Accident Analysis and Prevention 72 (2014) 17–22

Contents lists available at ScienceDirect

Accident Analysis and Prevention

journal homepage: www.elsevier.com/locate/aap

Driving under the influence of alcohol in the Netherlands by time of day and day of the week

Sjoerd Houwing*, Henk Stipdonk

SWOV, Institute for Road Safety Research, Bezuidenhoutseweg 62, 2594 AW The Hague, The Netherlands

ARTICLE INFO

Article history:
Received 9 January 2014
Received in revised form 2 June 2014
Accepted 6 June 2014
Available online 5 July 2014

Keywords:
Alcohol
Enforcement
Drink driving

ABSTRACT

The purpose of this study is to provide an overview of the variation in the prevalence of alcohol in everyday traffic in the Netherlands during all days of the week and all times of day. Breath tests were taken from randomly selected car drivers and drivers of small vans in six police regions in the Netherlands between January 2007 and August 2009. A total of 28,057 drivers were included in the study. The prevalence of driving under the influence of alcohol was highest during night-time hours of weekend days. Large proportions of sampled drivers under the influence of alcohol were also found during day-time hours on weekend days, especially early in the morning and early in the evening. Furthermore, a small proportion of sampled drivers under the influence of alcohol was found during morning traffic on Monday and Friday mornings. The results of this study indicate that drink driving is not only limited to night-time hours and that prevalence of drink driving is also high during evening hours from Wednesday to Sunday. In addition to these time periods, breath testing activities may also be effective from a police enforcement perspective on Monday, Friday, and Saturday mornings between 06.00 h and 08.00 h and on Sunday mornings until 10.00 h.

1. Introduction

Alcohol use in traffic is one of the most important factors in road safety crashes (Kim et al., 1995; Peden et al., 2004). It is estimated that in Europe 25% of all road fatalities are related to alcohol use (European Communities, 2013). In the United States and in Australia the proportion of alcohol related road fatalities is even higher (Sweedler and Stewart, 2009).

The most commonly used measure against alcohol use in traffic is a combination of legislation that prohibits driving with a blood alcohol concentration (BAC) beyond a certain limit, combined with police enforcement of this legislation. The effective element of police enforcement is deterrence and the effectiveness of deterrence depends on the drivers' impression of the likelihood of being caught when exceeding the limit. A distinction can be made between general deterrence and specific deterrence (Krismann et al., 2011). The aim of general deterrence is to motivate all drivers not to break the rules by creating fear of sanctions and providing the belief that the risk of being caught is high. For general deterrence the severity, speed and certainty of the punishment are important elements (Freeman et al., 2006). The aim of specific deterrence is to improve the attitudes and behavior of drivers once they are caught in order to prevent recidivism.

In most European countries (e.g. France, Norway, Spain, The Netherlands) random roadside breath testing is allowed and in a few countries (e.g. the United Kingdom and Germany) some kind of suspicion, for instance the smell of alcohol, is conditional for a policeman to test a driver (Österberg and Karlsson, 2002). Both systems are effective, but random breath testing was found to be twice as effective as selective testing, i.e. testing only after suspicion (Henstridge et al., 1997).

Doubling the number of random breath tests in the Netherlands was found to decrease the number of drink driving offenders by approximately 25% (Mathijssen, 2005). The effectiveness of random breath testing can be enhanced when it is done near places where alcohol is consumed and at specific times and specific days when the prevalence of drink driving is high, i.e. on weekend nights (Mathijssen, 2001). Effectiveness is further improved when publicity accompanies enforcement campaigns (Erke et al., 2008). Research and experience suggest that highly visible random breath testing (RBT) in order to deter, combined with targeted random breath testing that is not clearly visible and therefore harder to detect, is the most effective approach (ETSC, 1999).

Most random breath testing activities in the Netherlands are conducted during night-time hours, mostly on Friday and Saturday nights (Mathijssen, 2001). These enforcement activities are

* Corresponding author. Tel.: +31 703173386.
E-mail address: Sjoerd.Houwing@SWOV.nl (S. Houwing).

http://dx.doi.org/10.1016/j.aap.2014.06.004
0001-4575/

specifically aimed at nightlife activities. Results of several prevalence studies show that the proportion of sampled offenders increases between 22.00 h and 04.00 h (ADV, 2012; DVS, 2011). However, less is known about the prevalence during other days of the week and other hours of the day. The Dutch police presume (Jansen, 2013) that drinkers on Sunday nights are unaware that their BAC may still be over the legal limit when they drive to work the next morning. This is also visible in the log data from the Finnish alcohol program for drink driving offenders (Löytty, 2013) in which fail tests due to too high blood alcohol levels were especially prevalent on Monday mornings. If high BAC levels in drivers also occur during Monday mornings or other time periods, alcohol enforcement activities could also be performed during these other time periods. Depending on the traffic volume and the alcohol related road toll, enforcement activities during these time periods may be cost effective.

Between 2006 and 2011 the European research project DRUID (Driving under the Influence of Drugs, Alcohol and Medicines) was conducted to provide a scientific base for European road safety policy to combat driving under the influence of psychoactive substances (DRUID, 2012). Within the DRUID-project 13 national roadside surveys were held to determine the prevalence of psychoactive substances in traffic. These roadside surveys were designed according to a common study design (Assum et al., 2007) in which the hours of the day were classified into four six-hour time periods (04.00–10.00 h, 10.00–16.00 h, 16.00–22.00 h, and 22.00–04.00 h) and the days of the week were classified into weekdays and weekend days; this resulted in eight time periods. These eight time periods were chosen because each period was believed to represent more or less the same pattern in substance use. In the analysis that was presented in the official publication of the prevalence studies (Houwing et al., 2011), the eight time periods were clustered into four time periods to increase the statistical power of the study. This resulted in the following clusters: weekdays (04.00–22.00 h), weeknights (22.00–04.00 h), weekend days (04.00–22.00 h), and weekend nights (22.00–04.00 h). However, the clustering made the DRUID results less useful for national enforcement strategies. Other studies have reported on the prevalence of alcohol during different time periods as well, but they either used clustered time periods or time periods that only represented a limited proportion of the times of the day and the days of the week (Assum et al., 2005; Beirness and Beasley, 2010; Belgisch Instituut voor de Verkeersveiligheid, 2010; Gjerde et al., 2008; Ingsathit et al., 2009; Lacey et al., 2009; Li et al., 2013).

This study provides detailed insight on the variation of the prevalence of alcohol in traffic during all days of the week and all times of the day, as 84 time periods of two hours were used. The increased insight on the prevalence of alcohol in traffic can provide an improved basis for an expansion of alcohol enforcement activities to other time periods to the customary periods during weekend nights.

2. Method

2.1. General design

A roadside survey was conducted to determine the prevalence of alcohol among the general driving population in the Netherlands. A stratified multistage sampling design was used. In the first stage, four study regions were defined in the Netherlands: North, East, South, and West. These regions were considered to be representative for the entire country with regard to alcohol use and traffic based on the results of annually conducted national prevalence studies on alcohol use in weekend nights (DVS, 2008). Within these regions, smaller research areas (i.e. six Dutch police regions) were selected in the second stage (Fig. 1).

Fig. 1. Geographical distribution of the six police regions: Groningen, Twente, Amsterdam-Amstelland, Hollands Midden, Gelderland-Zuid, and Tilburg.

Within these six police regions, survey locations were selected in which 28,057 car drivers and van drivers were randomly selected from actual traffic between January 2007 and August 2009. Survey locations were situated on main municipal and provincial roads, mainly within built up areas of both small and large municipalities. During the period 2006–2008, these road types together accounted for approximately 80% of police reported serious injury crashes in the Netherlands. For each police region, data was collected during 12 roadside survey sessions distributed over eight 6-hour periods covering all hours of the day on both weekdays and weekend days. The periods were distributed into type of day (work day/weekend day) and time of day (04.00–10.00 h, 10.00–16.00 h, 16.00–22.00 h, and 22.00–04.00 h). Four survey locations were selected for each roadside survey session. The main selection criteria were: traffic flow, (lack of) possibilities for drivers to avoid the survey location, enough room for the research and police teams and their vehicles, and safe working conditions. The availability of the police officers determined the number of car drivers who were stopped and breath tested by the police. In the first hours of a test session, traffic was sometimes too dense to test all passing drivers. In that case, drivers were randomly selected from moving traffic, according to the availability of police officers to perform a breath test. During later hours, when traffic had become less dense, a breath sample was taken from every passing driver. Eventually, all observations were combined according to time of day and day of the week, and divided into 7×12 groups G_{dh} of two-hour periods h and for every day of the week d.

The breath test was compulsory for all drivers who were stopped. The estimated blood alcohol concentration (BAC) was measured with a handheld breath alcohol analyzer using a Dräger Alcotest 7410 Plus screening device (Dräger Safety AG & Co. KGaA, Lubeck). Under Dutch legislation the resulting breath alcohol concentrations (BrAC) are converted into BAC using a conversion factor of 1:2300: 1 μg alcohol/ℓ breath air corresponds to 2300 μg alcohol/ℓ blood (Mathijssen and Twisk, 2001).