



## Profiling drunk driving recidivists in Denmark



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### ABSTRACT

Drunk drivers are a menace to themselves and to other road users, as drunk driving significantly increases the risk of involvement in road accidents and the probability of severe or fatal injuries. Although injuries and fatalities related to road accidents have decreased in recent decades, the prevalence of drunk driving among drivers killed in road accidents has remained stable, at around 25% or more during the past 10 years. Understanding drunk driving, and in particular, recidivism, is essential for designing effective countermeasures, and accordingly, the present study aims at identifying the differences between non-drunk drivers, drunk driving non-recidivists and drunk driving recidivists with respect to their demographic and socio-economic characteristics, road accident involvement and other traffic and non-traffic-related law violations. This study is based on register-data from Statistics Denmark and includes information from 2008 to 2012 for the entire population, aged 18 or older, of Denmark. The results from univariate and multivariate statistical analyses reveal a five year prevalence of 17% for drunk driving recidivism, and a significant relation between recidivism and the drunk drivers' gender, age, income, education, receipt of an early retirement pension, household type, and residential area. Moreover, recidivists are found to have a higher involvement in alcohol-related road accidents, as well as other traffic and, in particular, non-traffic-related offences. These findings indicate that drunk driving recidivism is more likely to occur among persons who are in situations of socio-economic disadvantage and marginalisation. Thus, to increase their effectiveness, preventive measures aiming to reduce drunk driving should also address issues related to the general life situations of the drunk driving recidivists that contribute to an increased risk of drunk driving recidivism.

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### 1. Introduction

Drunk drivers are a menace to themselves and to other road users, as alcohol is a main cause of accidents and premature death (Norheim et al., 2014). In the sphere of road safety, the risk of severe or fatal injuries increases significantly when driving under the influence of alcohol, and more specifically, with rising blood alcohol concentration (BAC). For example, driving under the influence of a BAC of 0.12% or above implies that the risk of being seriously injured is 78 times higher, compared to driving while not under the influence of alcohol (Hels et al., 2013). This increased risk is a consequence of the impairment in driving performance that is caused by alcohol, regardless of the driver's driving skills and frequency of drinking. Examples of the influence of alcohol on driving performance include increased reaction times, increased error rates, decreased car control, tunnel vision, slower visual information

processing, increased ignorance of traffic rules and an inability to handle unexpected or emergency situations (e.g., Domingues et al., 2009; Friedman et al., 2011; Ogen and Moskowitz, 2004).

Recently, the prevalence of alcohol among killed drivers in road accidents was found to be stable over the last 10 years, at around 25% in Norway, 31% in Finland, 32% in Sweden and 45% in Portugal (Legrand et al., 2014). All four countries reported a higher prevalence in male drivers and younger drivers (<35 years of age). In addition, the prevalence of fatalities involving BAC over the legal limit was high in all four countries. Thus more than half of the fatalities in Portugal and Spain, and more than 70% of the fatalities in Finland and Norway involved a BAC above 0.13%. Although the legal BAC limit differed between the four countries (in Sweden and Norway the legal BAC limit was 0.02% and in Finland and Portugal it was 0.05%) the results indicate, that high BACs is a key challenge. The prevalence of alcohol use by drivers severely injured in road accidents in Europe was evaluated at about 27% in an investigation focusing on Belgium, Denmark, Finland, Italy, Lithuania, and the Netherlands (Hels et al., 2013), while the rate of drivers over the allowed BAC limit was found equal to 1.7% from road side random checks in the same countries (Hels et al., 2013).

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Similarly, in the U.S., the prevalence of alcohol use among drivers killed in road accidents has been reported to be stable over the past 10 years, at around 40% (Brady and Li, 2014). In Denmark, it is estimated that about 0.5% of car and van drivers drive under the influence of alcohol with a BAC above the permitted 0.05%, and alcohol involvement has remained fairly constant over the past twenty years, affecting about 18% of all road injuries (Wiese Simonsen et al., 2013) and 25% of all road fatalities (Vejdirektoratet, 2014).

Generally, drunk driving is more prevalent among male drivers than among female drivers because of higher compliance with the law among females (e.g., Kaplan and Prato, 2007), although, during the last decade, an increase in the prevalence of drunk driving among female drivers has been identified (e.g., Robertson et al., 2011). Moreover, the circumstances related to drunk driving among women differ from the ones related to drunk driving among men; for example, female drunk drivers are better educated and have more mental problems, but are less likely to have been apprehended for other alcohol-related or non-alcohol-related offences. However, alcohol increases the risk of different types of crimes for both genders (McMurrin et al., 2011). In addition, female drunk drivers are generally older and are more likely to be apprehended in a large city and during the day, compared to male drunk drivers (Armstrong et al., 2014). Thus, there are some differences with regard to the circumstances related to drunk driving for males and females, which makes a particular focus on gender issues in relation to drunk driving highly relevant.

In the context of drunk driving, it is relevant to distinguish between drivers who exceed the BAC limit only once, and those who do it repeatedly: the so-called recidivists. Initial evaluations from the US found that about one third of the drivers charged with exceeding the BAC limit were recidivists (Fell, 1995). Recent estimates show that 11–41% of the drivers who are arrested and 11–69% of the drivers who are convicted for driving under the influence of alcohol have been respectively arrested and convicted for drunk driving before at an earlier point in time (Warren-Kigenyi and Coleman, 2014). The large variation in the estimates of the prevalence of recidivism is partly due to differences in study methods, particularly in the recruitment of the analysed samples and the time periods considered to detect recidivism. Additionally, differences in national and local procedures and rules with regard to the amount of time that apprehensions for drunk driving remain in the official records influence estimations on recidivism (e.g., Nochajski and Stasiewicz, 2006).

Different studies illustrate contradictory results. For example, some studies indicate that the likelihood of drunk driving recidivism increases with increasing BAC at the time of arrest (e.g., Armstrong et al., 2014; C'de Baca et al., 2001), whereas other studies do not find that effect (e.g., Cavaola et al., 2007). Other factors related to recidivism include drinking frequency (Schell et al., 2006), use of prescription drugs (Dickson et al., 2013), a criminal record (LaBrie et al., 2007), neurocognitive impairment (Ouimet et al., 2007), and age and education level (C'de Baca et al., 2001). Also gender plays a role, as drunk driving recidivism is more prevalent among male drivers than female drivers (Armstrong et al., 2014; C'de Baca et al., 2001; Lapham et al., 2000). Moreover, the interaction between gender and age has been examined, with a young age predicting recidivism among male, but not female, drivers (McMurrin et al., 2011). Finally, persons who die in alcohol-related car accidents are more likely to have one or more previous incidents of drunk driving registered by the police, compared to drivers who die in non-alcohol-related accidents (Brewer et al., 1994).

As an understanding of drunk driving recidivism is essential in order to design effective countermeasures, the present study aims at identifying differences between drunk driving recidivists and non-recidivists with respect to their demographic and

socio-economic characteristics, road accident involvement, and other traffic and non-traffic-related law violations. While previous studies have focused only on drunk drivers, this study analyses register-based data from Statistics Denmark to provide a profile not only of drunk driving recidivists and non-recidivists, but also a comparison of them with the non-drunk driving population. Moreover, while previous studies have focused only on an arbitrary sample of drunk driving offenders (e.g., Cavaola et al., 2007; Dickson et al., 2013; Lapham et al., 2000; Ouimet et al., 2007), this study presents a robust design by focusing on the entire population aged 18 or older in Denmark, while examining a 5-year period between 2008 and 2012 to measure recidivism. Finally, this study is the first to look at the differences in accident involvement and law violations, not only between recidivists and non-recidivists, but also with respect to the entire population.

The remainder of this paper is structured as follows. The methods used for the data collection and statistical analyses are presented in the next section. Then, the results from the univariate and multivariate statistical analyses are illustrated. Finally, the findings from the study are discussed, and conclusions are drawn.

## 2. Method

### 2.1. Data

The study population included all persons in the register-based data of Statistics Denmark aged 18 (the licensing age in Denmark) or older in the year 2008 ( $N = 4,260,306$ ). These persons were identified in the database of Statistics Denmark, and the following demographic variables were connected to the persons via their personal identification numbers: gender, age, civil status, household type, number of children in the household, place of residence, immigration status (i.e., native Dane; immigrant; descendant) and country of origin, highest level of education, income, yearly rate of unemployment, and job-related position. For each person, the number of drunk driving offences and other violations of traffic laws or non-traffic laws for the years 2008–2012 were retrieved from the national crime database maintained by Statistics Denmark. Finally, the number of accidents involving injuries as the driver of a vehicle that requires a driver's licence in the years 2008–2012 and information on the BAC at the time of each accident was added from the national accident database that is maintained by the Road Directorate and constructed on the basis of police registered road accidents.

### 2.2. Statistical analyses

First, persons that were involved in only one drunk driving incident in the year 2008 were compared with those who were involved in at least one additional drunk driving incident within the study period, according to selected demographic and socio-economic characteristics. The significance of the differences between recidivists and non-recidivists was tested via Chi-square tests and *t*-tests. Persons without drunk driving incidents throughout the study period served as a comparison group. Moreover, the significance of the differences between the profiles of male and female recidivists and non-recidivists was tested via Chi-square tests. Then, a logistic regression model was estimated to examine the likelihood of becoming a recidivist within the study period 2008–2012 for persons involved in a drunk driving incident in 2008 on the basis of their socio-demographic characteristics in 2008, the year of the first offence. The multivariate approach allowed us to examine the specific effects of single predictors when others were controlled for. Finally, the analysis focused on accident involvement and other traffic and non-traffic law violations of persons with no, one, or

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