ELSEVIER

Accident Analysis and Prevention 37 (2005) 1121–1134

ACCIDENT ANALYSIS & PREVENTION

www.elsevier.com/locate/aap

Road mobility and the risk of road traffic accident as a driver The impact of medical conditions and life events

G. Parmentier [a,b], J.-F. Chastang [a,b], H. Nabi [a,b], M. Chiron [c], S. Lafont [c], E. Lagarde [a,b,*]

[a] *Inserm, U687, Saint-Maurice F-94415, France*
[b] *IFR69, Villejuif F-94807, France*
[c] *INRETS, UMRESTTE, Bron F-69675, France*

Received 9 March 2005; received in revised form 13 June 2005; accepted 13 June 2005

Abstract

Study objective: We conducted a longitudinal investigation of the impact of self-reported life events and medical conditions on changes in road mobility on the wheel between 2000 and 2002 in order to assess whether these changes would affect the risk of road traffic accident (RTA).
Methods: Data are from a cohort of workers and retirees from the French national gas and electricity companies (the Gazel cohort). In the present study, 10,483 participants were included (7843 men aged 51–61 years and 2640 women aged 46–61 years, in 2000). The link between mobility and the risk of RTA was approximated using data on RTA number during lifetime and reported mobility in 2000. We then compared changes in road mobility between 2000 and 2002 resulting from life events and medical conditions reported to have occurred in the year 2001 or changed when compared to year 2000. We also compared road mobilities in 2000 in order to assess any pre-existing differences before life events and medical conditions. This led to estimation of the effect of road mobility changes on the risk of RTA.
Results: Changes in road mobility associated with life events and medical conditions were only found among men. These changes in road mobility were minimal. Ensuing changes in the risk of RTA were estimated to be small (odds-ratios ranged from 0.94 to 1.01). The only life events found to be associated with increased road mobility was an important purchase. Hospitalization, serious RTA, and retiring were associated with reduced road mobility. Concerning medical conditions, men who reported cataract, angina pectoris, diabetes, anxiety and stress, sleep disorder, and depression decreased their road mobility.
Conclusion: We found no or moderate changes in road mobility resulting from life events and medical conditions, suggesting that results from previous published studies that assessed the impact of life events or medical conditions on RTA were not jeopardized by improper adjustment for road mobility.

Keywords: Road mobility behind the wheel; Risk of road traffic accidents as a driver; Medical conditions; Life events

1. Introduction

Most studies on individual risk factors of road traffic accident (RTA) fail to control sufficiently for exposure (mileage driven) when measuring associations. Measuring exposure to the risk of accidents is always difficult (Joly et al., 1991). In particular, temporary changes are almost impossible to capture in the context of retrospective studies. This problem is particularly acute in the study of medical conditions and life events associated with the risk of RTA. Association or absence of association may stem from changes in mileage induced by the disease or the event itself, rather than reflect the actual impact or absence of impact on driving performance.

For example, we found in a previous study that separation and divorce were associated with a 2.9-fold increase in risk of serious RTA (Lagarde et al., 2004). While we adjusted for annual mileage reported at the end of the study period, we were not able to account for changes in mileage driven within the same period. One can hypothesize that divorce may increase mobility which in turn increases the risk of

* Corresponding author. Tel.: +33 1 46183858; fax: +33 1 46183889.
E-mail address: emmanuel.lagarde@st-maurice.inserm.fr (E. Lagarde).

0001-4575/$ – see front matter © 2005 Elsevier Ltd. All rights reserved.
doi:10.1016/j.aap.2005.06.012

RTA. Conversely, some medical conditions associated with an increased risk of RTA might decrease mobility. In this case, the risk might be underestimated.

Unsurprisingly, annual mileage is one, if not the best, predictor of RTA (Peck and Kuan, 1983; Massie et al., 1997; Assum, 1997). Most of the difference in accident risk between men and women is explained by different mileage (Massie et al., 1997; Lourens et al., 1999). Correlations reported in the literature range from 0.12 to 0.35 (Elander et al., 1993). The relation between mileage and the risk of RTA is, however, not linear. Those with high annual mileage have a lower risk of accident per mile than those with low annual mileage (Janke, 1991). This can be partly explained by the different road types, intensive drivers tend to use more freeways than infrequent drivers who are more often found on two-way roads near or within urban areas. Frequent drivers are also more experienced than infrequent drivers.

Only two studies have attempted to identify individual factors associated with changes in mileage driven (Marottoli et al., 1993; Forrest et al., 1997). Both were conducted among cohorts of people over 65 years of age. Marottoli and colleagues found mileage reduction associated with increasing age and increasing disability (Marottoli et al., 1993). Forrest and colleagues showed falls, poor hearing and muscle pain to be associated with decreased mileage among women (after controlling for age, education, living arrangements and residence type) (Forrest et al., 1997).

The present study was carried out in a large cohort of French workers to examine the effect of selected medical conditions and life events (known or suspected to be risk factors of RTA) on changes in mileage driven and the potential impact of these changes on the risk of RTA.

2. Methods

2.1. Study population

The participants are employees or recent retirees from the French national electricity and gas companies, Electricité de France and Gaz de France (EDF–GDF), who volunteered to participate in a research cohort named GAZEL. Its main objective was to collect data about the annual prevalence and incidence of chronic health problems. Together, these two companies employ about 150,000 people of diversified trades and socioeconomic groups throughout France. Since 1989, the GAZEL cohort has been studied by the National Institute of Health and Medical Research (Institut National de la Santé Et de la Recherche Médicale, INSERM). Initially it included 20,625 participants: 15,011 men aged 40–50 years in 1989 and 5614 women aged 35–50 years. A comprehensive database has been regularly updated since then with data from the human resources department, the companies' medical insurance program, the occupational medicine department, and an annual questionnaire 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., 1994, 1990).

2.2. Data from the driving behaviors and road safety questionnaire

In March 2001, a questionnaire about driving behaviors and road safety was sent to the members of the GAZEL cohort. It included information about whole lifetime RTA as a driver of four-wheel vehicles (material and corporal RTA) and annual mobility in 2000 (number of kilometers driven in four-wheel vehicles).

2.3. Data from the annual GAZEL cohort questionnaire

Sociodemographic data from the annual GAZEL cohort questionnaire were: sex, year of birth, occupational categories, family status, and children at home. The annual questionnaire also included a set of questions about the occurrence of potentially stressful life events and health problems during the last 12 months. Since 2002, information about RTA and annual mobility has been added to this questionnaire.

2.4. Analysis

Two different persons separately entered the data from the questionnaires into a database. The two entries were compared, discrepancies were corrected, and inconsistencies were checked for. Data analysis used SAS version 8.2 and SPSS version 11.5.

2.4.1. Road mobility and the risk of road traffic accident as a driver

The literature suggests that the application of a natural logarithm transformation to the mileage driven leads to a linear relationship with the risk of accident (Janke, 1991). We therefore hypothesized that in the case of the logistic model, the logit of the probability of an accident behind the wheel (material and corporal accident) can be written as

$$\text{logit } P = \alpha + \beta \ln(\text{km})$$

where ln(km) is the road mobility expressed in the logarithm of kilometers driven in four-wheel vehicles.

The linear relationship between the logarithm of mobility and the logit of the risk of RTA was assessed by estimating parameter β. The risk of RTA being small, we used the number of RTA reported by a driver of four-wheel vehicles during his or her whole lifetime (material and corporal RTA). For each driver, we divided this number by the number of driving years, in order to estimate an annual rate of RTA. We approximated the logit of the probability of having an RTA over 1 year with the logit of this annual rate of RTA. We coded the natural logarithm of the number of kilometers driven in four-wheel vehicles in 2000 in 10 classes ranging from [6.00; 6.50[to [10.50; 11.00[. This includes