Appendix e-2 Data-extraction of the 24 included studies on clinically diagnosed LRS and work-related risk factors

Author, Country, Design	Case definition LRS	Scources of participants	Number of participants	Exposure definition	Exposure assessment	Occupation	Reference definition	Incidence / Prevalence	Risk estimate 95%CI	Adjustment
Ahsan 2013 Bangladesh Case-control	Diagnostic criteria applied by physicians working in the Spine Unit of an Department of Orthopaedic Surger. The criteria were: • Dominant leg pain than back pain • Restricted Straight Leg Raising, • Neurological deficit, • Positive MRI findings	Male and female patient older than 20 years fulfilling the case definition and no previous history of spinal injury or pathology.	200 participants (124 males and 76 females), mean age 39 years of the 210 wanting to participate of the 240 eligible	Job content, mainly: • Sitting or standing • Bending and postural twisting work load • Lifting or carrying heavy objects • Causal exposure to vibration Physical effort • Sedentary or minimal • Moderate • Hard	Self-reports	Diverse like farmer, fisherman, loader, construction worker, and machine operator	200 patients matched on age, sex and area of residence out of the non-spine related patients visiting the same orthopaedic department	Job content, mainly: • Sitting or standing, 46 cases, 68 controls • Bending and postural twisting work load, 98 cases, 60 controls • Lifting or carrying heavy objects, 36 cases, 56 controls • Causal exposure to vibration, 20 cases, 16 controls Physical effort • Sedentary or minimal, 42 cases, 46 controls • Moderate, 112 cases, 114 controls	Job content: • Lifting or carrying heavy objects (yes/no), OR=3.5, 95%CI 1.9-6.6 Physical effort • Moderate & Hard versus Sedentary, OR=3.1, 95%CI 1.7-5.7	No adjustments

								• Hard, 46 cases, 40 controls		
Chung 2013, Taiwan, Prospective cohort 2004-2010	Herniated intervertebral disc (HID) (ICD-9-CM 722.10) based on the clinic or hospital code	Randomly selection from the approximately 90,022 registered nurses in the Taiwan National Health Insurance (NHI) program database. The nurses included in this study comprised 3861 women and 53 men. The reference population was selected from 270,802 individuals whose occupation was not nursing and included both working and non-working subjects.	N= 3914 nurses • 99% ♀, age 34±8 years • 1% ♂ age 31±5 years N=11.744 non nurses • 99% ♀, age 34±8 jaar • 1% ♂ age 31±5 jaar	Job title according the Taiwan National Health Insurance Research Database	Job classification in the Taiwan National Health Insurance Research Database	Nurses	Individuals whose occupation was not nursing and included both working and non-working subjects.	Annual incidence for the number of new cases of herniated intervertebral disc divided by the size of the population at risk in each year. Nurses: • 1,45 Reference group: • 0,64	OR 2.5 (95% CI 1.8-3.4)	None
Heliovaara 1987, Finland Case control	The categories of hospital discharge diagnoses were used: herniated lumbar intervertebral disc (codes 725.10 or 725.19) and (2) sciatica (code 353.99).	All participants who, after the voluntary medical baseline examination between 1966-1972 (participation rate 87%) had been discharged from hospital between 1970 and 1980, with diagnosis codes of herniated lumbar intervertebral disc	592 male and female cases were compared with 2140 controls, matched individually for sex, age and place of residence.	Specially trained research assistants coded the job titles at the three-digit level using the Nordic Standard Classification of Occupation, which is an adaptation of the ILO	Questionnaire	Not specified	Professional and other white-collar workers	Men 20-59 year (case/control) Professional and other white-collar workers • 15/171 Intermediate non-manual workers • 30/145	RR ** p<0,01 ***p<0,001 Professional and other white-collar workers • 1.0 Intermediate non-manual workers • 2,8**	None

		(codes 725.10 or 725.19 of the International Classification of Diseases, 8th revision) or sciatica (353.99) were identified. For each incidence case, four control subjects matched individually for sex, age and place of residence were selected. The subjects who had reported severe back pains or symptoms suggesting sciatica at the baseline examination were excluded, as were those whose initial age was less than 20 or more than 59 years.		classification				Forestry workers • 12/51 Farmers and other agricultural workers • 43/213 Motor vehicle Drivers • 33/107 Metal or machine Workers • 62/222 Construction Workers • 41/171 Chemical processors and paper workers • 47/198 Other industrial Workers • 59/287 Service workers and other groups	Forestry workers • 3,4** Farmers and other agricultural workers • 2,6** Motor vehicle Drivers • 4,8*** Metal or machine Workers • 4,4*** Construction Workers • 3,3*** Chemical processors and paper workers • 3,3*** Other industrial Workers • 2,7** Service	

								• 22/97 Females, 20-59 year (case/control) White-collar Workers • 29/173 Nurses and related medical workers • 13/59 Sales workers • 25/100 Agricultural Workers • 38/153 Metal, paper, construction and related workers • 22/103 Other	workers and other groups • 3,0** RR ** p<0,01 ***p<0,001 White-collar Workers • 1,0 Nurses and related medical workers • 1,5 Sales workers • 1,6 Agricultural workers • 1,7 Metal, paper, construction and related workers • 1,3 Other industrial Workers • 2,1 Cleaners and Caretakers	

								industrial Workers • 22/76 Cleaners and Caretakers • 19/91 Other service workers and other groups • 29/136 Housewives • 31/179	• 1,2 Other service workers and other groups • 1,3 Housewives • 1,0	
Heliovaara 1991 Finland Case control	Clinical examination by a specifically trained physician. Sciatica was a history of pain radiating down to the leg with a segmental distribution and findings of lumbar nerve root compression or lumbar herniation was confirmed by surgery or myelography.	6102 adults in the age of 30-64 (2946 men and 3156 women) older than 30 years voluntarily participating in a nation wide health examination by the mobile clinic of the social Insurance institution	N=289 cases: • 133 ♀ • 156 ♂	The total number of exposures (the sum index of occupational physical stress) in the last or present job, or in the previous job of longest duration for the following five factors; 1. lifting or carrying heavy objects 2. stooped, twisted, or otherwise awkward body postures 3. vibration of the whole body or use of vibrating	Questionnaire	Not specified	No exposure to one or more of the five factors (=0 points for the sum index of occupational physical stress) No work-related driving of motor-vehicles	Sum index of occupational stress (case/control): • 0: 61/2054 • 1: 56/1114 • 2: 90/1389 • 3: 52/729 • 4: 24/316 • 5: 6/71 Work-related driving motor vehicles: • No: 209/3829 • Commuting: 64/1534 • Professional: 16/310	Sum index of occupational stress (case/control): OR • 0: 1.0 • 1: 1,7 (1,2-2,5) • 2: 2,0 (1,4-2,8) • 3: 2,2 (1,5-3,3) • 4: 2,5 (1,5-4,1) • 5: 2,4 (1,0-5,7) Work-related driving motor	Sex, Age

				equipment 4. a continuously repeated series of movements 5. paced work (working speed determined by a machine) Work-related driving in two categories: 1.professional driver like taxi, bus, truck or tractor driver in the last or present job or in the previous job of longest duration. 2.commuting driver for work in a private car					vehicles: • No: 1,0 • Commuting: 0,8 (0,6-1,1) • Professional:0,9 (0,5-1,6)	
Hrubec, 1975 USA Case control	First hospital diagnosis of lumbar HNP during 1944-1945	Sample of cases was compiled from the records of first admissions to Army hospitals for herniated lumbar disc disease in 1944 and 1945. A systematic sample of 1408 of these cases was selected by using service numbers wit a tens	1095 pairs of cases (height 174 cm ± .2, weight 73 kg ± .3) and controls height 172cm ± .2, weight 69 kg ± .3).	Service records provided information on rank and military occupation speciality assignments.	Not applicable	Military personnel	First hospital diagnosis of lumbar HNP during 1944-1945	Craftsmen, foremen or kindred occupation (n=993 pairs with full information): Cases 19.2% Controls 13.3% Clerical or kindred	Craftsmen, foremen or kindred occupation: RR=1.55 (p≤0.001) Clerical or kindred occupation RR=0.64 (0.01≥p>0.001)	

		digit of 2, 8 or 9 and a national Service Life Insurance (NSLI). A comparison group sample was selected from a file of premium record of the NSLI, matched on age and military service period and without a diagnosis of HNP prior to 1945.						occupation (n=993 pairs with full information): Cases 7.0% Controls 10.6% Military occupation specialty: ground combat (n=896 pairs with full information): Cases 24.8% Controls 18.6% Combat credit: 2+battle starts (n=1073 pairs with full information): Cases 29.2% Controls 35.9% Rank: staff sergeant, sergeant (n=1088 pairs with full information) Cases 25.9% Controls 20.7% Rank: officer	Military occupation specialty: ground combat RR=1.49 (0.01≥p>0.001) Combat credit: 2+battle starts: RR=0.71 (p≤0.001) Rank: staff sergeant, sergeant RR=1.35 (0.01≥p>0.001) Rank: officer RR=0.71 (0.05≥p>0.01)	

								(n=1088 pairs with full information) Cases 25.9% Controls 20.7%		
Jorgensen 1994 Denmark Cohort	The Danish National registry of Hospitalized patients, WHO codes 82073 and 82173	Register from the assistant nurses' pension fund and the Danish National registry of Hospitalized patients, from January 1st to December 31st 1988	1091 operated herniated lumbar discs among assistant nurses and the working female population	Job title Assistant Nurses	Job title	Nurses	General population, females mated in 5 years age categories	Total number of herniated disc operations among females 1091	Assistant nurses versus females in the general population: OR=1.6 (95% CI 1.2-2.2)	
Kaila-Kangas, 2009 Finland Retrospective cohort	In the presence of chronic (>3 months) low back complaints, sciatica was clinically diagnosed by the field physicians if the patient had a history of low back pain (LBP) radiating down to the leg, and either findings of lumbar nerve root compression	Participants from the Health 2000 Survey conducted in Finland between September 2000 and June 2001. Its main purpose was to achieve an overall view of the health of the Finnish population. The nationally representative 2-stage stratified cluster sampling consisted of persons aged 30 and over and comprised 8028 persons of whom 6986 (87%) were	1861 working men and 1940 working women	A cumulative sum index for years of exposure to the five workload factor : - Heavy physical work in general - Frequent handling of lighter objects (objects heavier than 5 kg on average for at least 2 hours per work day),	Work-related physical loading was assessed in an interview. The respondents were asked whether they had been exposed to different work-related factors daily in their current job	Not specified	No years in jobs involving one of the work load factors.	Men (80 cases/ 1861 participants) Heavy physical work in general 0: 32/922 1-10: 14/348 11-20: 21/277 >20: 13/314 Frequent handling of lighter objects 0: 46/1179 1-10: 9/288 11-20: 16/191 >20: 9/203 Handling of	Men (OR, 95%CI) Heavy physical work in general 0: 1 1-10: 1.26 0.69–2.28 11-20: 2.37 1.35–4.13 >20: 0.98 0.49–1.95 Frequent handling of lighter objects 0: 1 1-10: 0.87	Age, Body mass index, Smoking

	(positive straight-leg-raising test or a positive clinical sign) or lumbar disc herniation that had previously been onfirmed by radiographic examination or required surgery.	interviewed. Of the working-age (30–64 years) subjects (n= 5871), 88% participated in the interview and 83% attended the health examination. The working-age subjects were stratified into 2 groups: those who had worked during the preceding year (n=3801) at the time of the interview and those who had not (n=1010).		- Handling of heavy objects (20 kg on average at least 10 times per work day), - Kneeling (at least 1 hour per work day) - Bending (at least 1 hour per work day) and classified for the working subjects into 4 categories: none, 1 to 10, 11 to 20, and >20 years.	(yes/no) and in their 5 longest lasting past jobs. They were also asked about the duration (in years) of their jobs. of exposure. Few persons had had more than 5 jobs, and the cumulative index covered the whole occupationa l history for more than 99% of the subjects.			heavy objects 0: 39/1074 1-10: 15/331 11-20: 13/214 >20: 13/242 Kneeling 0: 36/996 1-10: 16/332 11-20: 16/255 >20: 12/288 Bending 0: 37/997 1-10: 13/316 11-20: 13/236 >20: 17/312 Women (69 cases/ 1940 participants) Heavy physical work in general 0: 41/1267 1-10: 11/288 11-20: 5/182 >20: 12/203 Frequent handling of lighter objects 0: 52/1561 1-10: 3/167 11-20: 6/112 >20: 8/100 Handling of	0.43–1.76 11-20: 2.24 1.23–4.09 >20: 1.00 0.47–2.09 Handling of heavy objects 0: 1 1-10: 1.30 0.70–2.42 11-20: 1.78 0.90–3.50 >20: 1.22 0.64–2.32 Kneeling 0: 1 1-10: 1.45 0.83–2.56 11-20: 1.82 0.95–3.51 >20: 0.91 0.44–1.88 Bending 0: 1 1-10: 1.18 0.66–2.11 11-20: 1.50 0.82–2.75 >20: 1.19 0.64–2.21 Women (OR, 95%CI)	

								heavy objects 0: 61/1536 1-10: 2/190 11-20: 3/91 >20: 3/96 Kneeling 0: 44/1309 1-10: 9/281 11-20: 8/174 >20: 8/176 Bending 0: 39/1234 1-10: 9/257 11-20: 6/208 >20: 15/241	Heavy physical work in general 0: 1 1-10: 1.19 0.57–2.52 11-20: 0.74 0.29–1.87 >20: 1.25 0.64–2.43 Frequent handling of lighter objects 0: 1 1-10: 0.55 0.17–1.70 11-20: 1.33 0.56–3.17 >20: 1.71 0.79–3.72 Handling of heavy objects 0:1 1-10: 0.25 0.06–1.05 11-20:0.72 0.22–2.41 >20: 0.53 0.16–1.82 Kneeling 0:1 1-10: 0.96	

									0.46–2.02 11-20: 1.23 0.57–2.64 >20: 0.92 0.42–2.02 Bending 0: 1 1-10: 1.24 0.59–2.60 11-20: 0.91 0.39–2.15 >20: 1.41 0.75–2.67	
Kaila-Kangas, 2011 Finland Retrospective cohort	In the presence of chronic (>3 months) low back complaints, sciatica was clinically diagnosed by the field physicians if the patient had a history of low back pain (LBP) radiating down to the leg, and either findings of lumbar nerve root compression (positive straight-leg-raising test or a positive	Participants from the Health 2000 Survey conducted in Finland between September 2000 and June 2001. Its main purpose was to achieve an overall view of the health of the Finnish population. The nationally representative 2-stage stratified cluster sampling consisted of persons aged 30 and over and comprised 8028 persons of whom 6986 (87%) were interviewed. Of the working-age (30–64 years) subjects (n=	2323 working men	The “physical strenuousness of work” (yes/no) was a combination of two questions based on cumulative exposure: “Did your work include kneeling or squatting for an average of at least 1 hour per working day” and “Did your work involve handling heavy objects such as lifting, manually carrying, or pushing objects heavier than 20 kg on	The “physical strenuousness of work“ was assessed in an interview. The history of professional car driving was assessed by using a questionnaire	Professional drivers and other not specified jobs	No physical strenuousness of work or no history of professional driving	Number of cases / Participants No exposure to professional car driving or strenuous physical work: 25/876 Exposed to driving, no strenuous physical work: 1/104 No exposure to driving, exposed to strenuous physical work:	OR (95%CI) No exposure to professional car driving or strenuous physical work: 1 Exposed to driving, no strenuous physical work: 0.30 0.04–2.30 No exposure to driving, exposed to strenuous	Age, BMI, Smoking, Working status, Distress symptoms

	clinical sign) or lumbar disc herniation that had previously been confirmed by radiographic examination or required surgery.	5871), 88% participated in the interview and 83% attended the health examination. The working-age subjects were stratified into 2 groups: those who had worked during the preceding year (n=3801) at the time of the interview and those who had not (n=1010).		average at least 10 times per work day?" If the participant answered "yes" to either of these questions and the cumulative exposure had lasted for over a year, he was classified as being exposed to strenuous physical work. The history of professional car driving was assessed by using a questionnaire. The participants were asked whether they had ever worked as professional car drivers, and if so, which of the following vehicles they had driven professionally: car,				67/1060 Exposed to both driving and strenuous physical work: 28/283	physical work: 1.83 1.13–2.98 Exposed to both driving and strenuous physical work: 3.13 1.79–5.46	

				van, truck, trailer truck, or other special vehicle such as police car or ambulance.						
Kelsey, 1975a USA Case control	The surgeon stated on the hospital chart a herniated disc during surgery, or the patient reported sciatic pain and a positive straight leg raising test and/or symptoms of increased pain in the low back or along the sciatic nerve when stretching or extending his leg from a sitting position. The cases are classified as surgical cases, probable cases and possible cases.	Persons in the age group 20-64 years in the New haven Standard Metropolitan Statistical Area who had lumbar x-rays taken at all three hospitals in the area and at the office of two of the private radiologists in New Haven during the period June 1971 to May 1973.	128 male pairs of matched cases and controls on age.	Questions regarding the type of job a person held for at least a year when there symptoms arose and the time they sat on their job (none, little, half, half or more) and whether they drove a car including make, model and year.	Interview by carefully trained non-medical interviewers using a questionnaire	Truck drivers	No possible, probable or surgical case of lumbar disc herniation with radiating symptoms	Truck driving/No truck driving Cases 15/113 Controls 4/124	Males Truck driving RR=4.67, p<.02	None
Kelsey, 1975b	The surgeon stated on the	Persons in the age group 20-64 years	217 pairs (128 males and 89	Questions regarding the	Interview by carefully	Not specifie	No possible, probable or	Half or more of the time sitting	Half or more of the time	None

USA Case control	hospital chart a herniated disc during surgery, or the patient reported sciatic pain and a positive straight leg raising test and/or symptoms of increased pain in the low back or along the sciatic nerve when stretching or extending his leg from a sitting position. The cases are classified as surgical cases, probable cases and possible cases.	in the New haven Standard Metropolitan Statistical Area who had lumbar x-rays taken at all three hospitals in the area and at the office of two of the private radiologists in New Haven during the period June 1971 to May 1973.	females) of matched cases and controls on age.	type of job a person held for at least a year when there symptoms arose and the time they sat on their job (none, little, half, half or more) and whether they did any lifting in their job	trained non-medical interviewers using a questionnaire	d	surgical case of lumbar disc herniation with radiating symptoms.	vs less than half the time sitting Both sexes < 35 years Cases 23/49 Controls 26/46 ≥ 35 years Cases 55/38 Controls 34/59 Any lifting or no lifting Both sexes Cases 111/56 Controls 100/67	sitting vs less than half the time sitting Both sexes < 35 years RR=0.81, not significant ≥ 35 years RR=7.84 (p<0.01) Any lifting or no lifting Both sexes RR=1.38	
Kelsey, 1995c, USA Case control	The surgeon stated on the hospital chart a herniated disc during surgery, or the patient reported sciatic pain and a positive straight leg	Persons in the age group 20-64 years in the New haven Standard Metropolitan Statistical Area who had lumbar x-rays taken at all three hospitals in the area and at the office of two of the private	217 pairs (128 males and 89 females) of matched cases and controls on age.	Questions regarding the type of job a person held for at least a year when there symptoms arose and the time they sat on their job (none, little, half, half	Interview by carefully trained non-medical interviewers using a questionnaire	Not specified	No possible, probable or surgical case of lumbar disc herniation with radiating symptoms	Not specified	Sedentary jobs, all ages RR=1.58 (p=0.06) Jobs requiring driving (males only) RR=2.75	None

	raising test and/or symptoms of increased pain in the low back or along the sciatic nerve when stretching or extending his leg from a sitting position. The cases are classified as surgical cases, probable cases and possible cases.	radiologists in New Haven during the period June 1971 to May 1973.		or more), whether they did any lifting in their job and whether they performed any pushing or pulling.					(p=0.02) Truck driving (males only) RR=4.67 (p=0.02) Jobs involving: Any lifting RR=1.25 (p>0.10) Any pushing RR=1.12 (p>0.10) Any pulling RR=1.16 (p>0.10) Any carrying RR=1.13 (p>0.10)	
Kelsey, 1984 USA Case control	The surgeon stated on the hospital chart a herniated disc during surgery, or the patient reported sciatic pain and a positive straight leg raising test	Persons in the age group 20-64 years who had lumbar x-rays or myelograms taken in three hospitals, one neurosurgical private practice and two orthopaedic private practices in the New Haven and Hartford,	325 pairs of matched cases and controls.	Lifting>11.3 kg • Not at all • <5 times/day • 5-25 times/day • >25 times/day Carrying>11.3 kg • Not at all	Questionnaire and diagnostic tests were administered by carefully trained nonmedical interviewers.	Not specified	Persons in the control group were individually matched (sex and age) to cases and consisted of persons admitted to the samen medical services as the	Not specified	Lifting>11.3 kg • Not at all RR=1 • <5 times/day RR=1.2 (0.7-2.0) • 5-25 times/day RR=1.3 (0.7-2.5)	

	and/or symptoms of increased pain in the low back or along the sciatic nerve when stretching or extending his leg from a sitting position. The cases are classified as surgical cases, probable cases and possible cases.	Connecticut during the period June 1979-1981.		• <5 times/day • 5-25 times/day • >25 times/day Twisting at waist • Not at all • <5 times/day • 5-25 times/day • >25 times/day			cases for conditions not related to the spine.		• >25 times/day RR=3.5 (1.5-8.5) Carrying>11 .3 kg • Not at all RR=1 • <5 times/day RR=1.0 (0.6-1.9) • 5-25 times/day RR=2.1 (1.0-4.3) • >25 times/day RR=2.7 (1.2-5.8) Twisting at waist • Not at all RR=1 • <5 times/day RR=1.7 (0.8-3.6) • 5-25 times/day RR=1.2 (0.7-2.1) • >25 times/day RR=1.3 (0.7-2.3)	

Kostova 2001 Bulgaria Cross sectional	The criteria for lumbosacral radicular syndrome were subjective complaints regarding pain in the low back of varying intensity following a radicular distribution in one or both legs (sometimes the pain is relieved when the patient lies down), loss of lordosis or flattening of the lumbar spine, reduced range of movement and tenderness of paraspinal muscles of the same region, numbness and paresthesias in the region of the affected root, positive signs of	Employees of the main departments of a fertilizer plant from 1995 to 1998.	N=898 group > 40 years • n=450 group ≤ 40 years • n=448	Physical work-related overuse is defined as workers exposed to moderately strenuous tasks at the work place (repair staff, loaders, transport equipment machine operators, pump machine operators) and reference as workers not exposed to repetitive motion, overexertion, heavy physical work, etc., in their jobs: operators, compressor operators, laboratory assistants, administrators. The classical occupational factors for the development of back pain syndromes such as	The information was gathered by means of a selective questionnaire and a complete neurologic examination.	• Compressor operators • Operators • Repair staff • Shop managers • Administration • Laboratory assistants • Other workers	No physical work-related overuse	Risk group • N=279, 8.6% Reference group • N=613, 11.9%	OR=0.70 (95% CI 0.42-1.16)	

	Lasseque, Neri, Wassermann, etc., objective symptoms for sensory deficit with radicular distribution, occasional weakness in the leg (sometimes of the dorsi-flexion of the big toe), and/or depressed ankle or Achilles reflexes. The testing was conducted at the health center of the fertilizer plant			constrained working postures and back-straining tasks, heavy physical work and repetitive manual handling, pulling, pushing, etc., are not part of the physical activities required for the risk group.						
Palmer, 2012 United Kingdom Case control	A consecutive series of patients referred for lumbar MRI because of LBP. Radiologists assessed MRI scans using a repeatable standardized protocol. Images were	Working-aged adults resident in the area served by a public hospital.	237 cases and 820 controls were studied, including 183 professional drivers and 176 cases with prolapsed intervertrebal disc and/or nerve root entrapment	Exposure to WBV in their latest job was assessed by six metrics: (i) professional driving (>1 hour/day); (ii) professional driving (>3 hours consecutively); (iii) weekly hours driven for	Participants completed a questionnaire on occupational history, work activities (digging, lifting, trunk bending/twisting), professional	Professional drivers	A consecutive series of controls X-rayed for other reasons than LBP	Professional driving (≥1 hours/day) Controls: • No, n=677, 82.6% • Yes, n=143, 17.4% Cases • No, n=147, 83.5% • Yes, n=29, 16.5%	OR, 95%CI Professional driving (≥1 hours/day) • No, OR=1 • Yes, OR=0.8, 0.5–1.3 Professional driving (≥3	Age, sex, BMI, somatising tendency , SF-36 mental health score, smoking status,

	graded at three spinal levels (L3/L4, L4/L5, L5/S1) for: (i) disc herniation (protrusion, herniation, or disc sequestration); and/or (ii) nerve root entrapment (displacement Cases were those whose latest LBP episode (that since last pain-free for ≥1 month) began in their current/most recent job or compression)			the vehicle most used; (iv) weekly hours driven for all vehicles (none, <16, ≥16); (v) maximum-root mean square (rms) acceleration of any vehicle (0, −0.5, ≥0.6 ms−2 rms) and (vi) A(8) rms (< or ≥0.5 ms−2 rms [the action level in the European Union (EU) Physical Agents (vibration) Directive (14)]. Metrics (v) and (vi) were derived from driving times and imputed vibration magnitudes of vehicles.	driving, and exposure to WBV (vehicle types, duration, intensity).			Professional driving (≥3 hours/time) Controls: • No, n=765, 93.3% • Yes, n=55, 6.7% Cases • No, n=163, 92.6% • Yes, n=13, 7.4% Max rms of any machine (ms^{-2}) Controls • Not a regular driver, n=677, 82.6% • 0.5, n=87, 10.6% • ≥0.6, n=56, 6.8% Cases • Not a regular driver, n=147, 83.5% • 0.5, n=21, 11.9% • ≥0.6, n=8, 4.6% Current rms A(8) (ms^{-2})	hours/time) • No, OR=1 • Yes, OR=0.6, 0.5-1.8 Max rms of any machine (ms^{-2}) • Not a regular driver, OR=1 • 0.5, OR=1.0, 0.6-1.7 • ≥0.6, OR=0.5, 0.2-1.2 Current rms A(8) (ms^{-2}) • <0.5, OR=1 • ≥0.5, OR=1.0, 0.5-2.2	propensity to consult over back pain, fear avoidance beliefs, belief in work as a cause of back pain, occupational digging and/or lifting and occupational bending and/or twisting.

								Controls • <0.5, n=697, 85.0% • ≥0.5, n=123, 15.0% Cases • <0.5, n=149, 84.7% • ≥0.5, n=27, 15.3%		
Riihimäki 1989 Finland Prospective cohort	Two specially trained physiotherapists carried out a standardized interview on the occurrence of the following back symptoms: "sciatic pain," defined as back pain radiating to a leg; "lumbago," defined as sudden back pain causing constrained posture; and other back pain, referred to as "nonspecific back	In 1977 all active concrete reinforcement workers who were 25-54 years of age, had at least five years' experience in their current occupation, and were registered members of the regional trade union of the Uusimaa Province were enlisted in the study. In 1982 a postal follow-up questionnaire was sent to all the men who had participated in the cross sectional study in 1977.	Concrete reinforcement workers, n=171 House painters, n=157	Registered members of the regional trade Union for concrete reinforcement workers	In a self-administered standardized questionnaire the workers were asked to indicate the number of years in their resent occupation.	Concrete reinforcement workers, house painters	The house painters were selected from the active members of the local painters' trade union of Helsinki with the use of frequency-matching according to five-year age strata. The painters also had at least five years' experience in their current occupation.	Five-year prevalence of sciatic pain in the follow-up phase of the study in 1977-1982 Concrete reinforcement workers, 60% House painters, 42%	RR, 95%CI Occupation (concrete reinforcement workers versus house painters) RR=1.4, 1.1-1.8	Age

	pain ."									
Roquelaure, 2011 France Case control	The French hospital database (PMSI) that systematically registers hospital discharges for lumbar disc surgery in case of disc related sciatica in 2002 and 2003.	The study was undertaken in the spine clinics of the University Hospital of Nantes (one of the four spine centers of the region) that performs about 38% of the lumbar disc surgery for the region's inhabitants (36% for men and 43% for women) [data for the years 2002–2003]. We limited the study to patients residing in the catchment area (Loire-Atlantique region) hospitalized between 1st January 2002 and 31st December 2003 (hospital admission dates). The population base for this study was defined as all residents of the Loire-Atlantique region between the ages of 20–59 [307,822 women (49.8%) and 309,861men (50.2%)] according	Patients with known occupation employed at time of lumbar disc surgery (54 women and 62 men, missing occupational category for one man) and the general population of the region in this occupation	Occupation	Questionnaire and French classification of occupations (PCS codes). The analysis was performed on the occupation at the time of lumbar disc surgery.	Farmers, craftsmen, salesmen and managers, upper white-collar and professionals, technicians and intermediate occupations, lower white-collar worker, blue-collar worker, skilled manufacturing worker, drivers, unskilled manufacturing worker	The whole sample of subjects included in the study as reference, whether they were employed at the time of lumbar disc surgery or not.	Incidence, number of cases (n), percentage of the general population of the region in this occupation (%Pe) Women • Farmers, n=0, %Pe=1.1 • Craftsmen salesmen and managers, n=0, %Pe=2.4 • Upper white-collar and professional, n=6, %Pe=5.3 • Technicians and intermediate occupations, n=14, %Pe=11.7 • Nurses, n=7, %Pe=4.5	RR, 95%CI if n>5 Women • Farmers, n<5 • Craftswomen saleswomen and managers, n<5 • Upper white-collar and professional, RR=2.5 [1.0–5.9] • Technicians and intermediate occupations, RR=2.1 [1.1–4.0] • Nurses, RR=2.9 [1.3–6.4] • Lower white-collar workers,	Age

		to French National Institute of Statistics and Economic Studies (INSEE) census of 1999.				s		• Lower white-collar workers, n=30, %Pe=32.5 • Blue-collar workers, n=4, %Pe=6.5 Men • Farmers, n=0, %Pe=2.5 • Craftsmen salesmen and managers, n=6, %Pe=2.6 • Upper white-collar and professional, n=6, %Pe=11.8 • Technicians and intermediate occupations, n=7, %Pe=22.0 • Lower white-	RR=1.8 [1.1–3.1] • Blue-collar workers, n<5 Men • Farmers, n<5 • Craftsmen salesmen and managers, RR=2.2 [0.9–5.2] • Upper white-collar and professional, RR=0.8 [0.4–2.0] • Technicians and intermediate occupations, RR=0.6 [0.3–1.4] • Lower white-collar workers, RR=3.6	

								collar workers, n=8, %Pe=8.3 • Blue-collar workers, n=34, %Pe=30.5 • Skilled manufacturing workers, n=12, %Pe=8.8 • Drivers, n=7, %Pe=3.4 • Unskilled manufacturing workers, n=7, %Pe=5.1	[1.6–8.5] • Blue-collar workers, RR=2.4 [1.4–4.0] • Skilled manufacturing workers, RR=2.5 [1.3–4.7] • Drivers, RR=3.9 [1.8–8.8] • Unskilled manufacturing workers, RR=3.9 [1.6–9.6]	
Saftic, 2006 Kroatia Case control	Surgery of the lower spine due to lumbar intervertebral disc herniation L4/L5 or L5/S1	The study was conducted in 9 villages on Croatian islands of Rab, Vis, Lastovo, and Mljet. The villages were chosen in 2002 to present a range of differing ethnic histories, fluctuations in population size, accessibility of genealogical	67 cases and 268 matched controls	Occupation type was divided into sitting or standing occupations and occupations involving hard physical activity. All occupations were recorded as those before eventual	Standard WHO questionnaire	Diverse such as clerks, lawyers, economists, tailors, waiters, cooks, salespersons, teacher	For each of the cases, 4 controls were chosen from the reminder of the sample of 1001 examinees. These controls were matched to cases by the village of residence/immigrant status, gender,	Occupation 'Sitting or standing' • Cases, n=45 67.2% • Controls, n=214, 79,9% 'Hard physical activity' • Cases, n=22 (32.8%) • Controls,	OR, 95%CI Occupation 'Sitting or standing' • OR=1 'Hard physical activity' • OR=1.94, 0.13-3.75 Intensity of physical	No

		records and population collaboration in research program.		lower spine surgery. Intensity of physical labor at work was defined as sitting, easy, or moderate vs hard.		s, police men, electricians, and house wives, agriculture workers, soldiers, construction workers, mechanics, and fishermen	and age ±3 years).	n=54, 20.1% Intensity of physical labor at work: 'Sitting, easy or moderate' • Cases, n=46, 68.9% • Controls, n=232, 86.6% 'Hard' • Cases, n=21, 31.1% • Controls, n=36, 13.4%	labor at work: 'Sitting, easy or moderate' • OR=1 'Hard' • OR=2.94, 1.07-4.81	
Seidler, 2003 Germany Case control study	Lumbar disc herniation confirmed by computed tomography (CT) or magnetic resonance imaging (MRI)	Participating physicians in three neurosurgical clinics in Frankfurt/Main and surrounding area were asked to identify prospectively all male patients between 25 and 65 years, stationary treated with currently symptomatic herniation of the lumbar discs.	94 cases with acute lumbar disc herniation and 197 control subjects	Occupational groups were classified a priori by an occupational physician (GE) with respect to their exposure to carrying or lifting (low, moderate, high). Cumulated hours spent in	Expert opinion, questionnaires, biomechanical model	Not specified	The control group consisted of 107 population control subjects (response rate 66%) and 90 patients hospitalised for treatment of urolithiasis by lithotripsy (response rate 93%)	Prevalence, controls n %, cases n % Occupational groups (a priori assessment) • Always occ. with low physical workload, controls 95 48.2, cases 42 44.7 • >0–<10 y	OR, 95%CI Occupational groups (a priori assessment) • Always occ. with low physical workload, 1.0 – • >0–<10 y occ. with medium	Age, Region, Nationality, Diseases potentially affecting the lumbar spine

		Furthermore, participating physicians in two orthopaedic practices and in one orthopaedic clinic were asked to identify retrospectively all male patients between 25 and 65 years with herniation of the lumbar discs or osteochondrosis/spondylosis of the lumbar spine associated with chronic complaints (low back pain, sciatica) within the preceding 10 years.		working postures with extreme forward bending were calculated up to the year of diagnosis or ''reference year'' respectively (two years prior to data collection). Cumulative exposure to lifting/carrying and trunk flexion was calculated in two different ways. Firstly, the squares of the weights lifted or carried at work were multiplied by the corresponding durations and summed; separate categories were formed for isolated and combined lifting/carrying and extreme				occ. with medium physical workload, controls 13 6.6, cases 7 7.4 • >0–<10 y occ. with high physical workload, controls 10 5.1, cases 4 4.3 • >10 y occ. with medium physical workload, controls 51 25.9, cases 17 18.1 • >10 y occ. with high physical workload, controls 27 13.7, cases 24 25.5 Cumulated lifting/carrying (kg^2*h) • 0 kg^2*h, controls 64 32.5, cases 28 29.8 • >0–10 000 kg^2*h, controls 42	physical workload, 0.9, 0.3 to 3.0 • >0–<10 y occ. with high physical workload, 1.4, 0.3 to 5.9 • >10 y occ. with medium physical workload, 0.8, 0.4 to 1.7 • >10 y occ. with high physical workload, 2.1, 0.9 to 4.6 Cumulated lifting/carrying (kg^2*h) • 0 kg^2*h, 1.0 – • >0–10 000 kg^2*h, 0.8 0.3 to 1.8 • >10 000–150 000 kg^2*h, 1.3 0.6 to 2.8 • >150 000	

				forward bending. Secondly, the Mainz-Dortmund Dose model (MDD), which is based on overproportional weighting of the lumbar disc compression force in relation to the respective duration of lifting was applied with modifications: for up to three different objects or groups of objects as well as for working postures with extreme forward bending, lumbar spine forces at L5/S1 were calculated. The daily exposures were calculated on the basis of the products of the squared lumbar spine				21.3, cases 15 16.0 • >10 000–150 000 kg^2*h, controls 43 21.8, cases 22 23.4 • >150 000 kg^2*h, controls 43 21.8, cases 28 29.8 Extreme (>90° trunk flexion) forward bending (h) • 0 h, controls 119 60.4, cases 47 50.0, cases • >0–1500 h, controls 45 22.8, cases 26 27.7 • >1500 h, controls 19 9.6, cases 35 26.7 Lifting/carrying combined with extreme forward bending • No lifting/carrying; no extreme	kg^2*h, 1.6 0.7 to 3.4 Extreme (>90° trunk flexion) forward bending (h) • 0 h, 1.0 – • >0–1500 h, 1.4 0.7 to 2.8 • >1500 h, 2.7 1.2 to 6.4 Lifting/carrying combined with extreme forward bending • No lifting/carrying; no extreme forward bending, 1.0 – • Lifting/carrying>0–150 000 kg^2*h and/or extreme forward bending >0–1500	

				forces and the average exposure durations. To calculate cumulated total work time exposure (prior to the diagnosis of lumbar spine disease), the sum doses for the individual work-years were summed up.				forward bending, controls 56 28.4 cases 23 24.5 • Lifting/carrying>0–150 000 kg^2*h and/or extreme forward bending >0–1500 h, controls 79 40.1, cases 33 35.1 • Lifting/carrying >150 000 kg^2*h; extreme forward bending ≤1500 h, controls 33 16.8, cases 18 19.1 • Lifting/carrying ≤150 000 kg^2*h; extreme forward bending >1500 h, controls 9 4.6, cases 9 9.6 • Lifting/carrying >150 000 kg^2*h; extreme	h, 1.0 0.5 to 2.1 • Lifting/carrying >150 000 kg^2*h; extreme forward bending ≤1500 h, 1.5 0.6 to 3.8 • Lifting/carrying ≤150 000 kg^2*h; extreme forward bending >1500 h, 3.2 1.0 to 10.5 • Lifting/carrying >150 000 kg^2*h; extreme forward bending >1500 h, 2.2 0.7 to 7.3 Sum lumbar spine force through lifting/carrying and/or extreme forward bending (Nh)	

								forward bending >1500 h, controls 10 5.1, cases 10 10.6 Sum lumbar spine force through lifting/carrying and/or extreme forward bending (Nh) • 0 Nh, controls 56 28.4, cases 23 24.5 • >0–<2.0*10^6 Nh, controls 39 19.8, cases 19 20.2 • 2.0–<9.0*10^6 Nh, controls 45 22.8, cases 22 23.4 • >9.0*10^6 Nh, controls 47 23.9, cases 29 30.9 Exposure to whole body vibration • 0 h, controls 136 69.0,	• 0 Nh, 1.0 – • >0–<2.0*10^6 Nh, 1.2 0.5 to 2.8 • 2.0–<9.0*10^6 Nh, 1.2 0.5 to 2.7 • >9.0*10^6 Nh, 1.8 0.8 to 3.9 Exposure to whole body vibration • 0 h, 1.0 – • >0–1500 h, 1.8 0.8 to 3.7 • >1500 h, 1.7 0.7 to 4.3 Exposure to whole body vibration • 0 h, 1.0 – • >0–1800h* weighting type of terrain, 2.1 0.9 to 4.8 • >1800h* weighting type of terrain, 1.9 0.7 to 4.9	

								cases 47 50.0 • >0–1500 h, controls 37 18.8, cases 29 30.9 • >1500 h, controls 20 10.2, cases 16 17.0 Exposure to whole body vibration • 0 h, controls 152 77.2, cases 56 59.6 • >0–1800h* weighting type of terrain, controls 22 11.2, cases 20 21.3 • >1800h* weighting type of terrain, controls 19 9.6, cases 16 17.0 Sum lumbar spine exposure (α) to lifting/carrying and/or	Sum lumbar spine exposure (α) to lifting/carrying and/or extreme forward bending and/or whole body vibration • 0, 1.0 – • <0.1, 1.1 0.5 to 2.5 • 0.1–<0.4, 1.3 0.6 to 3.1 • ≥0.4, 1.9 0.9 to 4.3 Cumulative sedentary work (h) • ≤10 000, 1.0 – • >10 000–30 000, 0.8 0.4 to 1.7 • >30 000, 0.9 0.3 to 2.6	

								extreme forward bending and/or whole body vibration • 0, controls 54 27.4, cases 21 22.3 • <0.1, controls 44 22.3, cases 21 22.3 • 0.1–<0.4, controls 43 21.8, cases 21 22.3 • ≥0.4, controls 45 22.8, cases 29 30.9 Cumulative sedentary work (h) • ≤10 000, controls 51 25.9, cases 32 34.0 • >10 000–30 000, controls 67 34.0, cases 34 36.2 • >30 000, controls 64 32.5, cases 28 29.8		

Seidler, 2009 Germany Case control study	Outpatient or inpatient treatment in an included hospital because of lumbar disc herniation with sensitive and/or motor radix syndrome with clinically and radiologically verified lumbar disc herniation	Recruitment was performed prospectively in four study regions in Germany: Frankfurt am Main, Freiburg, Halle/Saale, and Regensburg. In the mentioned regions, all hospitals or practices (n = 29) treating at least five patients with lumbar disc herniation per year as well as a random sample of orthopedic practices (treating patients with lumbar disc narrowing; n = 14) were included. The corresponding physicians were asked to identify all patients between 25 and 70 years.	Cases were 286 males and 278 females, controls were 453 males and 448 females	Cumulative lumbar load during the total working life. All manual handling of objects of about 5 kilograms or more and postures with trunk inclination of 20 degrees or more are included in the calculation of cumulative lumbar load.	Structured personal interview, a complete occupational history was elicited to identify certain minimum workloads. On the basis of job task-specific supplementary surveys performed by technical experts, the situational lumbar load represented by the compressive force at the lumbosacral disc was determined via biomechanical model calculations	Not specified	Control subjects were randomly selected from a one percent random sample of residents aged 25 to 70 years drawn by the local population registration offices of the respective region. Of 1,687 population controls, 901 agreed to participate (53.4%).	Prevalence, Men, controls n % and cases n, % Cumulative lumbar load through manual materials handling and/or intensive-load postures • 0 – <5.0*10^{6}Nh, controls 159 35.1, cases 54 18.9 • 5.0 – <21.51*10^{6}Nh, controls 147 32.5 cases 76 26.6 • >21.51*10^{6}Nh, controls 147 32.5 cases 156 54.5 Cumulative lumbar load through manual	Men, OR, 95%CI Cumulative lumbar load through manual materials handling and/or intensive-load postures • 0 – <5.0*10^{6}Nh, 1.0 - • 5.0 – <21.51*10^{6}Nh, 1.7 1.1–2.7 • >21.51*10^{6}Nh, 3.4 2.2–5.0 Cumulative lumbar load through manual materials handling • 0 – <2.34*10^6 Nh, 1.0 - • 2.34 – <8.98*10^6	Age, region, and unemployment as severe life event; OR for manual materials handling additionally adjusted for intensive-load postures and vice versa

					.			materials handling • 0 – <2.34*10^{6}Nh, controls 163 36.0 cases 58 20.3 • 2.34 – <8.98*10^{6}Nh , controls 145 32.0 cases 77 26.9 • ≥8.98*10^{6}Nh , controls 145 32.0 cases 151 52.8 Cumulative lumbar load through intensive-load postures • 0 Nh, controls 129 28.5 cases 45 15.7 • >0 – <4.85*10^{6}Nh, controls 108 23.8 cases 45 15.7 • >4.85 – 14.62 *10^{6}Nh, controls 108 23.8 cases 84 29.4 • ≥14.62*10^{6}N	Nh, 1.5 1.0–2.2 • ≥8.98*10^6 Nh, 2.8 1.9–4.1 Cumulative lumbar load through intensive-load postures • 0 Nh, controls 1.0 - • >0 – <4.85*10^6 Nh, 1.3 0.8–2.1 • >4.85 – 14.62 *10^{6}Nh, 2.3 1.4–3.6 • ≥14.62*10^6 Nh 2.9 1.9–4.6 Lag-time analysis I: Cumulative lumbar load up to 10 years prior to diagnosis or interview date (in controls) = exposure	

								h controls 108 23.8, cases 112 39.2 Lag-time analysis I: Cumulative lumbar load up to 10 years prior to diagnosis or interview date (in controls) = exposure during last 10 years set to zero • 0 – <5.0*10^6Nh, controls 210 46.4 cases 69 24.1 • 5.0 – <21.51*10^6Nh, controls 133 29.4 cases 102 35.7 • ≥21.51*10^6Nh, controls 110 24.3 cases 115 40.2 Lag-time analysis II: Cumulative lumbar load;	during last 10 years set to zero • 0 – <5.0*10^6Nh, 1.0 - • 5.0 – <21.51*10^6Nh, 2.3 1.5–3.4 • ≥21.51*10^6 Nh, 3.5 2.3–5.4 Lag-time analysis II: Cumulative lumbar load; solely subjects unexposed in the last 10 years prior to diagnosis or interview date (in controls) = subjects exposed in the last 10 years excluded • 0 – <5.0*10^6Nh, 1.0 - • 5.0 – <21.51*10^6Nh 1.7	

								solely subjects unexposed in the last 10 years prior to diagnosis or interview date (in controls) = subjects exposed in the last 10 years excluded • 0 – <5.0*10^6Nh, controls 37 36.6 cases 15 23.8 • 5.0 – <21.51*10^6Nh controls 38 37.6 cases 28 44.4 • ≥ 21.51*106Nh controls 26 25.7 cases 20 31.7 Women, controls n % and cases n, % Cumulative lumbar load through manual materials handling and/or	0.8–3.9 • ≥ 21.51*10^6 Nh 1.8 0.7–4.5 Women, OR 95% CI Cumulative lumbar load through manual materials handling and/or intensive-load postures • 0 Nh 1.0 - • >0 – <4.04*10^6 Nh 1.9 1.2–3.0 • 4.04 – <14.47*10^6Nh, 2.7 1.8–4.2 • ≥14.47*10^6 Nh, 2.8 1.8–4.2 Cumulative lumbar load through manual materials handling • 0 Nh, 1.0 -	

								intensive-load postures • 0 Nh controls 195 43.5, cases 71 25.5 • >0 – <4.04*10^6Nh controls 84 18.8, cases 55 19.8 • 4.04 – <14.47*10^6Nh, controls 85 19.0 cases 74 26.6 • ≥14.47*10^6Nh, controls 84 18.8 cases 78 28.1 Cumulative lumbar load through manual materials handling • 0 Nh, controls 218 48.7, cases 92 33.1 • >0 – <1.58*10^6Nh, controls 76 17.0 cases 46 16.5 • 1.58 –	• >0 – <1.58*10^6 Nh, 1.5 1.0–2.4 • 1.58 – <9.06*10^6 Nh, 2.4 1.6–3.6 • ≥9.06*10^6 Nh, 2.3 1.5–3.5 Cumulative lumbar load through intensive-load postures • 0 Nh, 1.0 - • >0 – <2.77*10^6 Nh, 1.9 1.2–3.0 • >2.77 – 8.83 *10^6Nh, 2.5 1.6–3.8 • ≥8.83*10^6 Nh 3.2 2.1–4.9 Lag-time analysis I: Cumulative lumbar load up to 10 years prior	

								<9.06*10^{6}Nh, controls 77 17.2 cases 70 25.2 • ≥9.06*10^{6}Nh, controls 77 17.2 cases 70 25.2 Cumulative lumbar load through intensive-load postures • 0 Nh, controls 206 46.0 cases 75 27.0 • >0 – <2.77*10^{6}Nh, controls 80 17.9 cases 52 18.7 • >2.77 – 8.83 *10^{6}Nh, controls 81 18.1 cases 66 23.7 • ≥8.83*10^{6}Nh controls 81 18.1, cases 85 30.6 Lag-time analysis I: Cumulative lumbar load up to 10 years prior to	to diagnosis or interview date (in controls) = exposure during last 10 years set to zero • 0 Nh, 1.0 - • >0 – <4.04*10^6 Nh, 1.5 1.0–2.3 • 4.04 – <14.47*10^{6}Nh, 2.5 1.6–3.9 • ≥14.47*10^6 Nh, 2.5 1.6–3.9 Lag-time analysis II: Cumulative lumbar load; solely subjects unexposed in the last 10 years prior to diagnosis or interview date (in controls) = subjects exposed in the last 10 years	

								diagnosis or interview date (in controls) = exposure during last 10 years set to zero • 0 Nh, controls 215 48.0 cases 92 33.1 • >0 – <4.04*10^6Nh, controls 97 21.7 cases 60 21.6 • 4.04 – <14.47*10^6Nh, controls 70 15.6 cases 62 22.3 • ≥14.47*10^6Nh, controls 66 14.7 cases 64 23.0 Lag-time analysis II: Cumulative lumbar load; solely subjects unexposed in the last 10 years prior to diagnosis or interview date (in controls) = subjects exposed in the	excluded • 0 Nh, 1.0 - • >0 – <4.04*10^6 Nh, 1.2 0.6–2.6 • 4.04 – <14.47*10^6Nh 2.2 1.0–4.8 • ≥14.47*10^6 Nh 1.4 0.6–3.1	

								last 10 years excluded • 0 Nh, controls 195 75.9, cases 71 64.5 • >0 – <4.04*10^6Nh, controls 25 9.7 cases 12 10.9 • 4.04 – <14.47*10^6N h controls 18 7.0 cases 14 12.7 • ≥14.47*10^6N h controls 19 7.4 cases 13 11.8		
Sorensen 2011 Denmark Cohort	Endpoint was hospitalization due to HLDD identified in the National Hospital Register between 1977 and 2003. Code 725.11 from the International Classification of Diseases, Eighth Revision, was applied from 1977 to 1994,	The Copenhagen Male Study was established in 1970 to 1971 as a prospective cohort study of physical fitness and cardiovascular disease in employees at 14 private and public companies in Copenhagen including railway, telephone, insurance, postal delivery, and fire brigade enterprises.	At baseline, 1412 of the men (26.9%) reported a history of back disorder and were excluded. Only men who explicitly answered no to the question on history of back disorders or injury were eligible; thus, 3833 individuals were entered in the incidence study.	Physical work, strenuous enough to result in sweating asked in a question: "Do you perform strenuous work (regularly resulting in sweating)?" Answer options were "often," "occasionally," and "seldom or never."	Questionair re	Diverse jobs at 14 private and public compa nies in Copen hagen includin g railway, telepho ne, insuran ce,	No hospitakization due herniated lumbar disc disease	Incidence 64/3833 in study period 1977 to 2003 Strenuous work: • Seldom/ne ver (n = 2328), events 26 • Occasionall y (n = 1186) , events 26 • Often (n = 247) ,	Age-Adjusted HR (95% CI) Strenuous work: • Seldom/ never = 1 (referenc e) • Occasio nally = 2.09 (1.21– 3.61)	Age

	and code M51.1 from International Classification of Diseases, Tenth Revision was applied from 1994 to 2003.	All men aged 40 to 59 years were invited; 5249 men, 87% of potential participants took part in the examinations at baseline. All job categories were included in the study, and approximately 50% of the participants were manual workers. In the present study, only men without a history of back disorders were included.	Sixty-four men were hospitalized because of HLDD during the study period 1977 to 2003.			postal delivery, and fire brigade enterprises		events 10	• Often 3.95 (1.90–8.20)	
Virtanen 2007 Finland Cross sectional	Intervertebral disc disease (IDD), characterized by intervertebral disc herniation and/or sciatic pain based on a Latent Class Analyses of a clinical assessment of the medical history on LBP symptoms and intensity.	Finnish male train engineers and Finnish male paper mill workers.	150 Finnish male train engineers (38 to 56 years) working for the Finnish state railways. 61 Finnish male paper mill workers similar in age distribution with sedentary jobs and no occupational exposure to vibration	Train engineer with an average of 21 years (range, 5–31 years) of exposure to whole-body vibration. They all were full-time train drivers with about 5-hour daily exposure to whole-body vibration. Moreover, they were all from the same part of Finland,	History taking	Train engineers, Paper mill workers	The occupational control group consisted of 61 male paper mill workers with sedentary jobs and no occupational exposure to vibration. They were similar to the train engineers in age distribution and educational background. All the subjects	Prevalence A total of 42% (38 of 91) of train engineers *versus* 17.5% (7 of 40) of sedentary workers had IDD phenotype (cluster “4”).	Train engineers belonged significantly more often to IDD-phenotype (P =0.005). RR=2.39, 95%CI 1.17-4.88, calculated using medcalc.org/calc/relative_risk.php	No

				which ensures that they had been operating the same kinds of locomotives and had similar exposure to vibration.			were Finnish and unrelated to each other.			
Wahlstrom 2012 Sweden Prospective cohort study	Hospitalization due to lumbar disc disease and the International Classification of Diseases, Ninth Revision (ICD-9) code 722.1 (1987–1996, "Displacement of thoracic or lumbar intervertebral disc without myelopathy") or International Classification of Diseases, Tenth Revision (ICD-10) code M51.1 (1997–2003, "Lumbar and other intervertebral disc disorders with radiculopathy")	A cohort of Swedish construction workers who participated in a national occupational health surveillance program from 1971 until 1992	2239 cases among 263,529 Swedish construction	Job title	Medical examination	Construction workers	White-collar and foremen working in construction	Prevalence, n total, n cases • White-collar and foremen 34,717 208 • Electricians 33,938 248 • Glass workers 247618 • Asphalt workers 360127 • Insulators 2513 21 • Painters 20,681 169 • Rock workers 2678 19 • Sheet-metal workers 10,980 102 • Wood workers 57,700 526 • Machine operators 9904 90 • Preparatory	RR (95%CI) • White-collar and foremen 1 • Electricians 1.08 (0.89–1.30) • Glass workers 1.08 (0.67–1.76) • Asphalt workers 1.15 (0.77–1.72) • Insulators 1.25 (0.80–1.96) • Painters 1.27 (1.03–1.55) • Rock workers 1.30	Age, height, weight, smoking, and time period

								workers 9859 89 • Drivers 3881 36 • Bricklayers 8167 72 • Concrete workers 27,704 243 • Repairers 2429 19 • Roofers 1210 13 • Crane operators 2996 28 • Plumbers 21,962 235 • Floor layers 4937 59 • Refrigerator technicians 1196 17	(0.81–2.08) • Sheet-metal workers 1.37 (1.08–1.74) • Wood workers 1.40 (1.19–1.64) • Machine operators 1.42 (1.09–1.82) • Preparatory workers 1.50 (1.17–1.93) • Drivers 1.52 (1.06–2.16) • Bricklayers 1.52 (1.16–1.99) • Concrete workers 1.55 (1.29–1.87) • Repairers 1.60	

									(0.91–2.06) • Roofers 1.60 (0.91–2.80) • Crane operators 1.65 (1.11–2.44) • Plumbers 1.68 (1.39–2.02) • Floor layers 1.89 (1.41–2.53) • Refrigerator technicians 1.98 (1.21–3.26)	
Zhang 2009 China Case control	Lumbar disc herniation diagnosis was evaluated by 2 or more orthopedic experts in term of patient's symptoms, signs, and imaging examination (CRT or MRI).	Patients visiting the Department of Orthopaedics of the First Affiliated Hospital, Medical College of Xi'an Jiaotong University, Shaanxi Provincial People's Hospital and Xian Tang City Hospital from January 2005 to January 2007, because of	2010 cases and 2170 controls matched in race, gender, age and living area.	Lumbar load: • "very light" = no stable job, and very few manual, • "light" = work mainly as seat, • "middle" = work mainly as bending and shaking, • "heavy" =	Questionnaire	Not specified	Subjects in the control group were randomly selected from in-patients or participants of medical examination, which had no back pain history at present or more than a month ever,	Not described	OR (95%CI) Men & women Age<30 years • Occupational character 5.175 1.738–15.433	Diverse for instance family history, physical exercise, educational back ground, hard working

		conditions such as back leg pain, diagnosis of lumbar disc herniation by CT, and/or MRI and with typical sciatica.		work mainly as weight lifting and heavy physical labor Occupational character: • Nonmanual • Half manual/half nonmanual • Manual			sciatic nerve pain, such as spinal instability from trauma, scoliosis, and spondylolisthesis.		Age 30-55 years • Lumbar load 1.983 1.527–2.575 Age >55 years • Lumbar load 2.909 1.830–4.627	, time urgency
Zhang 2013 China Case control	Lumbar disk herniation, and typical sciatica. according to the Department of Orthopaedics based on reasons of back leg pain, computed tomography/magnetic resonance. Patients with lumbar spinal stenosis, spinal congenital dysplasia, intraspinal tumor, and	Lumbar disk herniation patients admitted to the Department of Orthopaedics of the First Affiliated Hospital, Medical College of Xi'an Jiaotong University, Shaanxi Provincial People's Hospital, and Xian Tang City Hospital from January 2005 to January 2007.	131 patients and 137 subjects in the control group	Lumbar load • Level I (slight) represents no fixed occupation and little physical labor; • Level II (mild) represents mainly sitting at work; • Level III (moderate) represents mainly bending over and twisting and whole-body vibrating at work; • Level IV	Questionnaire	Not specified	Subjects were selected randomly from in-patients or participants of medical examinations who had no history of back pain at present, for more than a month, or ever; sciatic nerve pain; spinal instability from trauma; scoliosis; or spondylolisthesis.	Prevalence Lumbar load Levels I and II • Patients n=57, 44.5% • Controls n=104, 78.8% Levels III and IV • Patients, n=71, 55.5% • Controls n=28, 21.2%	OR (95%CI) Lumbar load 4.627 (2.686 - 7.969)	

	spondylolisthesis were excluded from this study.			(severe) represents mainly heavy lifting and heavy labor work						