Work-related road crashes

What do we know? What are the research needs?

Barbara CHARBOTEL, UMRETTE, Université Claude Bernard Lyon I, Domaine Universitaire Rockefeller, 8 avenue Rockefeller. 69373 Lyon CEDEX 08 France.

UMRETTE (Transport, Work & Environment Epidemiology Research Unit), joint research unit of INRETS (French National Institute for Transport and Safety Research) and University Claude Bernard, Lyon, France.

Abstract

In many countries road crashes are the main cause of fatal work accidents, even without taking into account commuting crashes. When the figures are known, they represent from 20 to 30% of fatal work accidents in several industrialised countries. In France, nearly 40% of fatal work accidents are road crashes, and the rate of 60% is reached if commuting crashes are included. The human and economic consequences of these work-related road crashes are considerable. However, few authors have focused on this subject, neither to describe in detail the characteristics of these accidents nor to identify their risk factors.

In a descriptive analysis of all victims of road crashes recorded by the police in 1997 in France, crashes occurring during the course of work, were compared with those while commuting and also others during private journeys. The analysis concerned 105,816 drivers from 14 to 64 years of age; among these, 9.9%, were injured during the course of work and 18.6% while commuting. The gender-ratio (number of men / number of women) was maximal for crashes during the course of work and minimal while commuting. Compared with the incidence rates for labourers, those of self-employed trades and services (SETS) and those of employees and executives were higher for crashes incurred during the course of work and lower for those incurred during commuting. Professional drivers had the highest risk during the course of work. Crashes while working were most serious for SETS and professional drivers.
For this reason, we tried to describe truck driver injuries and assess their severity factors using the trauma registry of road crash victims of the Rhône district (France, population 1,6 million inhabitants, main city Lyon). Several descriptive characteristics were analyzed for the victims (age, place of residence) and their crash (place, antagonist, use of seatbelt ,…). The severity of injuries was measured by the injury severity score (ISS). 300 truck drivers were compared to 9,488 car drivers (class of age: 18 to 67). Truck drivers were more seriously injured than car drivers, 13% of them had an ISS of 9 or more compared to 8% for car drivers and the mortality-rates were 3.3% and 1.5% respectively. After adjustment on the use of seatbelt, The Odds Ratio, for truck drivers to be seriously injured was 1.04 (95 percent confidence interval: 0.73, 1.47) compared to car drivers. This study has confirmed the particular severity of truck driver road injuries and identified specific severity factors.
These studies pointed out the real share of work related road crashes and showed the need to identify more precisely groups at risk, to identify occupational factors and develop prevention by adapting it to the targets identified.

Introduction

Work-related road accidents include two types: commuting accidents and accidents occurring during the course of work. In France and several other European countries, employees injured

in commuting accidents and those occurring during the course of work are indemnified as for other occupational injuries [1]. In Italy and Portugal only special circumstances are accepted [2]. In the Netherlands, the United Kingdom, Denmark, Norway, as in the United States and Canada, road accidents while commuting are not considered to be work accidents. In many countries road accidents are the main cause of fatal work accidents, even when commuting accidents are not taken into account. They represent from 20 to 25% of occupational fatalities in the USA [3, 4], 30% in Canada [5] and approximately 25% in Denmark, Finland and Sweden [6]. In France, nearly 40% of fatal work accidents are road accidents, and the rate of 60% is reached if commuting accidents are included [7]. The human and economic consequences of these work-related road accidents are considerable [7, 8]. However, few authors have focused on this subject, whether to describe in detail the characteristics of these accidents or to identify their risk factors. Some information on their characteristics are known as a result of general studies on accidents at work.

In the recent years we have tried to improve knowledge on these work related road crashes and conducted two main studies. The first study was a descriptive analysis of BAAC (French police road accident casualty data), that lists casualties of road accidents, i.e. those that cause at least one victim (injured or killed), occurring on a road open to public traffic and involving at least one vehicle. We focused on drivers from the working population (14 to 64 years old) for the year 1997 [9]. A second study focused on the severity factors for truck driver crashes [10]. In the future other studies will to be carried out to identify more precisely groups at risk and occupational factors to develop prevention by adapting it to the targets identified.

Descriptive analysis of BAAC

In 1997, the BAAC contained information on 128,619 accidents in which there were 182,625 casualties. Among these, 137,264 had light injuries, 37,076 were seriously injured and 8,285 died. The analysis concerned 105,816 drivers from 14 to 64 years of age; among these, 9.9%, were injured during the course of work and 18.6% while commuting.

Gender and age

The gender-ratio was maximal for accidents during the course of work (SR = 5.5), and minimal for commuting (2.1), compared to non-work related accidents (2.7).

For commuting accidents and those incurred during the course of work the highest numbers came from the 25-34 years age group (Figure 1) whereas in non-work related accidents the 14-24 years age group was the most concerned.

Considering the share of work related road crashes, we identified that they represent 40% of all crashes in the 35-55 class of age (Figure 2). For this reason we consider that this group should be a target for the prevention of these crashes.

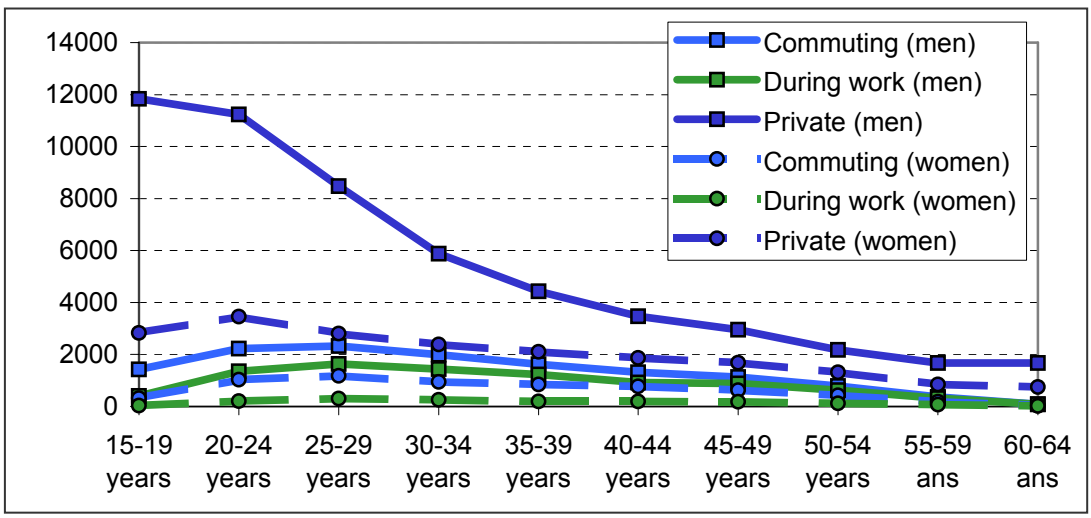

Figure 1 : Age breakdown for injured drivers as a function of the type of journey, BAAC 1997

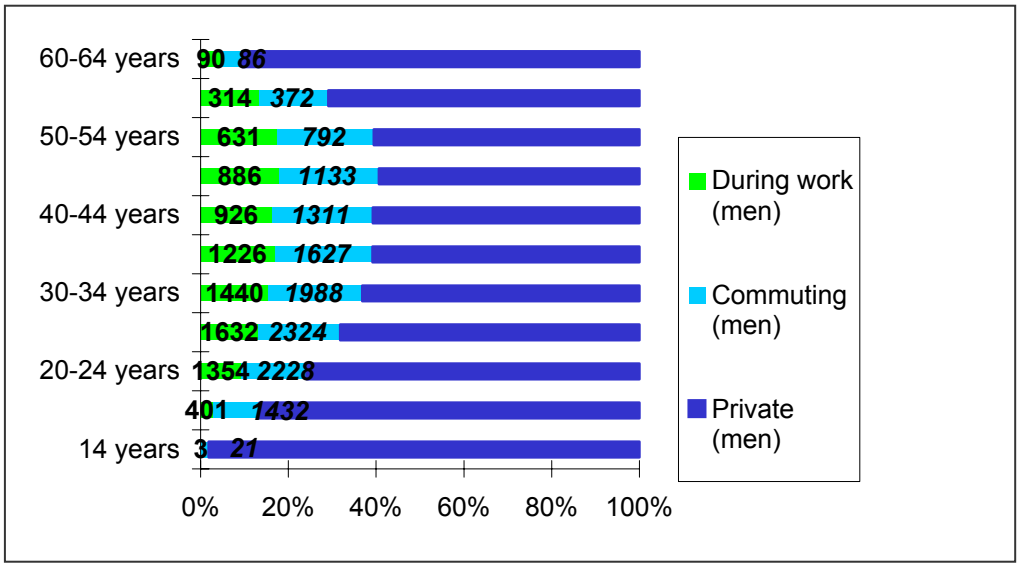

Figure 2 : Proportion of work related road crashes as a function of age, BAAC 1997

Occupations

Drivers injured in a crash occurring during work were mainly non-professional drivers who represented only 21.7% of the total. In fact, employees, clerical staff and middle managers represented 37.8% of the victims of these crashes. We compared our data with the distribution of occupations in the general population. Logically, the relative risk for professional drivers was the highest at 16.5, but other professions were identified to be at risk for crashes during work such as employees, clerical staff, middle managers with an odds Ratio of 1.8 [1.7 ; 1.9] compared to labourers (referent group), or self-employed trades and services Odds ratio 2.8 [2.6 ; 3.1]. The risks measured for the different aforementioned categories are, of course, representative of higher kilometres travelled, but also of the risks taken during the journey. Unfortunately, the number of kilometres travelled is not recorded by police data and therefore could not be taken into account in the analysis. However these results are indicative of professions that should be targeted for prevention.

	DURING WORK	**COMMUTING**	**PRIVATE**
Professional drivers	16.5 [15.4 ; 17.7]	1.2 [1.1 ; 1.3]	1.1 [1.0 ; 1.1]
Farmers	0.4 [0.3 ; 0.5]	0.1 [0.1 ; 0.2]	0.3 [0.2 ; 0.3]
Self-employed trades and services SETS	2.8 [2.6 ; 3.1]	0.7 [0.7 ; 0.8]	1.0 [1.0 ; 1.0]
Employees, clerical staff, middle managers	1.8 [1.7 ; 1.9]	0.7 [0.6 ; 0.7]	0.6 [0.6 ; 0.6]
Labourers	1	1	1

Numbers for 14-64 year old drivers from BAAC data 1997
Population aged from 20 to 59, labourers as reference group

Table 1: Relative Risk for each occupation men and women [10]Vehicle driven

Logically, during the course of work, professional drivers were mostly victims of accidents while driving heavy trucks (62%). Employees, clerical staff and middle managers were mostly

injured riding motorised two-wheeled vehicles (51%). The share of motorised two-wheeled vehicles was also high for executives (40%) and labourers (31%).
This specific frequency of two wheels for crashes occurring during work justifies the needs to improve the knowledge on professions concerned by these crashes and their types of occupational tasks.

Severity of the crash

On the whole, accidents during the course of work were less serious, followed by commuting accidents and non-work-related accidents. The fatality rates were 34‰, 48‰, and 53‰ respectively
Surprisingly, work-related accidents are significantly more serious for farmers, SETS and professional drivers than for all the other occupations and less serious for employees and executives. For commuting journeys, accidents were significantly more serious for farmers, SETS and labourers than for the other occupations The specific severity of professional driver crashes was linked with the type of vehicle driven, heavy vehicle.

severity factors for truck driver crashes

The trauma registry of road crash victims in the Rhône region (France, population 1,6 million inhabitants, main city Lyon) has been operational since January 1995 (11). Any victim of a road crash injury which happens within the Rhône region is eligible. Whatever the type of vehicle involved, every road accident is reported. Victims are defined as every person presenting at least one injury of a severity level of 1 or more according to Abbreviated Injuries Scale defined by the Association for the Advancement of Automotive Medicine (12). The collection of the data is based on the participation of various medical centers taking part in the health care of crash victims. Overall, there are about one hundred medical services involved from private, civil and military centers dealing with crashes. The information collected consists of the characteristics of the victim, the crash characteristics, the medical assessment and the injured person's subsequent progress. After cross-checking from one source to another, the medical data is coded by a physician.
Data collected in the Rhône registry for crashes occurring from 1995 to 1999 included was analyzed with the aim of understanding the difference previously observed between the severity of truck driver injuries and those of car drivers.
The ISS (total of the squares of the highest AIS of the three body regions most injured) was used to assess the severity of the crash.
Among the 52,315 victims of a road crash included in the Rhône registry from 1995 to 1999, 310 were at the wheel of the truck and 300 were males, aged from 18 to 67 years old. Because of the low number of female truck drivers, the following analysis compared male truck drivers characteristics to the 9,488 male car drivers in the age class of 18 to 67.

A total of 13.3% of the truck drivers were seriously injured (ISS of 9 or more) compared to 7.6% of car drivers, OR 1.87 [1.33, 2.63]. The same was true for the mortality rates, 3.3% for truck drivers and 1.5% for car drivers.

After accounting for seatbelt use the OR was 1.04 [0.73 ; 1.47] for truck drivers to be seriously injured compared to car drivers. Moreover, no serious injuries were observed among the 41 belted truck drivers. Indeed, the seatbelt was worn by only 14 % of truck drivers compared to 72 % for car drivers, 51 % of truck drivers did not wear it compared to 15 % of car drivers. For the other cases the information on seatbelt use was unknown.

Well known severity factors were studied in the analysis (and identified to be severity factors in this study) to compare truck driver and car driver crashes: age, seatbelt use, antagonist type (third party involved), road category, time of the crash, vehicle driven.

Interestingly, when taking into account all these different severity factors the differences in severity observed between the two vehicle types were even lower but not significant, probably because of the low number of truck drivers included.

		Odds Ratio	95% confidence interval
Age	55 to 64	1.71	1.30 ; 2.25
	35 to 54	1.46	1.23 ; 1.73
	18 to 34	1	
Seat belt	No	2.81	2.31 ; 3.41
	unknown	3.18	2.62 ; 3.86
	Yes	1	
Antagonist	Fix obstacle	3.03	2.47 ; 3.74
	Heavy vehicle	3.04	2.35 ; 3.94
	Other/unknown	1.75	1.21 ; 2.51
	No antagonist	1.16	0.93 ; 1.46
	Light vehicle	1	
Road category	Highways	1.70	1.38 ; 2.59
	Road	3.51	2.91 ; 4.22
	Urban zone		
Time	[0.00-6.00[	1.83	1.49 ; 2.25
	[6.00-0.00[	1	
Vehicle	Truck	0.74	0.51 ; 1.07
	Car	1	

Table 2: Injuries severity (ISS9+) for truck and car drivers from logistic regression (Trauma registry of road crash victims in the Rhône region. 1995-1999) [10]

The low rate of seatbelt use seems to be a factor in explaining the difference in the injuries severity suffered by truck drivers compared to car drivers. For a long time French legislation has imposed the use of seatbelt for drivers of vehicles weighing up to 3.5 tons. Drivers of vehicles weighing more than 3.5 tons were allowed to drive without wearing their seatbelt until May 2003 when the legislation changed. However seatbelt equipment was not obligatory for new vehicles and buses until 1997. Now, a European law requires seatbelt equipment seatbelt equipment for vehicles built after 2002, but older vehicle still have no seatbelts.

Risk factors for Work related road crashes ?

For several authors the line of business most concerned by fatal work-related accidents is that of transport. In a study carried out by the Harrison et al., 36% of victims killed in road accidents during the course of work were working in the transport sector and 92% of these were truck drivers. For Toscano et al., 50% of victims killed during the course of work in 1993 in the USA died at the wheel of a heavy truck [4]. In this activity sector, several publications focused on the work conditions and the risk factors for crashes. Hours of work and rhythms were analysed and some business sectors were identified to be more at risk because of the numerous rhythm modifications generating great fatigue. An increase of the risk of accident during the work day has been identified [15]. A minimum of the risk was observed at 6.00 (RR = 0,6), and the maximum at 24.00 (RR = 2), with a medium peak of frequency at 14.00 (RR = 1,4). The risk for being involved in a crash increased after 4 hours driving without any pause and over 11 to 12 hours of work. The number of hours of work during the previous week was also an important factor.
Other professions have been identified to be at risk for work-related road crashes. Two studies, one from Spain [16] and the other from the United Kingdom [17], have highlighted the

frequency of accidents involving delivery personnel and have called into question the working conditions of this occupation for which the commission based work encourages lack of caution.
The study we carried out on BAAC 1997 underlined the fact that employees, clerical staff and middle managers represented 37.8% of the victims of crashes occurring during work. Until now no study focused on the specific occupational risk factors involved in these occupations.
Consequently, because of the frequency of these occupations among victims of road crashes occurring during work as well as the poor knowledge on the risk factors in these crashes we plan to carry out a specific study based in the Rhône Registry to include patients victims of road crash during work. These patients, their work and medical conditions will be compared to a group of controls from de general population in the same geographic area.

Conclusion

Road casualty is a main occupational risk representing worldwide from 20 to 40 % of the fatal occupational accidents and much more when taking into account commuting road crashes. However, little is known about the precise occupation of the victims. For some lines of business (mainly the transport sector and the occupational drivers of heavy vehicles) the risk of road crashes is known and some occupational risk factors have been identified. But for other lines of business and other professions little is known about occupation or about occupational risk factors. Studies on this topic are necessary to adapt prevention and reduce the number of workers injured or killed in road crashes.

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