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Abstract

The objective was to describe at-work and commuting crashes occurring in a cohort of French employees and to investigate occupational risk factors. The subjects were employees of the French national electricity and gas companies, Électricité de France and Gaz de France (EDF-GDF), who volunteered to join a research cohort (the GAZEL cohort which included 20 625 participants in 1989). Only crashes with injuries were considered. Crashes for the period 1989-2001 were recorded together with the type of journey (commuting, work, private), the type of road-user, self-estimated responsibility, and injuries sustained by the subject. Annual incidences for gender/age groups and socio-occupational groups were computed for each of the two types of work related crashes. Occupational risk factor analyses were conducted using a Cox proportional hazards regression model with time-dependent covariates adjusting for the main confounders. A total of 146 285 person years at work were observed. Two indicators of self-reported work fatigue were associated with the occurrence of at-work crashes: “nervously tiring work” for males (RR=1.6, 95% CI [1.1;2.3]), sustained standing for females (RR=3.0, 95% CI]1.0;8.4]), adjusting for health status, location of residence, type of family, transport mode and mileage. As regards crashes while commuting, a self-reported uncomfortable position at work was a risk factor among women (RR=1.9, 95% CI [1.1;3.3]). On the other hand these occupational factors were not linked to road crashes in private trips. Work-related road crashes

seem then to be a matter for a specific prevention. Preventing employees from becoming exhausted should be considered as the first way to initiate such a prevention.

Key-words: occupation, traffic, accident, risk factor, fatigue

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Injury crashes occur in the course of both private trips and work related trips, the latter taking place either during the course of work or while commuting. In France, as in several other countries, injuries that occur when commuting or when at work are treated as occupational injuries for the purposes of compensation. At-work road crashes are the primary cause of occupational fatalities in most industrialised countries (Personick and Mushinski, 1997; Charbotel et al., 2001), because of their severity. The sociodemographic characteristics of the population groups at risk differ for the three types of accidents (at-work, commuting, or private trips) (Charbotel et al., 2001; Boufous and Williamson, 2006).

Several risk factors have been identified as playing a role in the occurrence of occupational accidents of all types. These include psychological factors (e.g. job satisfaction), work organisation and scheduling, the personal characteristics of employees, environmental and social conditions, in addition to specific work exposures such as chemical, physical, postural hazards (Dembe et al., 2004). For example, a prospective study conducted in Israel (Melamed et al., 1999) has shown that adverse work and environmental conditions, objectively assessed and expressed as the “ergonomic stress level”, are related to the occurrence of occupational injuries even after adjustment for age, job experience, educational level, managerial status, and occupational status (white/blue collar). Chronic or acute fatigue (after a day’s work) has been specifically accused of increasing the risk of work accidents in the Maastricht cohort (Swaen et al., 2003). The mechanism involved could be a reduction in the ability to gather information on dangerous situations and a reduction in the capacity to respond effectively to them.

Work related road crashes are the interface between road crashes and work accidents. The causes of work related road crashes have been subjected to the largest amount of investigation in the case of professional drivers (Hakkaken and Summala, 2001; Philip, 2005; Sabbagh-Ehrlich et al., 2005; Tzamalouka, 2005; de Pinho et al., 2006) and the results have highlighted the influence of lack of sleep, overall workload (including work other than driving), fatigue, and chronic daytime sleepiness. To our knowledge, outside the transport sector, occupational stresses have rarely been studied as potential risk factors for road traffic injuries. In the German medical staff (Kirkcaldy et al., 1997) the average yearly number of car accidents was predicted as a function of age and number of working hours. Furthermore, driving accidents going to or coming from work during the last year was associated with working climate, hours of work, length of lunchtime break, distance travelled to and from work, number of dependent children, and

gender (more accidents among women, which was surprising for the authors, and which they assumed (Kirkcaldy et al., 1997) to be specific to the occupation of medical staff). Physicians who worked more than 48 hours per week had five times the incidence of driving accidents doing house visits than their less time-stressed colleagues. Similarly, among American nurses (Novak and Auvil-Novak, 1996) working 12 hour shifts was associated with an excess crash involvement during their commuting trips. Lastly, this was confirmed among house doctors in the United States (Barger et al., 2005) whose over long working hours lead to excess crash involvement.

Few studies have considered the two types of work related road accidents (Harrison et al., 1993; Charbotel et al., 2001; Mitchell et al., 2004; McNoe et al., 2005; Boufous and Williamson, 2006; de Pinho et al., 2006). Three concern Australia, one New Zealand, and one France. Crashes while commuting were always more numerous than crashes in the course of work, except in coroner's records in Australia, which often did not contain the required information. The higher number of driver casualties was among the 25-34 years(Charbotel et al., 2001; Boufous and Williamson, 2006). Among risk factors, fatigue was pointed out, but this notion was recorded after the crash, and its occupational origin was ignored (Boufous and Williamson, 2006). These studies underlined that male drivers were more likely to be involved in a work-related traffic crash than female drivers, particularly while in the course of work, and that male drivers' crashes were the most severe. At work, truck crashes were responsible of a high severity for men, while among females, commuting crashes were more severe than on duty ones. The authors underlined that developing prevention strategies aimed at reducing the burden of work-related traffic crashes requires sound knowledge of areas related to environmental, behavioural and organisational factors that contribute this type of injury (Boufous and Williamson, 2006).

The aim of the present study was to assess the impact of occupational stresses on both at-work and commuting injury crashes in a cohort of employees with different occupations.

1. Materials and methods

1.1. Study population

The subjects were employees of the French national electricity and gas companies, Électricité de France and Gaz de France (EDF-GDF), who volunteered to join a research cohort, known as GAZEL, whose main objectives are to estimate the annual prevalence and incidence of chronic health problems. Nationwide,

the two firms have approximately 150 000 employees, representing a wide variety of occupations and socioeconomic groups.

The French National Institute of Health and Medical Research (Institut National de la Santé et de la Recherche Médicale, INSERM) has been studying the GAZEL cohort since 1989. At that time the cohort had 20 625 participants: 15 011 men aged 40-50 years and 5614 women aged 35-50 years. A comprehensive database has been regularly updated with data from the human resources department, the firms' medical insurance programme, the occupational medicine department and annual questionnaires mailed to participants at the beginning of each year. The GAZEL cohort objectives and methods have been described in more detail elsewhere (Goldberg et al., 1990).

The 19 894 living members of the GAZEL cohort received a questionnaire about road accidents in January 2001. The questionnaire was pilot tested in December 2000 on 500 randomly selected participants, 330 of whom responded. We used their answers and comments to finalise the questionnaire described below.

1.2. Data

1.2.1. Data from the driving behaviour and road safety questionnaire (survivors only)

The questionnaire was designed primarily to elicit descriptions of traffic crashes over the past 12 years. For this analysis the outcome studied is the occurrence of traffic crashes in which the subject was injured during the follow-up period. For each crash, the type of journey (commuting, at-work, and private), the type of road-user, self-estimated responsibility, the location of the crash and the injuries sustained by the subject were recorded. Mileage was estimated in 2001 from the reported number of kilometres travelled in the past 12 months by all transport modes. Four categories were defined as the quartiles of the distribution (<10 000 km; 10 000-15 999; 16 000-20 999; ≥21 000).

1.2.2. Data from the GAZEL cohort

The cohort database includes sociodemographic data on gender, year of birth, and occupation. In addition, health and family type variables are collected annually. An alcohol consumption variable is derived from questions in the 2001 annual questionnaire about subjects' frequency and quantity of alcohol consumption. Drinking habits are classified into four categories: non-drinker, occasional, intermediate and heavy drinker. From 1993 onwards, the annual questionnaire has included a set of questions on any

potentially stressful life events that occurred during the last 12 months. Separation and divorce are considered in the present study, as a previous analysis has shown that this variable influences crash incidence (Lagarde et al., 2004).

In 1978 the company's health insurance department set up a database to record employee health problems (Goldberg et al., 1982). This database contains demographic, socio-economic, and occupational data. It includes all the variables that relate to working conditions, some of which have been recorded every year: being on call for emergencies, daily commuting time, physically or nervously tiring work, and work satisfaction. Some other variables are available only for 1989 and 1990: work schedule, working at night, working outside, being in contact with the public, being in contact with chemical, thermal, mechanical or electrical hazards, road accident risk in the course of work, and type of transport used when commuting. Some were recorded in 1989, 90 and 94: postural stress (standing or uncomfortable position), carrying heavy loads, exposure to vibrations, cold, heat, and noise. For these variables, we considered the last known state. As occupations were precisely recorded with the dates of any changes, we created a variable called "work change in last three months". This database also provided deaths from road accidents. These cases (n= 16, including three while commuting) were included in the assessment of incidences.

Retirees were excluded from the present study. When studying risk factors, only injured drivers, riders or pedestrians were considered; passengers and unspecified individuals (fatalities), were excluded.

1.3. Statistical analysis

Annual incidences were computed for each of the two types of work related crashes. All injury crashes were taken into account, some subjects having two or three crashes in the follow-up period. The number of person years was calculated from the 1st of January 1989 (the start of the cohort) until retirement when relevant, or until the 31st of December 2001 for subjects who were still working.

Incidences were calculated for 9 gender/age groups (35-39 for women only; 40-44, 45-49, 50-54 and 55+ for both genders) and 4 socio-occupational groups (blue-collar workers, clerical staff, middle managers, executives). Incidence rates were compared with a Wald test(Esteve et al., 1994). Injuries were coded using AIS 90 (AAAM, 1990), which ascribes a severity score to each injury, from 1 (minor) to 6 (most severe). For instance, a superficial laceration is coded as AIS 1, a closed fracture as AIS 2, an open/displaced fracture as AIS 3. AIS 4 and 5 injuries, possibly fatal, involve internal organs. The overall severity for an individual with multiple injuries is measured by the MAIS, which is the severity of the subject's most severe injury.

There is a noteworthy gender difference concerning road morbidity and mortality, corresponding to differences in the number of trips, differences in the choice of road transport types, and moreover to differences in risk-taking behaviours (Martin et al., 2004). Therefore separate analyses were conducted by gender for each of the two types of crash using a Cox proportional hazards regression model with time dependent covariates ("last state"). The event is the first injury crash of each type during the period 1989-2001. Men and women were analysed separately. For each type of crash, an adjustment model was fitted on the basis of sociodemographic factors (age, separation in the last year, living alone or in a family), location of residence, health (self evaluated state of health and depression, alcohol consumption) and general mobility variables (annual mileage and road transport mode used in 2001). Commuting time and transport mode in 1989 were taken into account in the model for commuting crashes, while self reported "at-work crash risk" was considered for at-work crashes, these variables being considered as specific exposure measures for each type of trip. Occupational group was considered as an indicator of lifestyle and standard of living, in contrast to occupational data as such (working conditions) which are variables of interest. In order for the results to be generally applicable, precise jobs (electrician…) were not studied as risk factors, but detailed exposures (last state) to specific hazards were. Only those occupational variables linked to each type of crash with p<20% were used to calculate adjusted proportional hazard ratios to estimate the relative risk of an injury crash associated with each suspected occupational risk factor compared to a reference group.

2. Results

2.1. Study participation

The questionnaire on driving behaviour and road safety was returned correctly completed by 14 200 participants (68.9%), consisting of 10 639 men and 3561 women. The response rate was significantly higher among men (70.9%) than women (63.4%), and the respondents were slightly but significantly younger than non-respondents: mean age 56.7 (σ=2.88) versus 57.1 (σ=2.84) for men and 53.8 (σ=4.19) versus 54.4 (σ=4.04) for women. A significant upward trend was observed in response rates with occupational category: among men the response rate was 58.2% among blue collar workers and clerical staff but reached 71.4% among middle managers and 77.7% among executives. The comparable figures for women were 55.1% among unskilled workers, 66.2% among skilled workers and 74.7% among managers.

2.2. Incidences and characteristics of work related crashes

A total of 146 283 person years at work were observed, during which 231 crashes occurred while commuting (involving 217 individuals), and 165 during the course of work (160 individuals). Three people were killed in a crash while commuting. The overall incidence is thus 27.0 work related injury crashes per 10 000 person years.

Table 1 gives annual incidences, by gender, for each type of work related crash, according to age and occupational category. For crashes *in the course of work* the difference between genders is not significant, and aging has no clear effect, except in the case of men aged 55 years and over for whom the incidence is significantly lower (only one accident, p=0.02). Among men, blue collar workers ($p=3.10^{-7}$), and middle managers ($p=1.10^{-4}$) are more frequently concerned than executives.

The incidence of *commuting* crashes is maximal under 40 years, a category which unfortunately consists only of women in our sample, and for which the incidence is twice higher, compared to women between 40 and 44 years of age (p=0.03). Even after 40 years of age, the genders globally differ for commuting crashes ($p=7.10^{-4}$). Compared to men, women have a double incidence between 45 and 49 years of age (p=0.004) and between 50 and 54 years of age (p=0.02). Commuting crashes are more frequent among clerical staff of both genders (men $p=3.10^{-4}$, women p=0.02), compared to executives. Male middle managers have also a higher incidence than executives (p=0.03). It is only among middle managers that women have a significant higher incidence than men (p<0.03).

Table 2 sets out the characteristics of all work related crashes of each type, by gender: transport mode used at the time of the crash, location of the crash, severity, and self reported responsibility. All these variables differ greatly for the two types of crash. For both genders, the percentage of car and commercial vehicle crashes was greater at work and the percentage of bicycle crashes was minimal at work. Injury severity was lower for at-work crashes than for commuting crashes. Self reported responsibility was less frequent for both genders in the case of at-work crashes. Commuting crashes occurred more often on urban roads. The percentages of injury crashes as a passenger or a car driver were much higher among women, together these represent the great majority of women's crashes, while men were also injured while riding two-wheelers (especially when commuting) and driving commercial vehicles (at work). Women experienced less severe injury crashes than men.

2.3. Risk factors of work related crashes

The analyses described below attempted to identify risk factors, and only considered crashes experienced by drivers, riders or pedestrians. Thus, 109 crashes were excluded (in which 52 females and 39 males passengers were injured and 3 females and 11 males whose transport mode at the time of the crash was unspecified were killed). Eight additional subjects were excluded because they did not provide mileage estimates in 2001.

Factors relating to personal characteristics, lifestyle, health and occupation were assessed for their association with the risk of at-work and commuting crashes for each gender (results of the univariate analysis not shown). At-work crashes were significantly linked to the number of days of sick leave (males with the most sick leave had more crashes), occupational category (more crashes among male blue collar workers and middle managers), and for both genders with a self reported at-work road crash risk. This road hazard at work involved 60.3% of observed man years, but only 12.6% of observed woman years. Accidents while commuting were the most numerous among the youngest males, clerical staff of genders, females living alone or having had many days of sick leave. For both genders the frequency of crashes increased with the length of commuting journeys. The incidence of commuting crashes was highest among male motorised two wheeler users, while pedestrians and public transport users were less often involved in crashes than motorists of either gender. All these variables were included in the adjustment model.

Table 3 gives the crude relative risks by gender for occupational characteristics and each type of work related crash. Working night shifts, contact with the public, vibrations, thermal stress, and noise were associated with at-work crashes among males. Contact with the public, sustained standing, carrying heavy loads, vibrations and thermal stress were associated with at-work crashes among females. An uncomfortable position at work was associated with commuting crashes among females.

Table 4 gives RR (significant for at least one column) for work related and general risk factors, obtained from a Cox proportional hazards regression model adjusting for age, transport habits (total vehicle kilometres travelled, self reported road risk at work for at-work crashes, km travelled and type of vehicle for commuting crashes), health and personal characteristics, and socio-occupational category. “Nervously tiring work” for males and sustained standing for females were associated with at-work crashes. An uncomfortable position at work was associated with commuting crashes for females, together with bad life circumstances (living alone, many days of sick leave).

The same analysis was conducted on accidents occurring during private journeys (results not shown). No link was found with any occupational constraint, except that those who were exposed to road crash risk at work were less likely to have a crash in their private life.

Discussion, conclusions

Because of its age (35-60), the study population is particular as regards work related accidents and road crashes. Indeed work related injuries are generally known to be more frequent among young employees, especially men.(Salminen, 2004) In the French population as a whole, the frequency of work related traffic injuries is the highest among 25-34 year olds and decreases steadily with age,(Charbotel et al., 2001) and the situation is exactly the same in Australia.(Boufous and Williamson, 2006). We can thus state that we studied a group with a fairly low risk of injury crashes. Moreover, some biases exist both at the beginning of the cohort and thereafter due to the fact that participation in the GAZEL cohort was voluntary, and the participation rate (Goldberg et al., 2001) is linked to gender, education, job grade, family status, health, and residence in particular regions. Groups with favourable family, health or socioeconomic characteristics are overrepresented among volunteers. On the other hand, occupational exposures had no effect on participation adjusted for social and demographic variables. Among men, but not women, diseases caused by alcohol, smoking, and dangerous behaviour (accidents) were the primary reason for the health differences observed between participants and non-participants. It is therefore possible that some subjects ceased to participate in the study due to a severe injury crash. Only fatal crashes were reintroduced into the data in order to compute incidences as other severe crashes, that might have been the cause of non-participation, being unknown. All in all, it is possible that the incidences calculated here are underestimated due to participation bias; however the assessment of occupational risk factors is valid given that other personal risk factors have been taken into account.

The higher risk for women while commuting, which is responsible for their higher overall work related crash risk, was observed neither in the general French population including non-working women,(Charbotel et al., 2001) nor in Australia.(Boufous and Williamson, 2006) Commuting risk was very high for women aged under 40 years, but there were no men in the same age group in the cohort. The greater risk for commuting accidents among young male and female blue collar workers has also been observed in national data (Charbotel et al., 2001) and by Boufous et al.(Boufous and Williamson, 2006). The difference between genders for the incidence of commuting crashes is also significant in the present study for the entire working

life after 40 years of age. Our study therefore confirms the results of Kirkcaldy and al.(Kirkcaldy et al., 1997) in a very different working population. Women's commuting journeys are often more complex and fragmented than men's due to domestic shopping trips and taking children to and from school.(McGuckin and Murakami, 1999) In our sample, women living alone seem to be the most exposed to road-crashes. Therefore chores can hardly be blamed. Being aged 40 and more, women living alone may mostly be divorced or separated, and we can then, on the contrary, suppose that lonely women behave less carefully in road traffic. On the other hand, women generally use two wheeled vehicles less often and are therefore less exposed to traffic crashes. In our sample, 7% of men and 1% of women commuted by two wheeled vehicle while 19% and 26% respectively reported commuting exclusively by foot and/or public transportation. Women who had had a large number of days sick leave also exhibited excess crash involvement while commuting, in spite of their lower number of days of exposure. This factor could be related to chronic fatigue, such as that measured by Swaen (Swaen et al., 2003), which is linked to the general incidence of work accidents. All things considered, this excess of commuting accidents among middle-aged active women, compared to men, is worth noting. Further studies are required as it is very rare to find an excess of accidents among women, either at work or in road traffic.

The incidence of at-work crashes was slightly greater for men than for women even if the difference between genders was not significant, and was much smaller than has been observed in previous studies. (Harrison et al., 1993; Personick and Mushinski, 1997; Charbotel et al., 2001; CDC, 2004; Mitchell et al., 2004; Boufous and Williamson, 2006)

However, we have found no published study that takes account of the number of working years when comparing at-work crash risk, an adjustment which was feasible here as the denominator for incidence only includes people at work. It is therefore possible that a considerable proportion of the excess involvement rates for men that are observed in these studies with crude results for commuting and at-work crashes is attributable to a gender difference in employment rates.

Both mileage and the type of vehicle used for commuting, as measured in 1989, were associated with commuting crashes. Similarly, self reported "risk of a road crash at work", as measured in 1989 and 1990, is associated with at-work crashes over the whole period suggesting that transport habits both at work and while commuting have remained very constant for most individuals over a 12 year period.

At-work road crashes were less severe than commuting ones. This has already been reported from a comprehensive analysis of all road crashes in France using police data. (Charbotel et al., 2001) Overall

injury severity, as measured by the MAIS, increases with age which concurs with previous studies that show an increase with age for both occupational injuries (Salminen, 2004) and road injuries.(Ryan et al., 1998) The most likely explanation for this is the lower vulnerability of young people to impacts. Men's injuries are much more severe, as already shown elsewhere. (Charbotel et al., 2001; Boufous and Williamson, 2006)

The major result of this analysis is the influence of tiring work conditions (measured by "nervously tiring work" or "sustained standing") on the incidence of at-work crashes. Even more instructive is the link between commuting accidents and tiring work conditions (uncomfortable sustained position) among women, after adjusting for health status, residence location, family life and commuting behaviour (distance and mode). The significance of these findings is further increased by the fact that the risk of non-work related crashes in the same cohort was not associated with any of available occupational variables. The same process is therefore present in work related crashes and work accidents in general, both of them being associated with the fatigue that is created by work. (Swaen et al., 2003)

Road traffic accidents being the most serious work related accidents, this study suggests that improving working conditions should be considered as a way of reducing not only the number of industrial accidents, but also the number of road traffic accidents that occur while at work and while commuting.

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Table 1 Work related injury road crashes between 1989 and 2001: incidence per 10,000 person years according to age and occupational category

n=14,216 individuals, 146,283 person years

	Person years		At-work 165 crashes		Commuting 231 crashes	
			Incidence		Incidence	
	men	women	men	women	men	women
Age						
[35-40[	-	3,262	-	6.1	-	39.8
[40-45[	15,601	9,838	13.5	7.1	17.3	18.3
[45-50[	41,943	14,451	13.8	10.4	11.9	22.8
[50-55[	43,533	10,042	11.7	9.0	12.4	21.9
55+	5,707	1,906	1.8	5.2	17.5	21.1
Occupational category						
Executives	41,119	4,861	6.1	6.2	10.0	12.3
Middle managers	54,080	26,459	14.8	9.4	14.9	21.5
Clerical staff	3,007	7,970	10.0	7.5	32.7	33.9
Blue collar workers	8,578	209	26.8	-	12.0	-
Total	106,784	39,499	12.3	8.6	13.2	22.8

Table 2. Characteristics of work related injury road crashes

	At-work		Commuting	
	men	women	men	women
n crashes	131	34	141	90
n individuals	*128*	*32*	*132*	*85*
	%	*%*	*%*	*%*
Type of road user when injured				
passenger	9.9	17.7	2.8	6.7
pedestrian	3.8	-	5.7	11.1
bicycle rider	2.3	-	15.6	1.1
motorised 2-wheeler rider	2.3	-	27.7	1.1
car driver	64.1	73.5	45.4	74.4
commercial vehicle, or truck driver	16.8	8.8	0.7	-
other, unspecified*	0.8	-	2.1	5.6
Location				
urban road	47.3	35.3	58.2	60.0
other road other than motorway	37.4	41.2	26.2	21.1
motorway	10.7	20.6	10.7	12.3
other, unspecified*	4.6	2.9	4.9	6.6
Injury severity				
unspecified	0.8	-	5.0	4.5
MAIS 1	77.0	91.2	59.5	72.2
MAIS 2	19.9	5.9	29.8	17.8
MAIS 3	1.5	2.9	4.3	2.2
MAIS 4	0.8	-	0.7	1.1
MAIS 5	-	-	-	-
Fatality	-	-	0.7	2.2
Responsibility (self-reported)				
Unspecified*	2.3	2.9	4.3	3.3
Not at fault	75.6	76.4	56.7	66.7
At fault	22.1	20.5	39.0	30.0

*including fatalities

Table 3. Occupational factors and work related injury crashes: univariate models

Crude relative risks

Occupational stresses	*At work injury crash*						*Commuting injury crash*			
	Men 106 280 person years			**Women** 39 113 person years			**Men**		**Women**	
	RR	95%CI	Person years	RR	95%CI	Person years	RR	95%CI	RR	95%CI
Physically tiring work										
no	1	-	91 547	1	-	35 168	1	-	1	-
yes	1.5‡	0.9 to 2.3	14 733	1.9‡	0.7 to 5.2	3 945	1.0	0.6 to 1.7	1.0	0.4 to 2.1
Nervously tiring work										
no	1	-	46 612	1	-	20 917	1	-	1	-
yes	1.4‡	0.9 to 2.0	59 668	1.1	0.5 to 2.4	18 196	0.8	0.6 to 1.2	1.4‡	0.9 to 2.2
Night shift										
never	1	-	61 283			37 698	1	-		
sometimes	1.5*	1.1 to 2.3	39 228			1 378	0.8‡	0.5 to 1.1		
regular	0.8	0.3 to 2.2	5 769			37	0.7	0.3 to 1.6		
Night shift										
no				1	-	37 698			1	-
yes (at least sometimes)				2.2	0.5 to 9.5	1 415			0.4	0.1 to 2.7
Contact with the public										
no	1	-	66 140	1	-	24 554	1	-	1	-
yes	2.2***	1.5 to 3.1	40 140	2.3*	1.1 to 5.0	14 559	1.1	0.8 to 1.6	1.1	0.7 to 1.8
Sustained standing					-					
no	1	-	81 562	1	1.7 to 12.2	37 188	1	-	1	-
yes	1.3‡	0.9 to 2.0	24 718	4.6**		1 925	1.3‡	0.9 to 1.9	1.1	0.4 to 3.1
Other uncomfortable position										
no	1	-	95 361	1	-	34 591	1	-	1	-
yes	1.0	0.5 to 1.8	10 919	1.4	0.5 to 4.0	4 522	1.6‡	1.0 to 2.5	2.0*	1.1 to 3.6
Carrying heavy loads										
no	1	-	96 275	1	-	37 401	1	-	1	-
yes	1.0	0.5 to 1.9	10 005	3.7*	1.4 to 11.5	1 712	0.6	0.3 to 1.3	0.9	0.3 to 3.0
Vibrations										
no	1	-	98 133	1	-	38 905	1	-	1	-
yes	2.3**	1.4 to 3.8	8 147	7.5*	1.0 to 55.4	208	1.0	0.5 to 2.0	1.0	0.5 to 2.0
Thermal stress										
no	1	-	39 138	1	-	35 887	1	-	1	-
yes	3.0***	1.8 to 4.9	67 142	4.2**	1.7 to 9.9	3 226	0.8	0.6 to 1.1	0.8	0.3 to 2.1
Noise										
no	1	-	79 072	1	-	28 944	1	-	1	-
yes	1.7*	1.1 to 2.7	14 773	0.9	0.3 to 2.6	6 062	1.3	0.8 to 2.0	1.6‡	0.9 to 2.7
unknown	0.8	0.4 to 1.6	12 435	0.7	0.2 to 3.0	4 107	0.8	0.5 to 1.5	0.9	0.4 to 2.0
Self-reported risk of a road accident at work[a]										
no	1	-	42 243	1	-	34 177	1	-	1	-
yes	3.9***	2.3 to 6.6	64 037	3.1**	1.3 to 7.1	4 936	1.0	0.7 to 1.4	0.9	0.4 to 1.8

‡ 0,05<p<0.20 * p<0.05 ** p<0.01 *** p<0.001

a: this variable was used as an adjustment variable (exposure) for at-work accidents in subsequent analysis (table 4)