.32 (0.29 - 0.34)	34.2	93.4	0.64	11.1
	50	0.01 (-0.00 - 0.02)	0.8	99.2	0.50	0.2	0.23 (0.20 - 0.25)	19.6	97.1	0.58	5.6

Standing/Walking	20	0.58 (0.56 - 0.59)	96.6	59.4	0.78	70.9	0.44 (0.43 - 0.46)	94.6	52.0	0.73	68.7
	30	0.65 (0.64 - 0.67)	93.6	70.5	0.82	64.2	0.56 (0.54 - 0.57)	86.4	70.7	0.79	54.6
	40	0.68 (0.66 - 0.69)	91.3	75.6	0.83	60.6	0.59 (0.58 - 0.61)	81.3	78.4	0.80	48.1
	50*	0.68 (0.67 - 0.70)	89.7	78.1	0.84	58.6	0.59 (0.58 - 0.61)	78.1	81.3	0.80	45.0

Psychosocial work exposures		WOMEN					MEN				
	Cut-off level*	Kappa	Sensitivity	Specific	AUC	Exposed	Kappa	Sensitivity	Specific	AUC	Exposed
High psychological demands	Median*	0.38 (0.36 - 0.40)	69.1	68.9	0.69	52.1	0.28 (0.26 - 0.30)	52.4	75.7	0.64	37.5
	Upper tertile	0.34 (0.32 - 0.36)	68.6	68.2	0.68	44.2	0.26 (0.24 - 0.29)	42.4	83.1	0.63	22.9
Low decision latitude	Median*	0.24 (0.22 - 0.25)	78.5	44.4	0.61	67.6	0.26 (0.25 - 0.28)	48.9	76.8	0.63	33.6
	Upper tertile	0.25 (0.23 - 0.27)	63.2	62.2	0.63	51.6	0.27 (0.24 - 0.29)	36.7	87.3	0.62	19.5
High job strain	Median*	0.28 (0.26 - 0.31)	52.8	75.9	0.64	33.1	0.19 (0.16 - 0.21)	52.8	75.9	0.58	10.5
	Upper tertile	0.22 (0.20 - 0.25)	59.3	51.0	0.43	22.6	0.12 (0.09 - 0.16)	10.5	98.0	0.50	2.6
Low supportive leadership	Median*	0.11 (0.09 - 0.13)	57.2	54.2	0.56	50.4	0.11 (0.09 - 0.13)	54.8	56.6	0.55	48.1

	Upper tertil	0.11 (0.09 - 43.9 68.0 0.56 35.5 0.13)	0.11 (0.09 - 38.3 72.7 0.55 30.7 0.13)
High monotonous work	Media n*	0.37 (0.35 - 64.5 72.9 0.68 42.4 0.39)	0.32 (0.30 - 55.7 75.4 0.65 37.0 0.33)
	Upper tertil	0.33 (0.31 - 68.2 70.3 0.69 38.5 0.35)	0.33 (0.31 - 53.1 81.2 0.67 38.5 0.35)

* Cut-off level indicates the one used in the constructed JEM.

** We chose the individual cut-off levels based on the exposure distribution and the performance indicators (kappa, sensitivity and specificity), favoring specificity as recommended by Tieleman et al. (35). The mean scores of the mechanical exposure in each occupational group were dichotomized and cut-off levels of 20, 30, 40 and 50% were tested. The mean scores of the psychosocial exposures in each occupational group were dichotomized and median and upper tertile cut-off level were tested.