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Characteristics of Drunk Drivers in Sweden

Alcohol problems, Detection, Crime Records, Psychosocial Characteristics, Personality Traits and Mental Health

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To my grandmother Amelia

and little Amelia

ABSTRACT

Drunk driving not only causes public and individual harm but also leads to economic costs with severe consequences for society. Research on the Driving Under Influence (DUI) phenomenon in many countries was initiated to improve public safety, prevention and rehabilitation of the DUI offenders. Research results and experiences from other countries on DUI may not be directly applied to Swedish conditions because of different legislations, norms and attitudes towards drunk driving.

The main purpose thus has been to investigate and analyse Swedish DUI offenders with respect to their alcohol problems, detection, crime records, psychosocial characteristics, personality traits and mental health.

The main sample comprised 2 100 suspected DUI offenders from 17 police stations from all over Sweden. Alcohol problems were screened using Alcohol Use Disorders Identification Test (AUDIT). Detection was analyzed on the basis of information received from police authorities. Crime records were collected from Sweden's official crime statistics. From this sample of 2 100 suspected DUI offenders, 290 responded to an invitation to take part in the study of psychosocial problems assessed with the Addiction Severity Index (ASI). Additionally, 162 severe DUI offenders were assessed with the Neuroticism-Extroversion-Openness Personality Inventory - Revised (NEO-PI-R) and Symptom Checklist with 90 items, (SCL – 90) for psychiatric symptoms.

At least half of the suspected DUI offenders have alcohol problems, including those assumed offenders with a Blood Alcohol Concentration (BAC) below the allowed Swedish legal limit. Manner and time of detection of DUI are significant for the type of offender being identified. Criminality among Swedish DUI offenders is substantially higher than among Swedes in general. Swedish DUI offenders seem to be underprivileged in social dimensions including education and financial standing as compared to Swedish standard. DUI offenders have, despite low scores in Conscientiousness (common with substance abuse and antisocial personality profiles), significantly low scores in the Openness (to experience) domain.

DUI offenders are a heterogeneous group and drunk driving is not only a symptom of alcohol problems, but also of psychosocial problems often parallely with psychiatric comorbidity and criminality. Rehabilitation programmes thus ought to take into account alcohol dependence, mental health and antisocial traits and the frequently underprivileged psychosocial situation of DUI offenders.

LIST OF PUBLICATIONS

I. Bergman H, **Hubicka B**, Laurell H. Alcohol problems and blood alcohol concentration among Swedish drivers suspected of driving under the influence *Contemporary Drug Problems*, 2005, 32: 387-404

II. **Hubicka B**, Bergman H, Laurell H. Alcohol Problems among Swedish Drunk Drivers: Differences Related to Mode of Detection and Geographical Region *Traffic Injury Prevention*, 2007, 8: 224-231

III. **Hubicka B**, Laurell H, Bergman H. Criminal and alcohol problems among Swedish drunk drivers – Predictors of DUI Relapse *International Journal of Law and Psychiatry*, 2008, 31: 471-478

IV. **Hubicka B**, Laurell H, Bergman H. Psychosocial characteristics of Drunk Drivers assessed by the Addiction Severity Index, prediction of relapse *Scandinavian Journal of Public Health*, accepted November the 5th 2008.

V. **Hubicka B**, Källmén H, Hiltunen A, Bergman H. Personality traits and mental health of severe drunk drivers in Sweden. Submitted: *Social Psychiatry and Psychiatric Epidemiology*, November 2008.

CONTENTS

LIST OF ABBREVIATIONS

ASI	Addiction Severity Index
AUDIT	Alcohol Use Disorders Identification Test
BAC	Blood Alcohol Concentration
DUI	Driving Under Influence
DWI	Driving While Intoxicated
NEO-PI-R	Neuroticism-Extraversion-Openness Personality Inventory (Revised)
SCL-90	Symptom Checklist (90 items)

1 INTRODUCTION

1.1 A BRIEF BACKGROUND

Since Sweden became a member of the European Union in 1995, Swedish alcohol policy has been successively liberalized. Consequently, alcohol consumption (Bergman and Källmén 2002, 2003b; Källmén et al. 2007) and alcohol involvement in fatal car accidents has increased considerably up until 2003 (Swedish National Road Administration 2008). Total registered alcohol consumption in Sweden increased by 13% only between 1996 and 2000 (Sweden's Statistical Databases 2003). Unregistered sale of alcohol constitutes about 25% of total sales (Swedish National Road Administration 2008). In 1996 the total consumption per person was 8.0 litres of pure alcohol and by 2004 it had risen to 10.5 litres. According to other sources (SoRAD 2008), total alcohol consumption in 2005 was 10.2 litres pure alcohol per person. In the past two years, 2007 and 2008, recorded consumption was 9.8 litres per year.

An increase in alcohol consumption of 1% leads to an increase in the risk of Driving under Influence (DUI) by 0.6%, (Norström 1999). The estimated number of drunk driving offences in Sweden is over 12 000 per day and about 0.2% of all such incidents are made by a driver with Blood Alcohol Concentration (BAC) above the legal limit. This results in about 4.6 million DUI offences per year, (VTI 2008). DUI offenders kill about 125 people every year and injure more than 1 000 people in drunk driving related offences (Swedish National Road Administration 2008).There was a small decrease of DUI drivers dying from alcohol related car accidents in 2007 (23%) compared to 2004 (27%). Fewer drivers have died on the whole. Contributing factors to this improvement are probably the effects of an increasing number of sobriety controls by the police (from 1.4 to 2.5 million since 2003) and the introduction of Alcohol Ignition Interlock Devices (Swedish National Road Administration 2008). The true DUI rate - incidents which go undetected - is roughly estimated at 50 -1 000 incidents for every identified DUI offence. This depends among other things on the availability of police resources (Nochajski and Stasiewicz 2006). The probability of detection when driving drunk in Sweden is estimated to be about 1/200-1/250 (VTI 2008). About 20% of fatal road traffic accidents are alcohol-related, and the death rate among young drivers under the age of 35, and those over 65, is increasing. Approximately 50% of single-vehicle fatal accidents are alcohol-related. In 2006, the number of reported DUI cases by the police was 27 000. Drivers with prior DUI convictions are overrepresented in alcohol-related

fatal crashes (Swedish National Road Administration 2008). Since many such offenders continue to drive despite license suspension, monitoring their post-conviction driving is also a significant problem for the criminal justice system.

The average societal cost of a registered convicted drunk driver is now twice as high as in 1995. Alcohol-related traffic accident costs comprise at least 3 billion SEK every year (Swedish National Road Administration 2008). A government investigation committee calculated the total, annual societal cost for alcohol-related traffic accidents at 8.3 billion SEK (Swedish National Road Administration 2008).

Public, social, and individual harm together with the financial costs to society caused by offenders driving under the influence of alcohol have stimulated much research into the DUI phenomenon in many countries. The most important reasons for these studies are public safety, DUI prevention and rehabilitation of the offenders.

1.2 PREVENTIVE MEASURES AGAINST DUI IN SWEDEN

According to Swedish legislation, the allowed BAC limit for motor vehicle drivers is 0.02%. Exceeding this limit results in a fine and driving licence suspension for 1-12 months and possibly even a prison sentence of up to 6 months. The limit of ≥ 0.10% BAC is used in the case of severe DUI offence with a prison sentence of up to 2 years and driving licence suspension for 12-36 months alternatively driving licence revocation as a sanction. A severe DUI offence causing an accident resulting in somebody's death or serious injury may lead to a prison sentence of up to 8 years. It should be noted that the license sanctions are not part of the penalty system but an administrative sanction to increase road safety. A short prison sentence may be transformed into intensive supervision with electronic monitoring. License suspension or revocation may be avoided if the DUI driver agrees to join an Alcohol Ignition Interlock Programme. If the DUI offender admits to having a drinking problem and agrees to join a certified treatment programme, this may be an alternative to a prison sentence (Swedish National Road Administration 2008).

Other preventive measures consist of more than 2 million random or planned sobriety controls per year by the police. Sweden has a long tradition of very restrictive legislation regarding alcohol in traffic in form of laws and acts, directions, regulations and legal BAC limit.

The BAC limit in Sweden when compared to other countries is low (0.02%). In Europe only Estonia, Norway and Poland have the same BAC limit as Sweden.

However Croatia, Czech and Slovak Republic, Hungary and Romania have zero tolerance, (ICAB 2008).

1.3 ALCOHOL PROBLEMS AMONG DRUNK DRIVERS – AN OVERVIEW

Research on the prevalence of alcohol problems among drunk driving offenders has produced mixed findings. The differences are related to the various definitions of alcohol problems, the choice of samples and methods of assessment. The majority of DUI offenders show evidence of alcohol problems (see Appendix). Alcohol dependent persons and other problem drinkers, who constitute only a fraction of the general population, account for a very large proportion of problems related to DUI. This clear prevalence indicates a strong association between alcohol abuse and various types of driving-associated crimes. However, the degree of overlap is not clear.

The prevalence of alcohol problems among numerous samples of DUI offenders is rather varied, as presented by Vingilis (1983), ranging from 4% to 87% depending on the definition of alcohol problems and the methods of assessment. The studies are usually carried out on selected DUI groups already identified by either a high and illegal BAC, involvement in traffic accidents with or without fatal outcome, detention for a DUI offence or participation in treatment programmes for alcohol problems.

The purpose of this short overview (Appendix) is to present a comparison on the indicated prevalence of alcohol problems among DUI offenders in relation to; a) screening methods, b) definitions of alcohol problems and c)sample selection criteria, in studies dealing with alcohol problems in connection with drunk driving. Of importance is to mention that only psychometric methods for screening alcohol problems are analyzed, and none of the biological markers for liver status or similarly, no BAC level for establishing the presence of alcohol problem were utilised.

1.3.1 Definition of alcohol problems

Depending on the context, alcohol problems are defined in scientific literature in various ways. A commonly used definition based on the Diagnostic and Statistical Manual (DSM-IV) states that: “Alcohol dependence, (i.e. ‘alcoholism’, ‘alcohol addiction’) involves impaired control over drinking, manifested by physiological addiction to alcohol and/or serious disturbances of health, work, social or recreational activities. Alcohol abuse (i.e. ‘harmful drinking’) involves serious disturbance of health, work, or other areas of functioning related to alcohol use, without satisfying the criteria

for alcohol dependence. Hazardous use of alcohol, such as binge or chronic heavy drinking, places asymptomatic drinkers at risk for future health and other problems", (American Psychiatric Association 1994). Although DSM-IV definition criteria are most commonly used among researchers, not everyone applies them in the "drunk driving – alcohol problems" perspective.

For the purposes of this overview, *alcohol problems* as a term, is used widely to embrace various definitions including different degrees of the phenomenon, that is designations such as alcohol dependence, alcoholism, alcohol addiction, alcohol abuse, harmful drinking, hazardous use of alcohol (binge or chronic heavy drinking).

Alcohol problem definitions and specific criteria definitions with clear cut-off points, influence the results of research on the prevalence of alcohol problems among subjects. Quantified, well-defined operational descriptions of alcohol problems like those behind a*lcohol abuse, alcohol dependence, alcohol problem or severe alcohol problem*, result in a comparable prevalence of subjects with alcohol problems and their severity among DUI offenders within brief range (Table 1).

Table 1. Prevalence of DUI offenders with alcohol problem in relation to operational definition of *alcohol problems* (range and mean).

Operational definition of alcohol problems	Number of studies	Prevalence of DUI offenders with alcohol problem (range)	Prevalence of DUI offenders with alcohol problem (mean)
Presumptive-strong evidence of Problem drinking or Drinking problem	6	10-51%	33%
Alcohol problem,and	1	55-58%	56.5%
Severe alcohol problem		23-27%	25%
Alcohol abuse	8	21-78%	48%
Alcohol dependence		19-87%	43%
Alcoholism, Alcoholic, Alcohol-use disorder	10	6-92%	50%
Jellinek: problem drinkers	1	49%	90%
addicted drinkers		41%	
Lifetime problems associated with excessive alcohol use	1	90%	90%

On the other hand, an unspecific definition like "Alcoholism", along with subjective judgments made by nurses, physicians or other interviewers using different criteria, bring different results regarding the prevalence of subjects with alcohol problems among DUI offenders within a very wide range.

1.3.2 Assessment instruments

Assessment instruments for alcohol problems can be grouped as follows: a) screening instruments, where the purpose is to determine the presence of a problem; b) instruments estimating the severity of the problem and c) goal-specific instruments for establishing directions for rehabilitation and assessing change. The choice of instruments used in the DUI assessment can greatly influence the resulting percentage of offenders considered to have alcohol-related problems (Lapham et al. 1995; Korzec et al. 2001; Chang et al. 2002). For the purpose of such a study, screening instruments with good reliability and widespread application ought to be implemented. Unfortunately, there is a great variety of instruments used all over the world, and they are not necessarily reliable or standardized. Not many have good predictive validity for DUI risk.

Only a few of these instruments are frequently used internationally, are standardized, show good reliability and have a good reputation e.g., Alcohol Use Disorders Identification Test (AUDIT) or Michigan Alcohol Screening Test (MAST). Since many studies DUI offenders are assessed by a particular instrument often designed for that occasion, where not much is known about its reliability, the sole fact of the use of this screening instrument to some degree prevents a valid comparison. Therefore, the qualitative overview has limited value, as it compares reliable, well-tried internationally instruments like AUDIT or MAST with screening methods constructed for occasional studies, where the procedure and instrument's reliability are simply unknown (for example telephone interviews). Taking these limitations into consideration, comparisons are done despite the differences in the quality of the psychometric methods (Appendix).

1.3.3 Variety of selected samples

The third essential risk of the methodological inadequacy of comparisons between studies on DUI offence is the variety of selected samples. Usually the availability of DUI offenders determines sampling rules. It means, for example, selected DUI groups being already identified by either a high or illegal BAC. One of the subsequent problems in such a case is that what comprises an illegal level of BAC varies substantially between different countries and states (in USA), even up to 0.1%. Unfortunately, research findings and experiences from different countries might not be valid for comparison since legislation, alcohol use and attitudes towards drunk driving differ considerably between countries. In addition, there are also historical differences

within one country or state, owing to changed rules and laws. Legal blood alcohol concentrations from ten years ago often have become illegal due to new road safety rules in many countries, which makes samples gathered over the years less comparable.

Other frequent sources of studied samples are: involvement in traffic accidents and detention for DUI offence or participation in treatment programmes for alcohol problems. The prevalence of alcohol problems differs between traffic accident participants and general hospital emergency ward patients compared to participants in rehabilitation programmes.

Results showing prevalence of alcohol problems among subjects are influenced by sample selection rules and sample characteristics. For example, the results will differ depending on whether the sample comprises DUI first offenders, or multiple offenders, or mixed group subjects. The highest rate of alcohol problems occurs among multiple offenders compared to first offenders or only suspected offenders (Table 2).

Table 2. Prevalence of DUI offenders with alcohol problem in relation to sample characteristics

Sample characteristics	Suspected offenders	First offenders	Mixed group offenders	Multiple offenders
Number of studies	3	7	9	5
Prevalence of DUI offenders with alcohol problems	10-53%	6-70%	28-91%	80-92%
(range and mean)	36%	34%	66%	88%

The main issue of this overview would then be: Despite the variety of samples, assessment methods and definitions of alcohol problems, the prevalence of alcohol problems among drunk driving offenders is very prominent, implying that drunk driving is a part or result of alcohol problems according to a broad definition (considering the variety of definitions). Regardless of the assessment method and sample criteria for DUI offenders, the prevalence of DUI offenders with alcohol problems is substantial, approximately about 57%, (see Appendix).

1.4 THE COMPLEXITY OF DUI CASES

Drunk driving is seen as a criminal offence of varying degrees of seriousness in different countries. In the context of the protestant religious background and high sense of morality in Swedish society, the prevailing attitude toward the DUI offence is one of condemnation. So how DUI is regarded in each culture, is largely based on values and traditions. As a consequence, social interventions and sanctions have taken different forms, and implementations of these vary across countries and social groups.

Other factors also play an important role, such as opportunity factors i.e., availability of substance and accessibility of the vehicles. In countries where substance use is condemned due to religious reasons the risk of DUI offences is low. In addition low availability of vehicles has is indicative of fewer DUI offences. In other countries where substance use is legal, the substance is available around the clock and most people have purchasing power and access to a vehicle, the risk of DUI offences is higher.

"The manner in which an offence comes to the knowledge of the police includes mechanisms of selection", quoted from Karlsson and Romelsjö (1997). The manner in which a DUI offender is detected depends to some extent on regional differences in population density, police resources and above all, on the chosen strategy to detect and prevent drunk driving in terms of mode and time of police interventions. As a consequence, identification of DUI offenders in roadblocks and general traffic controls might be more feasible in metropolitan areas than in sparsely populated geographic regions like the north of Sweden. As a result, different kinds of DUI offenders might be apprehended. In a number of countries legal restrictions make it impossible for the police to conduct random breath testing.

Frequent alcohol problems are not the only problems DUI offenders have to deal with. In most of the studies, substance abuse is attributed to DUI offenders as an underlying cause or at least accompanying disorder. As a consequence social interventions in form of treatment are offered and often demanded in connection with driving licence retrieval. Since treatment efforts alone are not effective enough to prevent from relapse into DUI, other factors must be taken into consideration. Recently, in addition to substance abuse, other characteristics of DUI offenders have come into focus. These include:

- Attitudes towards drinking and driving
- The public knowledge level about risks and alcohol's influence on the brain
- Demographic characteristics
- Criminality and antisocial traits
- Personality characteristics

In this thesis, attitudes towards drinking and driving and the public knowledge about alcohol influence will be omitted and the demographic characteristics, criminality and personality characteristics will be analyzed more closely.

1.4.1 Demographic characteristics

With regard to socio-demographic characteristics like employment, formal education, family and social relations, DUI offenders are often reported as underprivileged compared to drivers in general (Siegal et al. 2000; Riala et al. 2003; Nochajski and Stasiewicz 2006).

Female DUI offenders have been reported as more underprivileged in such socio-demographic characteristics as employment, formal education, family and social relations, compared to drivers in general (Waller and Blow 1995; Wells-Parker et al. 1991; Siegal et al. 2000; Riala et al. 2003). Nochajski and Stasiewicz (2006) compared female and male DUI offenders and the effects of intervention on women's recidivism rate. Female DUI offenders were less likely to be married, more likely to be between 30 and 50 years of age and more highly educated, and had lower rates of high-problem drinking, lower prior DUI and public drunkenness arrest rates and lower re-offence rates than male offenders. Compared to male DUI offenders, female DUI offenders were more often unemployed, drug dependent, have more family problems and more often psychiatric problems such as depression and anxiety, when assessed using the Addiction Severity Index, (Maxwell and Freeman 2007ab; Hubicka et al. 2008).

1.4.2 Criminality and antisocial traits

According to Stewart et al. (2000) at least 45% of DUI offenders were found to have other convictions in addition to DUI. They conclude that repeat offending offers a better basis for planning penalties than BAC or any other relevant factor of prognostic value.

The belief that “first DUI offenders” are drivers with a single and isolated DUI event is inconsistent. “First offenders” usually have an extensive history of alcohol-impaired driving because of the low risk of detection, or, still even lower likelihood of conviction. One alcohol-related traffic event is a powerful risk factor of future alcohol-related relapse (Rauch et al. 2002). Cubric et al. (1990) found multiple offenders distinctive from first-time offenders with regard to the total number of crimes and lower age. Most multiple offenders proved to be criminal delinquents and were frequently prominent not only for various traffic violations, but also for various criminal offences. Independent predictors of re-offence into DUI among DUI offenders reported by Siskind et al. (2000) were: a) previous drunk driving, b)unlicensed or dangerous driving, and c) history of criminal convictions of any type.

Based on the fact that hostility and psychopathic deviations are common among DUI offenders, Wells-Parker et al. (1986) tried to construct a DUI typology for policy purposes. Many DUI offenders are habitual violators of other laws, so rehabilitation systems ought to take both severe alcohol dependence and antisocial traits among DUI recidivists into account.

The findings presented above lead to conclusion; the DUI offence is generally often only one aspect of criminal behaviour among disposed individuals.

1.4.3 Personality characteristics

Two different sets of DUI offender characteristics are apparent in former studies: First, there is a number of various characteristics often attributed to alcohol problems, for example anxiety (Ball et al. 2000), depression (Ball et al. 2000; Bauer and Baab 1995; Chalmers et al. 1993; Donovan and Marlatt 1982; Lapham et al. 2001, McMillen et al. 1992ab; Miller and Windle 1990; Parks et al. 1996; Siegal et al. 2000; Wieczorek and Nochajski 2005; Windle and Miller 1990), low assertiveness (Donovan and Marlatt 1982), neuroticism, introversion and inhibition.

Second, characteristics often reported in antisocial personality disorders, particularly in repeat DUI offenders, for example antisocial personality (Ball et al. 2000; Cavaiola et al. 2003; Miller and Windle 1990; Wells-Parker et al. 1986), low social responsiveness (Bauer and Baab 1995), lack of self-control (Bauer and Baab 1995), hostility (Begg et al. 2003; Cavaiola et al. 2003), poor decision-making lifestyle (Cavaiola et al. 2007), low emotional adjustment (Chalmers et al. 1993; Donovan and Marlatt. 1982), aggression (Miller and Windle 1990; Moore 1994; Stacy et al. 1991), sensation-seeking and impulsivity (Cherpitel and Tam 2000; Eensoo et al. 2005; McMillen et al. 1992ab; Nadeau 2002; Schell et al. 2006; Wieczorek and Nochajski 2005; Wilson 1992).

Psychiatric comorbidity is often attributed to both “profiles” of DUI offenders, (Lapham et al. 2001; LaPlante et al. 2008; McMillen et al. 1992ab; Nielsen et al. 1999; Nielsen et al. 2000; Rasanen et al. 1999; Siegal et al. 2000; Steer et al. 1979; Wieczorek and Nochajski 2005). Psychiatric comorbidity among DUI offenders with alcohol-use disorders - 50% of women and 33% of men are reported to have at least one additional psychiatric disorder, mainly posttraumatic stress disorder or major depression (Lapham et al. 2001).

Subtypes of DUI offenders became an object of focus, in order to devise the most beneficial prevention efforts and rehabilitation programmes. The question is whether a

DUI offender personality, or personality types, really does exist. The predisposition to DUI involves many different factors: psychological, social, familial, biological. Typical and often reported for DUI offenders are previous criminality, earlier DUI convictions, alcohol problems, parental conflicts, aggression and antisocial personality.

2 GENERAL AIMS

The main purpose of this thesis was an investigation and analysis of alcohol problems, detection, crime records, psychosocial characteristics, personality traits and mental health of Swedish DUI offenders.

2.1 Specific Aims

I To investigate the prevalence of alcohol problems in a representative sample of Swedish drivers suspected of drunk driving. To evaluate the validity of the BAC as a screening method for alcohol problems.

II To investigate the prevalence of alcohol problems in a representative sample of Swedish drivers suspected of drunk driving in relation to mode and time of detection. To identify the best predictors for alcohol problems among DUI offenders.

III To investigate the prevalence of DUI offences and other types of crimes, among drivers suspected of DUI. To check the significance of the previous criminality, different circumstances at detection, BAC level and self-reported alcohol problems as predictors of relapse.

IV To investigate the psychosocial characteristics of Swedish drunk drivers and psychosocial predictors of relapse into drunk driving. To investigate family background with respect to drinking and psychiatric/psychological problems and differences between the male and female Swedish DUI offenders with regard to their psychosocial problems.

V To capture and describe selected personality traits and mental health of Swedish severe DUI offenders. To verify the significance of the alcohol problems, personality characteristics and mental health profile for prediction of DUI relapse.

3 MATERIALS AND METHODS

3.1 SAMPLES AND PROCEDURE

3.1.1 Subjects

A total of 2 171 drivers suspected of DUI offence during the time period 1997 – 2001 were investigated and responded to the AUDIT questionnaire. (Suspected DUI indicates in this context an assumed DUI offender before the BAC level has been established). Since 66 of the DUI offenders responded more than once during this period because of a relapse, only their first BAC and AUDIT results were recorded and included in the study. All later responses were discarded.

As a result, the final sample included 2 100 DUI offenders (169 females; 8%), from 17 police stations representatively distributed all over Sweden, covering both densely and sparsely populated regions, to enhance the validity of the results for the whole of the country.

Mean and median age of the male drivers was 40 years (range: 15-88) and of the female drivers 39 years (range: 15-73). The proportion of the females among DUI offenders increased from 7.3% at the end of 1996 to 11.0% in early 2001.

Of all 2 100 suspected DUI offenders, 36 had BAC equal to 0.0% and 189 had BAC below the Swedish legal limit of 0.02%. DUI offenders with the BAC above 0.1% (Severe DUI offenders) consisted of 986 drivers. The majority of the vehicles were cars or trucks (1 750), followed by motorcycles and mopeds (153) and snowmobiles (20). Occasional single cases of a DUI offence with a tram or boat occurred too.

During the period of 1997 – 2001 period there were no significant changes in the age of DUI offenders, alcohol use, proportion of positive cases, or any other AUDIT results among the investigated drivers despite a minor decrease in average BAC. The investigated sample distributed with regard to manner and time of detection and BAC, separately for male and for female drivers is presented in Table 3.

Furthermore a control group of 785 drivers (266 females) not suspected of DUI, were recruited at general traffic controls by the same police districts as above, during the time period 1997-1998.

Table 3. Number of suspected DUI offenders at different modes and times of detection, mean age, mean BAC, type of vehicle and geographic region.

Detection	Men			Women		
Detection mode	n	Age	BAC/%	n	Age	BAC/%
Ordered traffic controls (road blocks)	418	44	0.052	47	40	0.047
Other specifically aimed traffic controls	110	41	0.078	8	39	0.078
Regular traffic supervision	535	36	0.093	31	34	0.103
“Calls” from public, (named)	96	46	0.150	8	46	0.147
“Calls” from public, (other)	327	43	0.148	33	42	0.164
Traffic accidents/severe personal injury	8	29	0.149	1	37	0.008
Traffic accidents/slight personal injury	35	38	0.170	8	31	0.130
Traffic accidents/property damage	94	40	0.153	11	42	0.149
Reckless driving	29	36	0.143	3	41	0.152
Hindering/disturbing traffic	1	28	0.024	-	-	-
Unlicensed driving	131	36	0.116	11	34	0.102
Speeding	61	40	0.071	3	40	0.099
Driving through red light/stop	8	36	0.108	1	33	0.002
Lack of proper vehicle lighting	20	31	0.125	1	47	0.020
Other offences (sea,air,railroad)	11	35	0.163	1	56	0.024
Missing	46	36	0.136	2	19	0.064
Time of day						
08-11.59	408	45	0.064	36	42	0.048
12-18.59	411	47	0.113	37	44	0.161
19-03.59	931	36	0.116	85	36	0.103
04-07.59	167	35	0.097	10	33	0.082
Missing	14	41	0.145	1	58	0.060
Type of vehicle						
MC, moped	153	31	0.109	12	21	0.068
Car, Truck	1750	41	0.102	155	40	0.106
Snowmobile	20	31	0.124	-	-	-
Boat	2	34	0.188	-	-	-
Railroad, tram	-	-	-	1	56	0.024
Tractor	2	45	0.046			
Missing	4	32	0.116	1	23	0.088
Police districts						
East Norrbotten	72	41	0.127	6	45	0.175
Umeå	111	41	0.107	12	36	0.061
Jämtland	84	38	0.161	9	39	0.158
Västernorrland	357	41	0.098	32	41	0.101
Dalarna*	23	42	0.105	1	33	0.250
Stockholm North	129	40	0.117	15	38	0.087
Stockholm West	195	37	0.109	16	37	0.119
Stockholm Södertorn	69	43	0.110	7	40	0.086
Östergötland	408	41	0.105	35	38	0.112
Jönköping	139	41	0.098	10	40	0.097
Kristianstad*	5	43	0.109	-	-	-
Gotenburg/Bohus	339	39	0.078	26	38	0.074

Note. Information about mode of detection was missing in 48 cases, time of day missing in 15 cases, about BAC in 4 cases, vehicle in 5 cases. Two regions* were active only for a few months due to lack of capacity to adhere to the study requirement of 90% distribution of the AUDIT.

3.1.2 Procedure Studies I and II

Information about the project and an AUDIT questionnaire with a stamped-addressed envelope were given to the suspected DUI at the police station, after the DUI offence. Once the ordinary interrogation and assessment of alcohol concentration had been completed, the participants were provided with the questionnaire, to be filled at home. In this way the AUDIT responses of the drivers were kept confidential from the police. All the police stations guaranteed that the AUDIT questionnaire would be handed out to at least 90% of suspected DUI offenders brought to the stations. Remuneration of 100 SEK (equivalent of about 12 USD) in the form of a shopping voucher was awarded when the AUDIT questionnaire was returned to the research team. In the case of the control group the AUDIT questionnaires were handed out to the drivers after routine traffic sobriety controls at the roadside, to be completed at home with similar remuneration conditions.

Information about sex, age, BAC and the circumstances at detection (manner and time of detection, type of road, and kind of vehicle) was also collected from the police (Table 1). Alcohol concentration was received directly from blood samples in 306 cases and from breath-alcohol instruments (intoxylizers) in 1 788 cases, recalculated afterwards into BAC. Both blood and breath analysis is expressed in percent of alcohol in blood.

“General traffic controls” comprise all routine controls, roadside sobriety tests, random spot checks, regular patrols, and roadblocks. “Calls from the public” include both anonymous cases and those with information about the driver or the vehicle; any information to the police, usually by telephone, from a witness, a family member or a friend about a person who is driving or intending to drive under the influence of alcohol. “Unlicensed driving” covers any kind of unlawful, illegal, unauthorized driving with license suspended, cancelled or revoked. Since there were no differences in course of action between “ordered traffic controls” and “other specifically aimed traffic controls”, the results are on occasion reported as “general traffic controls” including all random spot checks, sobriety checkpoints and roadblocks. “Traffic accidents” with severe personal injury are reported separately despite the small number of cases because of significant differences from all other traffic accidents with regard to prevalence of alcohol problems. “Traffic accidents – slight damage” includes all other types of accidents, with slight personal injuries as well as just property damage.

3.1.3 Procedure Study III

Out of 2 100 suspected DUI offenders described above 2 016 civic registration numbers were collected and checked against the criminal offender's register. The number of cases unidentified, having no address or a false address was 51. Furthermore, among suspected DUI offenders, 33 were foreigners with no Swedish civic registration number, and were therefore not included in the study. Finally, out of the 2 016 drivers, 1 830 could be found in the register.

The crime data was collected for the period of five-years before the investigation and also for the following two years. The five-year period (instead of life-time) was applied for the control of the time factor connected with age.

The categorization of crimes was made after consulting experts in the area. The crimes were combined in the following 14 categories: 1) DUI - drunk driving, 2) drug DUI, 3) other traffic violations, 4) illicit drugs, 5) murder or manslaughter, 6) other violence - crimes against life and health, 7) robbery, 8) sex crimes, 9) crimes inflicting damage – vandalism, 10) public order offences, 11) weapon crime, 12) theft or shoplifting, 13) fraud and other acts of dishonesty and, 14) illegal alcohol trade.

The DUI offences included the following crimes: DUI (BAC below 0.1%), severe DUI (BAC 0.1% or higher). Other traffic offences included: recklessness in traffic, crimes against the road traffic offences act, speeding, driving a banned vehicle, driving a defective vehicle, unlawful use (of vehicle), fleeing the scene of a traffic accident, running a red light, unlawful driving, acceptance of unlawful driving, promotion of unlawful driving and crimes committed against railroad law.

3.1.4 Procedure Studies IV and V

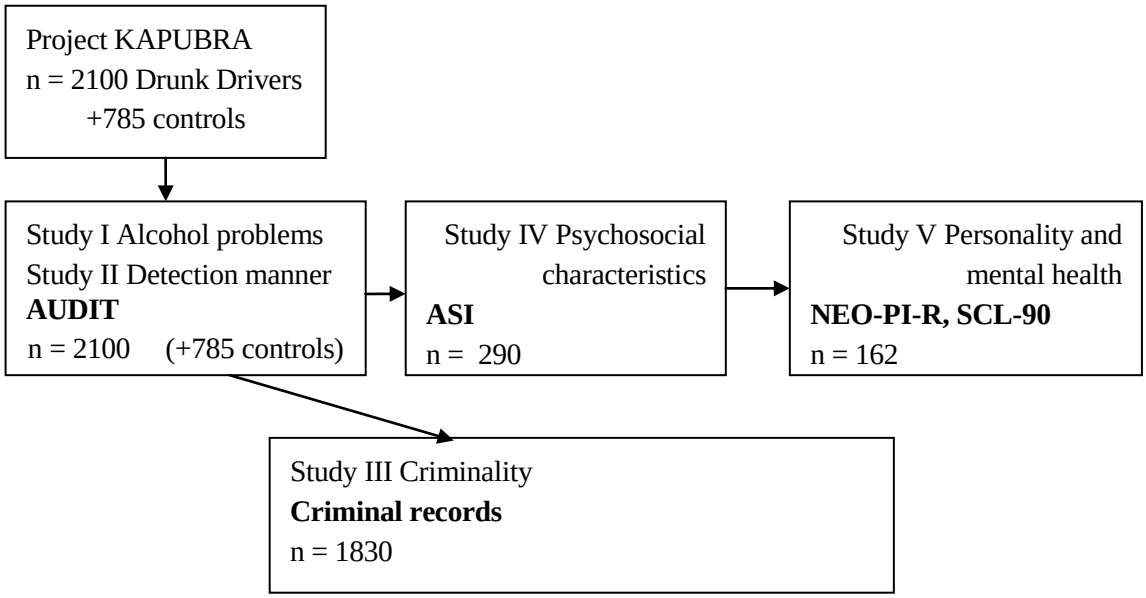
A sample of 475 drivers with a BAC above 0.019%, (Swedish legal limit) was drawn from the above described sample of 2 100 DUI offenders assessed for their alcohol problems with AUDIT and invited to further investigation.

They were recruited from nine police districts representatively selected from the north to the south of Sweden (Umeå, Sundsvall, Stockholm, Östergötland and Gothenburg) and invited to take part in Study IV, which consisted of an ASI intervew, (Addiction Severity Index - see assessment methods). Unwilling and unidentified drivers, drivers having no address or a false address and foreigners (with language difficulties) were not included in the study. Remuneration of 250 SEK (equivalent to about 30 USD) was given. In total, 290 DUI offenders were assessed with ASI, 128

with a BAC between 0.020% and 0.099% (DUI offenders) and 162 drivers with a BAC of 0.1% or above (severe DUI offenders). In all, 257 men (89%) and 33 women (11%) were investigated.

Furthermore, 162 severe DUI offenders out of 475 described above, with a BAC higher than 0.099% responded to the invitation to take part in the more extended Study V, where Neuroticism-Extroversion-Openness Personality Inventory Revised (NEO-PI-R) and Symptom Checklist with 90 items (SCL-90) were applied in addition to ASI. The participants received remuneration of 500 SEK (equivalent to about 60 USD). In all, 162 severe DUI offenders were investigated, 143 men (88%) and 19 women (12%). For overview of main aims, investigated samples and assessment methods see Figure 1 below.

Figure 1. Diagram representing main aims, the samples and assessment methods.



3.2 ASSESSMENT METHODS

3.2.1 AUDIT - Assessment of alcohol problems, Studies I and II

The AUDIT is a paper-and-pen, self-report questionnaire, with 10 items and three subscales: the consumption subscale (items 1-3) the dependence symptoms subscale (items 4-6) and alcohol-related harm subscale (items 7-10). Information about hazardous alcohol consumption (quantity and frequency of use, inclusive binge drinking), dependency symptoms (loss of control and abstinence symptoms), harmful consumption (guilt feelings, blackouts, somebody hurt, other people worried) is obtained. The total score varies between 0 and 40. The scale is recommended by the

World Health Organization, and others; Allen et al. (1997) Conley (2001), Bergman and Källmén (2002), Reinert and Allen (2002), Rumpf et al. (2002).

There are two ways to evaluate the AUDIT results. The first one is most common, simply based on raw scores, where 8 points or more is a "positive case", indicating some kind of alcohol problem. It is useful when the prevalence of alcohol problems in a sample is in focus and not the severity of the problem, which is simple screening procedure. Another, higher cut-off score has also been suggested, that is 16. The terms medium and high level of alcohol problems are recommended for 8–15 and 16-40 points respectively by Babor et al. (2001). Bergman and Källmén, (2002) suggest a lower cut-off score of 6 (respectively 14) or more for women.

The second way to evaluate AUDIT results is more informative. It allows the estimation of the severity of alcohol problems in comparison with the general population. Based on the AUDIT responses of a simple random sample of about 1 000 Swedes (80% response rate) raw scores were transformed to age- and gender corrected non-normalized T-scores (M=50, SD=10) (Bergman and Källmén, 2002). The internal consistency reliability of AUDIT in the investigated sample was satisfactory (Coefficient Alpha=0.87).

3.2.2 Crime Records - Assessment of criminality, Study III

Crime records of DUI offenders were collected from the Swedish National Council for Crime Prevention which is the Swedish Government's body of expertise within the judicial system and also produces Sweden's official crime statistics.

3.2.3 ASI - Assessment of psychosocial problems, Studies IV and V

The Addiction Severity Index is a semi structured interview including 180 items within seven domains; Medical condition, Employment and support, Alcohol use, Drug use, Legal status, Family and social relations and Psychiatric/psychological condition (McLellan et al. 1980; 1990).

Problem severity and need of help for each of the seven domains are assessed in terms of both, client and interviewer, ratings. Mathematically calculated severity indexes (Composite scores), based on the responses to some objective measures, are also calculated for each domain varying between 0 and 1.

For the purpose of the present study two constructs; "family harm index" and "abuse index" were created on the base of answers from Family History and Family Relationships domains. The "family harm index" summarizes drinking, drug use and

psychiatric problems in the family background and was calculated for each parent separately. The “Abuse index” was assigned when the subject was emotionally, physically or sexually abused.

3.2.4 NEO-PI-R - Assessment of personality, Study V

NEO PI-R - Neuroticism-Extroversion-Openness Personality Inventory (Revised) is a 240-question self-report personality inventory based on personality trait research for use with adults without evident psychopathology. It measures five personality domains: Neuroticism, Extraversion, Openness to experience, Agreeableness and Conscientiousness. This method differentiates between normal and atypical personality among ordinary individuals (Costa and McCrae 1992). The Swedish NEO-PI-R version is valid and reliable and norms in the form of T-scores show results in comparison to the Swedish general population (Bergman and Källmén 2003a).

3.2.5 SCL-90 - Assessment of mental health, Study V

The Symptom Check List-90 (SCL-90) is a self-rating scale with 90 items which documents psychiatric symptoms (Derogatis 1977). The SCL-90 has ten subscales: Somatization, Obsessions-compulsions, Interpersonal sensitivity, Depression, Anxiety, Hostility, Phobic anxiety, Paranoia and Psychoticism. A Global Severity Index (GSI) summarizes all subscales. Raw scores were transformed to a T-scale showing results in comparison to the Swedish general population (Malling Andersen and Johansson 1998). The method has been used to describe DUI-samples (Mulligan et al. 1973; Steer et al. 1979).

3.3 STATISTICAL ANALYSES OF THE DATA, STUDIES I-V

The Statistical Package for the Social Sciences (SPSS) was used to test differences between group means and group percentages (ANOVA, T-tests and Chi-Square tests) in studies I and II.

In Study III, in order to identify predictors of DUI relapse, two complementary methods were used. Segmentation analysis with Answer Tree (CHAID), Growing Method, was used to explore all combinations of variables and to identify subgroups where the proportions of the dependent variable “relapse to DUI during the following two years after investigation” are high. The segmentation analysis was used to identify which variables were particularly relevant for the prediction of relapse. Instead of

AUDIT T-scores, raw scores dichotomized at 16 points for male and 14 points for female drivers were used to simplify the CHAID analyses.

Binary Logistic Regression (SPSS) with backwards elimination of insignificant variables was used to achieve quantitative estimates (odds ratios) of the risk of relapse into DUI. The following variables were used as dichotomous predictors: prior DUI, prior drug DUI, prior traffic violations, previous other crimes according to the crime categories named in procedure, AUDIT dichotomized at the high level of alcohol problems (16+/14+) raw score, BAC dichotomized at ≥ 0.1%, mode of detection in seven dichotomous categories, that is general ordered traffic controls, regular traffic supervision, "calls" from the public, traffic accidents, reckless driving, unlicensed driving, speeding, and lastly, time of detection in four dichotomous categories: 08-11.59, 12-18.59, 19-03.59, 04-07.59. The age variable is confounded with prior DUI and other traffic violations and was omitted.

In Study IV, ANOVA, T-tests and Chi-Square tests were used to test differences between groups. Binary Logistic Regression was used to achieve quantitative estimates of the risk of relapse to DUI. Predictors were the dichotomized ASI interviewer ratings of the seven ASI domains.

In Study V additionally One Sample T-test to estimate significant differences between DUI group and Swedish normative sample was applied. K-means cluster analysis was used to generate subgroups. Binary Logistic Regression was used to achieve quantitative estimates of the risk of relapse into DUI. Dependent variables were registered relapse into DUI within two years and alcohol problems according to AUDIT. Predictors were alcohol problems according to AUDIT, NEO-PI-R domains and SCL-90 subscales in the first case, NEO-PI-R domains and SCL-90 subscales in the second case. The predictors were dichotomized according to principle problem-no problem for all variables.

4 RESULTS AND DISCUSSION

4.1 ALCOHOL PROBLEMS AND BAC - STUDY I

4.1.1 AUDIT results and BAC by gender and age

The main finding of this study is that more than half of the suspected DUI offenders (58% of male drivers and 55% of female drivers) have some alcohol problems according to the AUDIT. It can be compared with 15% of male and 10% of female control drivers (Table 4) and 18% of men and 11% of women in the general Swedish population (Bergman and Källmén 2002). The difference was statistically significant for both men and women ($p < 0.001$). The discrepancy between the groups was particularly large with regard to severe alcohol problems according to the 16+/14+ criteria ($p < 0.001$).

Table 4. Prevalence of medium and high levels of alcohol problems together with AUDIT T-scores among Swedish drivers suspected of DUI offence (n = 2 100) and control drivers (n = 785), by gender.

	Men						Women					
	DUI offenders			Controls			DUI offenders			Controls		
	n	%	T-score	n	%	T-score	n	%	T-score	n	%	T-score
None	803	41.6	49.2	441	85.0	47.2	76	45.0	52.4	240	90.2	49.2
Medium	662	34.3	63.0	75	14.4	60.7	59	34.9	72.6	24	9.0	64.0
High level	466	24.1	91.8	3	0.6	73.7	34	20.1	125.9	2	0.8	100.0

The differences between age groups in BAC levels were small even if significant ($p < 0.05$) and there was no difference in BAC level between male and female drivers (m = 0.103% and 0.102% respectively). However, the age differences both in AUDIT raw scores ($p < 0.01$) and in age- and gender-corrected AUDIT T-scores ($p < 0.001$) were more evident for the youngest group and between the age groups of female DUI offenders (Figure 2).

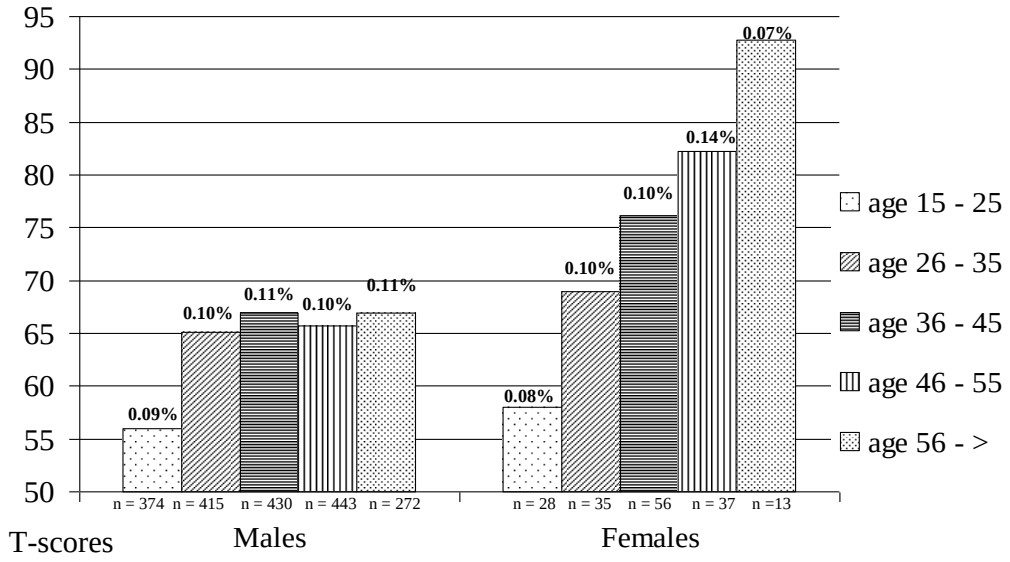
4.1.2 Female DUI offenders

About 8% of the suspected drunk drivers investigated in the present study were females. This prevalence is comparable to similar studies in Norway (Skurtveit et al. 1995), Germany (Iffland et al. 1995) and other countries. The female proportion of drunk drivers has increased steadily in Sweden, that is, in 1967 it was 1.5%, 6.2% in

1986 (Valverius 1989), 8.7% in 1999. The proportion of female DUI offenders in the present study increased from 7% in 1996 to 11% in 2001. This trend has also been observed in other countries (National Commission Against Drunk Driving 2002).

Comparisons between male and female DUI offenders on age- and gender-corrected AUDIT T-scores indicate more severe alcohol problems among female drunk drivers, particularly among middle-aged and older women (Figure 2). The parallel tendency was not observed among male drivers.

Figure 2. AUDIT T-scores, BAC level and number of investigated drivers suspected of DUI offence by age group and gender.



Note: A T-score of 50 corresponds to value of the general population. BAC missing for 4 cases.

The actual sample of 2 100 suspected DUI offenders was investigated during the period 1997-2001. During the same period there was a trend of higher AUDIT scores and an increased prevalence of positive cases identified in the general Swedish population that was statistically significant among females, particularly those 28-38 years old (Bergman and Källmén 2003b). Corresponding changes were not at that point observed among DUI offenders.

Swedish women who scored higher on AUDIT in 2001 than just a few years earlier may probably increasingly show up among the Swedish DUI population.

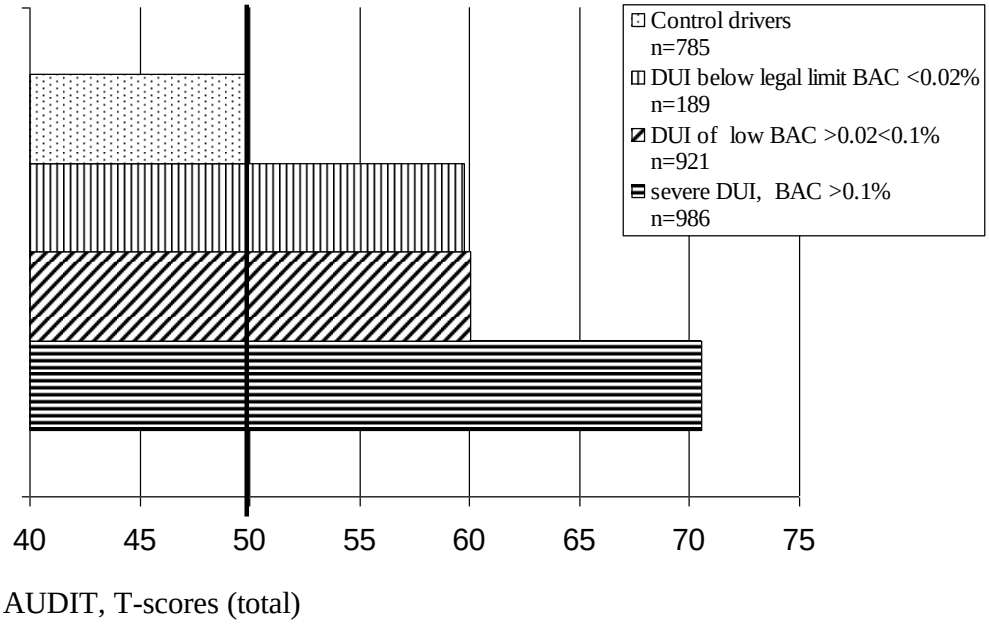
4.1.3 BAC level as an indicator of alcohol problems

The highest BAC level observed among the studied sample of 2 100 suspected DUI offenders was 0.484% among male drivers and 0.336% among female drivers.

Blood analysis is more often used in cases of traffic accidents and on drivers who refuse the breath test and on drivers who are too drunk to be able to give a breath sample. The mean BAC was higher in cases of blood analysis than in cases of breath analysis. In the group on which blood analysis was carried out, the mean BAC was 0.153% and for the group with breath analysis 0.094% (n = 308 and 1 788, respectively). The AUDIT results of those two DUI groups were also significantly different ($p < 0.001$).

Among 1 110 suspects with a BAC below 0.1% (the legal limit for severe DUI offence in Sweden) every second driver (49%) scored in the alcohol-problems region on AUDIT. Among 986 with BAC of 0.1% or and above more than two-thirds (69%) scored in the alcohol-problems region on AUDIT (Figure 3).

Figure 3. AUDIT T-scores for different BAC levels among Swedish drunk drivers.



Note: A T-score of 50 corresponds to value of the general population. BAC missing for 4 cases.

Fifteen percent of suspected DUI offenders, with a BAC below 0.1%, and 34% of suspected severe DUI offenders, with a BAC of 0.1% or higher, scored in the severe alcohol-problems region. The two BAC level groups differed significantly ($p < 0.001$) in both AUDIT total raw and T-scores.

A particularly interesting finding was that no fewer than 46% of the 189 suspected drunk drivers with a BAC below the Swedish legal limit of 0.02% had alcohol

problems according to the 8+/6+ criteria. Furthermore, no fewer than 50% of 36 drivers with a BAC of 0.00% scored in the alcohol-problems region. Consequently alcohol problems are common among "low BAC drivers." This trend was particularly evident among female drivers, where the prevalence of positive cases was about the same (48% - 53%) from 0.00% up to a BAC of 0.15% (Table 5).

DUI offenders with very high BAC levels, that is 83 cases with BAC 0.25% or higher, had a mean AUDIT T-score of 87 (83% positive cases that is AUDIT 8+). All other 2 021 cases with BAC below 0.25% had a mean AUDIT T-score of 64 (57% positive cases).

The suspected DUI offenders (BAC below 0.1%) and the suspected severe DUI offenders (BAC 0.1% or higher) had somewhat different AUDIT profiles. The DUI offenders and the severe DUI offenders differed significantly as evaluated by ANOVA with regard to quantity of alcohol consumed per drinking occasion, item 2 in AUDIT ($p < 0.001$), and frequency of binge drinking, item 3 ($p < 0.001$), but not with regard to frequency of consumption, item 1. Thus, the severe DUI offenders generally do not drink more often than the other drunk drivers, but they drink more per occasion and binge drink more often. Furthermore, they also score much higher on the alcohol-problems subscales (items 4 - 10, $p < 0.001$).

Table 5. Mean AUDIT T-scores and proportion of AUDIT-positive cases (score 8+/6+) among suspected DUI offenders at different BAC levels, by gender.

BAC	Men				Women			
	n	T-scores		Positive	n	T-scores		Positive
		Mean	Median	cases		Mean	Median	cases
0.000 – 0.019%	172	59	56	45%	17	67	65	53%
0.020 – 0.099%	847	60	56	49%	81	64	56	48%
0.100 – 0.149%	406	64	58	62%	33	81	60	52%
0.150 – 0.199%	295	68	65	70%	15	77	73	60%
0.200 – 0.249%	139	78	75	81%	9	102	98	100%
0.250 – 0.299%	45	83	87	87%	10	97	90	80%
0.300 – 0.484%	22	87	84	86%	3	138	177	67%

Using the Swedish legal BAC limit of 0.02% as a screening method for identifying alcohol problems (as defined by AUDIT 8+/6+) among suspected DUI offenders resulted in acceptable sensitivity (0.93) but very low specificity (0.12) and low positive prediction value (0.60) among male drivers. The corresponding values among female drivers were even lower. A high proportion of true positive cases (with

alcohol problems) could be identified, while true negative cases could not be excluded.

The highest positive prediction values were observed at 0.20% for female drivers and 0.25% for male drivers. However, at these high BAC levels the sensitivity was very low but the specificity approached 1.0. Thus at these high BAC levels, it can be established with certainty that identified drivers really have alcohol problems, but the majority of positive cases (with alcohol problems) are unidentified (Table 6).

Table 6. Sensitivity, specificity and positive predictive values for identifying alcohol problems AUDIT 8+/6+) at different BAC levels by gender.

BAC	Men			Women		
	Sensitivity	Specificity	Pos.pred.val.	Sensitivity	Specificity	Pos.pred.val.
0.00%	0.98	0.02	0.58	0.99	0.00	0.55
0.02%	0.93	0.12	0.60	0.90	0.11	0.55
0.05%	0.78	0.41	0.65	0.74	0.33	0.58
0.10%	0.56	0.65	0.69	0.49	0.66	0.65
0.15%	0.34	0.85	0.76	0.31	0.88	0.76
0.20%	0.16	0.96	0.83	0.22	0.96	0.87
0.25%	0.05	0.99	0.86	0.11	0.96	0.77
0.30%	0.02	1.00	0.86	0.02	0.99	0.67

In sum, using low BAC levels - for example, the Swedish legal limit of 0.02% - as a cut-off point to identify whether a driver has alcohol problems is not a valid screening method.

Despite being low, the response rate of 30% is comparable with the studies of a similar kind reporting rates varying between 20% and 50% (Vingilis 1983; 1989). Comparisons between the investigated 2 100 suspected DUI offenders and the total population of about 7 000 suspected DUI offenders with regard to BAC, age and sex (Independent-Samples T Test) support the representativity of the investigated sample for the population of DUI offenders in Sweden and the generalizability of the results. However, this sample might not be representative with regard to other characteristics - for example psychosocial status, antisocial attitudes, and, typical for persons with alcohol problems, denial and underreporting when responding to AUDIT, (Nochajski and Stasiewicz 2006). All substance abusers, including alcoholics and to a certain extent drunk drivers show evidence of scoring low on Conscientiousness (NEO-PI-R domain) and are known as “Noncompliant”. This may partly explain the dropout rate.

An even higher true proportion of DUI offenders with alcohol problems must be taken into consideration.

Participants were more heterogeneous than in most other previous relevant studies. The present study included drivers suspected of DUI, detected in various ways, times, places and with varying BAC levels from 0.00%. No less than 10% of the group had a BAC below the Swedish legal limit of 0.02%. The Swedish police use a device which shows nothing more than the positive or negative manifestation of alcohol incidence. The time factor might have had an impact on metabolism and eventually on BAC reduction before interrogation.

Besides increasing general knowledge about the connection between DUI offence and alcohol problems in Sweden, the present study should have implications for the legal BAC limit. Since the sample contained subjects with low BAC, under the legal limit and even with BAC 0.0% and still with alcohol problems, it confirmed that BAC level is a poor method for screening alcohol problems. The value of BAC as a screening instrument for alcohol problems begins first at a BAC of about 0.15%.

The reasons for low BAC in subjects with alcohol problems among suspected DUI offenders can be that they were detected during the falling phase of the BAC curve, or that their alcohol abuse problems were still only in their early course. From a public health point of view and in terms of prevention, waiting for these DUI offenders to reach high BAC levels as a result of prolonged over-consumption is neither reasonable nor economic.

4.2 ALCOHOL PROBLEMS IN RELATION TO DETECTION MODE AND TIME - STUDY II

4.2.1 The prevalence of alcohol problems in the DUI groups in contrast to control drivers and the general Swedish population

Drivers suspected of DUI detected in general traffic controls, (that is not biased by any extra circumstances like accidents or other offences), constitute the best sample for comparisons (of the prevalence of alcohol problems) with drunk drivers detected in other manners, with control drivers and with the general Swedish population (Bergman and Källmén 2002). Especially high levels of alcohol problems were observed among drunk drivers detected in manners other than general traffic controls (Table 7).

Table 7. Levels of alcohol problems according to AUDIT in DUI groups (general traffic controls vs. all other detection modes), control drivers and in the general Swedish population.

Alcohol problems	General traffic controls (n=583)		All other DUI offenders (n=1447)		Control drivers (n=785)		Swedish population (n=893)	
	Men	Women	Men	Women	Men	Women	Men	Women
None	53%	60%	37%	37%	85%	90%	77%	87%
Medium	33%	36%	35%	35%	14%	9%	18%	11%
High	14%	4%	28%	28%	1%	1%	5%	2%

4.2.2 Circumstances at detection

As presented in Table 3, the BAC level was found to be higher among suspected DUI offenders detected in certain manners, particularly in combination with "calls" from the public (especially women), traffic accidents, reckless and unlicensed driving ($p < 0.001$). DUI offenders detected by these manners also had significantly ($p < 0.001$) higher AUDIT, age- and gender corrected T-scores (Table 8).

Table 8. Number of suspected DUI offenders and AUDIT-results (T-scores and positive cases) at different modes and times of detection by gender.

Detection	Men			Women		
		T-scores	Positive		T-scores	Positive
	n	m	cases	n	m	cases
Detection mode						
General traffic controls	528	60	47%	55	62	40%
Regular traffic supervision	535	64	58%	31	67	48%
"Calls" from the public	424	68	63%	41	89	76%
Traffic accidents/ severe personal injury	8	69	88%	1	77	-
Traffic accidents/slight damage	129	66	68%	19	84	58%
Reckless driving	29	67	72%	3	88	67%
Unlicensed driving	131	72	76%	11	94	73%
Speeding	61	61	54%	3	56	33%
Lack of proper vehicle lighting	20	68	65%	1	48	-
Other/Missing	66	64	62%	4	60	50%
Time of day						
08-11.59	408	62	52%	36	65	50%
12-18.59	411	70	67%	37	95	70%
19-03.59	931	64	58%	85	71	52%
04-07.59	167	58	52%	10	60	50%
Missing	14	68	64%	1	56	-

Places of detection consisted of: urban road 77.3%; motorway 10.3%; rural road 13.1%; off-road or sea 0.9%; missing data 2.0%.

DUI offenders detected in general traffic controls, traffic supervision and in connection with speed offences scored lower on AUDIT and had lower BAC levels

(Table 3 and 8). DUI offenders stopped for unlicensed driving had the highest mean scores in AUDIT and the highest share of positive cases, 76% in males and 73% in females. A very high share of alcohol problems (88%) was found among eight drivers detected in traffic accidents with severe personal injury. The prevalence of alcohol problems is lowest among DUI offenders detected in general traffic controls, 47% in males and 40% in females. These differences were significant in both cases ($p < 0.001$). Female DUI offenders have in every case higher AUDIT scores through all detection manners except those detected through speeding offences.

The time of detection has also some impact on mean BAC-level and AUDIT scores. Drivers detected during the afternoon (between 12.00 and 18.59) have high BAC and the highest AUDIT-scores and share of positive cases, (ANOVA, $p < 0.001$), which presumably is caused by advanced alcohol problems in this group. In Sweden, norms with regard to drinking and driving may be described as very rigorous. The observation that the highest rate of drivers with advanced alcohol problems occurred during day hours may be explained by a combination of the lack of social norms along with highly developed alcohol abuse, with its impact on way of thinking (which has its impact on judgment of circumstances).

It is quite possible that DUI offenders detected with low BAC are in the falling phase of the BAC curve, thus having had high BAC levels before detection and therefore high probability of alcohol problem and relapse. DUI offenders with alcohol problems drive during the normal working hours while the average “party alcohol consumer” drives late in the evening or night and weekends. This might be the reason why drivers detected during the hours 12.00 - 18.59 had the highest AUDIT scores.

DUI offenders stopped for unlicensed driving have the highest proportion of positive cases with alcohol problems and the highest scores in AUDIT. Criminality or rather antisocial behaviour must be taken into consideration as a confounder for possible effects on the proportion of alcohol problems found via different manners of detection. Unlicensed driving, speeding or reckless driving are criminal acts per se and interact with alcohol problems. While 40% of all our DUI offenders had various kinds of criminal convictions during the preceding five-year period, the corresponding prevalence among the DUI offenders detected through unlicensed driving was no less than 77%. In a follow-up study two years after the enrolment, it was found that 45% of the DUI offenders had committed a variety of crimes as compared with 93% of the sample detected through unlicensed driving.

The relative impact of various predictors on the prevalence of alcohol problems (dependent variable) was explained by the following predictors (covariates): detection mode, time of detection, BAC, age and gender. These variables explained 10% of the variation of alcohol problems among the suspected DUI offenders. The greatest impact on the alcohol problems' prevalence emanated from the predictors in the following order: high BAC; unlicensed driving; detection hours 12.00 - 18.59; then detection hours 08 - 11.59, and age under 26 years. Age over 55 years and detection in general traffic controls were the two most significant factors with a negative correlation to the alcohol problem.

Almost the same results were obtained when the data was analyzed using the CHAID – method. Other important factors were detection in severe traffic accidents (only nine cases, positively correlated), detection through reckless driving (positively correlated) and speeding (negatively correlated). These results are stable even when the cut-off points for alcohol problems are increased to 16+ and 14+ respectively, that is to severe alcohol problems.

4.2.3 Regional differences

There are some differences between geographical regions in Sweden. In the sparsely inhabited northern region (for example Jämtland), the highest BAC levels were noted as well as a high share of positive cases. More detailed analysis explained that while large city streets are patrolled frequently, police enforcement works differently in sparsely populated areas of Sweden, turning out mainly to "calls" from the public or traffic accidents. It results in higher mean BAC levels and AUDIT T-scores than with the other modes of detection. Tested by ANOVA, differences between BAC levels between regions are significant for general traffic controls ($p < 0.01$), "calls" ($p < 0.01$), traffic accidents ($p < 0.01$), unlicensed driving ($p < 0.01$), but not for reckless driving or lack of proper vehicle lighting, though the results point in the same direction.

Nevertheless, if only one mode of detection is controlled and analyzed separately, for example general traffic controls only, significant differences between regions in the proportion of DUI offenders with alcohol problems remain. Differences in day schedules may partly explain variations in the numbers of DUI offenders detected during certain hours. In Stockholm, most DUI offenders are detected in the evening and early night hours. Many other districts concentrate their efforts on deterring drinking and driving during the day, and mostly before noon.

The differences between regions with regard to the alcohol problems rate among DUI offenders can to some extent be explained by police routines in terms of mode of detection. Urban areas are patrolled frequently with regular traffic controls, while police enforcement works differently in the sparsely populated areas in North of Sweden. In the northern counties (Jämtland, East Norrbotten), due to long distances and few policemen on duty, resources are often insufficient for regular traffic controls or supervision and drunk drivers are mostly caught when accidents occur or when the local police is informed about an offender. Often spot checks are carried out at places where drinking drivers are known to gather.

Another conclusion is that the mode and time of detection, and to a lesser degree BAC level, affect the prevalence of DUI offenders with alcohol problems and the prevalence of DUI offenders with a variety of criminal problems. Both the manner and time of detection are significant for the proportion of identified DUI offenders with a different complex of problems and thus different needs of preventive measures.

4.3 CRIMINALITY – PREDICTORS OF DUI RELAPSE - STUDY III

4.3.1 Criminality

Frequent problems connected to alcohol use is not the only problem among DUI offenders. Violent traffic behaviour, excitement-seeking, dysfunctional impulsivity (Eensoo 2005) and high prevalence of different psychiatric disorders (Lapham et al. 2001) are frequently observed as well. The results of Skurtveit et al. (1999) show that between 10% and 30% of the drivers convicted for DUI are rearrested two or more times for the same violation during a subsequent three-year-period. Other forms of criminality besides traffic violations are also common among DUI offenders, (Norström 1996; Nochajski and Stasiewicz 2006). The findings from other studies correspond with the results presented here.

Criminal acts other than traffic violations were four times more frequent among the investigated group of 1 830 Swedish DUI offenders (40%) than the national average (10%). The difference between male and female DUI offenders is significant ($p < .001$) 41% and 21% respectively.

The percentage of previous crimes besides traffic violations and DUI crimes during the five-year period before the investigation was as follows: thefts or shop-lifting 19%, violence - crimes against life and health 15%, frauds and other acts of dishonesty 13%, crimes inflicting damage – vandalism 9%, illicit drug crimes 8%, weapon crime 7%,

robbery 3%, public order offences 2%, illegal alcohol trade 2%, murder or manslaughter 0.3%, sex crimes 0.2%. In Table 9, the 11 crime categories besides DUI and traffic violations are merged and presented as “Other criminality” for reasons of simplicity.

Table 9. DUI, other traffic offences and other criminality in the five-year period before investigation and the following two years, for different modes of detection, in percent.

		Five years before investigation			Two years after investigation		
Detection mode	n	DUI Offences	Other traffic offences	Other criminality	DUI Offences	Other traffic offences	Other criminality
General ordered traffic controls	471	12	14	23	10	18	23
Regular traffic supervision	505	21	30	46	16	43	52
”Calls” from public	480	22	23	40	14	35	45
Traffic accidents	140	21	18	30	9	32	43
Reckless driving	21	14	24	52	10	43	48
Unlicensed driving	102	47	55	80	32	87	90
Speeding	34	21	38	47	15	71	74
Other /remaining	62	15	23	48	13	42	57
Total	1815	20	24	40	14	16	45

Note. Fifteen cases were missing.

Criminality among the described sample of DUI offenders increased overall from 40% in the five-year period before investigation to 45%, (for female DUI offenders from 21% to 34%) despite only a two-year follow-up. One possible explanation of the fact that criminality increased in almost all detection groups except those detected in general ordered traffic controls might be that the majority of the sample has some predispositions in the form of antisocial attitudes. The drunk driving offence is only one manifestation of these.

The proportion of convictions varied contingently according to detection manner. DUI offenders detected with unlicensed driving differed exceptionally from these detected in the other detection manners. The prevalence of sentences among DUI offenders detected through unlicensed driving was no less than 80% during the preceding five-year period, respectively 90% two years after (Table 9).

It is interesting to note that detection through regular traffic supervision resulted in a driver group with a prior crime prevalence of 46%, excluding DUI and other traffic

violations. The corresponding prevalence for general ordered traffic controls was only 23%. The explanation is that in the first case the police only check suspected drivers or vehicles and in the second case check vehicles randomly in road blocks. Thus, in the case of general traffic controls drivers are representative of the general population and in the case of regular traffic supervision only those who are suspected for some reason were checked and then apprehended.

4.3.2 Prediction of DUI relapse

The overall prevalence of DUI relapse during the two-year follow-up period was 14%. The prevalence of DUI relapse by age group was the following: 18-25 years 14%; 26-35 years 19%; 36-45 years 31%; 46-55 years 23%; 56 years or more 13%.

The largest share of previous DUI offences, other traffic offences and other criminality was observed among drivers detected with some kind of unlawful, illegal, unauthorized driving, with their license suspended or revoked, as compared to DUI offenders in other detection modes.

Re-offenders have heavier drinking patterns (binge drinking, item 3 in AUDIT) significantly differing from rest of the DUI offender group ($p < 0.01$).

The segmentation analyses using "DUI re-offence during the following two years" as a dependent variable resulted in the following significant segmentations: previous traffic violations, severe alcohol problems according to the AUDIT, previous DUI, other criminality, BAC <0.1%.

According to the Binary Logistic Regression analysis, the following six significant predictor variables for a relapse in DUI were identified in descending order according to the Odds ratio: 1) prior traffic violation, 2) prior DUI offence, 3) prior frauds or other acts of dishonesty, 4) detection between 12.00 and 18.59, 5) detection in general traffic controls (negative) and 6) BAC $\geq$ 0.1% (negative).

The time of day for detection seems not to have been reported as a relapse predictor previously.

The results from the segmentation analysis and the regression analysis coincided partly. High level of alcohol problems and age above 28 years identified in CHAID were not identified as predictors in the regression analysis. On the other hand, detection hours 12.00 – 18.59 and detection in general traffic controls identified in the regression analysis were not identified in the segmentation analysis. Separate analysis for men and women were not carried out since only ten women relapsed.

The BAC level has often been used as a predictor for re-offence with varying outcomes, (Nochajski and Stasiewicz 2006). In the present study DUI offenders and suspected DUI offenders relapsed more often when they had low BAC level at the time of enrolment in the study ($p < 0.05$). The possible explanation is that high BAC may be a reason for detention or parallel serious legal consequences so that intervention per se decreases the possibility of relapse. Thus, the detention might have a secondary preventive influence. Furthermore, some of the DUI offenders with high BAC might have such severe alcohol problems that they also have economic problems and therefore less access to a motor vehicle than before. In that case they do not drive as often as before and the risk of being detected again is reduced.

Since the probability of detection when driving drunk in Sweden is estimated to be about 1/200, only a very small proportion of DUI re-offenders could be detected during the following two years. Consequently, the criterion or outcome measure is not particularly sensitive. If a longer follow-up period could be used, the relapse rate would probably be higher and the influence of the rapidity of relapse could be investigated in the prognosis of DUI recidivism.

Alcohol is very often a powerful factor in connection with severe criminality. Alcohol destroys judgment and reduces inhibition, which results often in acts of violence, rules and law-breaking. The drunk driving offence is only one of it's manifestations. Criminal acts other than traffic violations were four times more frequent among the investigated DUIs (40%) than the Swedish national average (10%) (SCB 2003). A total criminality of 64% (other DUI offences and other traffic offences included) was found among the investigated sample of suspected DUI offenders. No less than 40% of the group had committed crimes other than traffic violations. Prevention and rehabilitation programmes for multi-criminal DUI offenders should take into consideration not only alcohol problems, but also personality deviations such as antisocial traits, poor decision-making skills and psychiatric comorbidity.

DUI offenders as a group are generally reported as psycho-socially underprivileged, (Nochajski and Stasiewicz 2006) and this is also the case in the present investigation. Female DUI offenders in particular seem to be disadvantaged during their childhood and adolescence in an environment with a lot of alcohol and drugs and parents with psychiatric problems. They also have alcohol, drug, psychiatric and interpersonal problems when arrested by the police for drunk driving. Thus, female drunk drivers, as a steadily increasing subgroup among DUI offenders, probably need specifically targeted treatment and rehabilitation resources.

4.4 PSYCHOSOCIAL CHARACTERISTICS - STUDY IV

4.4.1 Socio-demographic characteristics

Due to the sample collection procedure, the sample of 290 DUI offenders (33 female) assessed with the ASI was a comparatively representative group of Swedish DUI offenders (Table 10). However, it is reasonable to speculate that the remuneration of 250 SEK might have been particularly attractive for economically underprivileged DUI offenders, resulting in a socio-economic bias in the investigated sample.

Table 10. Sociodemographics of 290 DUI offenders according to ASI by gender, in percent, gender differences (* = $p < 0.05$, ** = $p < 0.01$).

DUI offenders	Men (n = 257)	Women (n = 33)	p
Age (mean)	41	37	*
Years of education (mean)	11	11	
Years of education (%)			
Education not completed <9years	20	9	
Education completed - 9 years	18	39	
High school/similar education	49	39	
College or university	12	13	
Living arrangements (%)			
With family (own or parents)	35	27	
With children alone	4	18	
With partner alone	27	36	
With friends	1		
Alone, institution, no stable	33	18	
Marital status (%)			**
Single	40	55	
Married or cohabiting	27	18	
Separated or divorced	32	21	
Widowed	1	6	
Employment pattern (%)			**
Full-time	55	33	
Part-time	7	30	
Student	12	24	
Military service	1		
Retired/disability	12	9	
Unemployed	11		
Controlled environment	2	3	
Alcohol problems in family (%)			**
Father	23	45	
Mother	6	28	
Psych. problems in family (%)			**
Father	6	13	
Mother	10	24	

The majority of the DUI offenders (66%) lived in metropolitan areas. Three-quarters had their own accommodation, 15% were living with their family and 1% was

homeless. Only about half of the DUI offenders had an income from employment. Severe DUI offenders were more often supported by the social welfare system or unemployed. Male DUI offenders were significantly more often unemployed than female DUI offenders. Female DUI offenders more often than male had part-time employment.

4.4.2 Health, social relations and family problems during childhood and adolescence

Injury or illness affecting the life of the DUI offenders was reported by 37% of the participants and 11% were living on sickness benefit or disability pension. No less than one-fifth (20%) had problems with controlling violent behaviour, 25% had had suicidal thoughts, 12% had attempted suicide and 27% had been prescribed medication for emotional problems.

A "family harm index" summarizing drinking, drug use and psychiatric problems in the family background was calculated for each parent separately. Among female DUI offenders 42% had a positive index value for the father as compared to 24% among male DUI offenders ($p < 0.01$). For the mother, positive index values were observed in 36% of female and in 13% of male DUI offenders ($p < 0.05$). No less than 61% of female DUI offenders as compared to 42% of their male counterparts reported earlier depression ($p < 0.05$). The corresponding prevalence of anxiety was 64% and 42% ($p < 0.05$). Furthermore, physical abuse earlier in life was reported by 40% of female and 11% of male DUI offenders ($p < 0.001$) and physical abuse in the last month by 12% of female and 0.4% of male DUI offenders ($p < 0.001$). Emotional abuse earlier in life was reported by 55% of female and 29% of male DUI offenders ($p < 0.01$) and emotional abuse in the last month by 18% of female and 7% of male DUI offenders ($p < 0.05$). Reported average number of days with interpersonal problems during the last month was 4.1 among female and 1.1 among male DUI offenders ($p < 0.01$). The corresponding number of days with psychological problems was 9.2 among female and 5.1 among male DUI offenders ($p < 0.05$). In sum, female DUI offenders had a worse psychosocial situation than male DUI offenders both when growing up and when enrolled in the study.

4.4.3 Alcohol and drug use

Among severe DUI offenders, 75% had scores indicating alcohol problems on AUDIT. The corresponding prevalence among the other DUI offenders was 49%. Female DUI

offenders scored significantly higher on the AUDIT T-scores than their male counterparts (m = 77 v s m = 68, $p < 0.05$). Multiple substance abuse was reported by some of the DUI offenders, that is alcohol in combination with the following drugs: amphetamine - 14%; cannabis - 19%; heroin - 4%; opiates - 5%; hallucinogens - 4%; cocaine - 3%; barbiturates or sedatives - 12%. The average number of days with drug problems during the preceding month was 1.3 for female and 0.2 for male DUI offenders ($p < 0.05$). Female DUI offenders reported more alcohol and drug problems than male DUI offenders.

4.4.4 Legal problems and previous criminality

According to ASI, 31% of DUI offenders had been prosecuted for a DUI offence more than once and 36% for other traffic offences resulting in a loss of driving licence sometime during their life prior to enrolment in the study. About a quarter (27%) of DUI offenders reported having been incarcerated for one month or more. Female drivers reported somewhat less criminality than male drivers. Severe DUI offenders scored higher than the others on the ASI index of legal problems ($p < 0.001$).

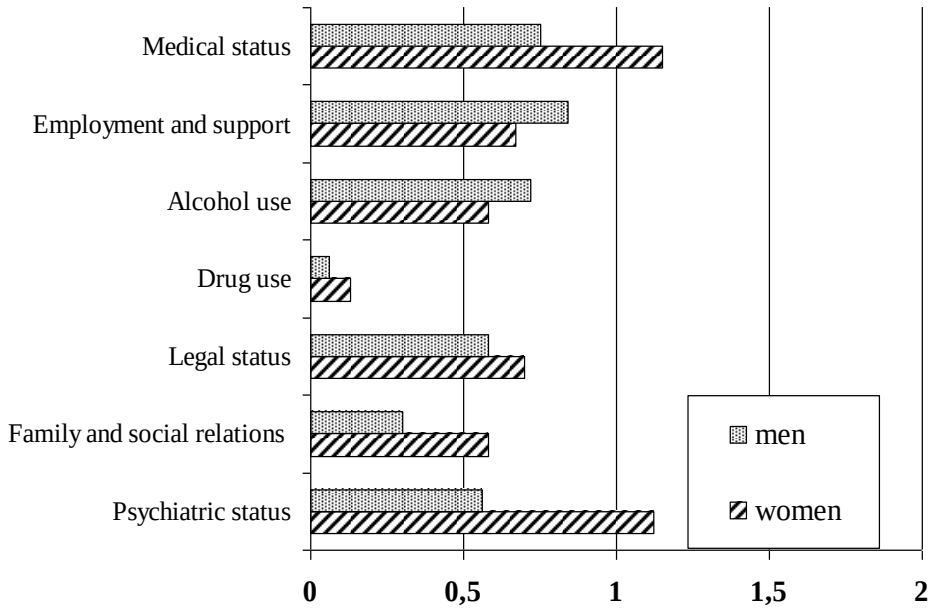
4.4.5 Psychosocial problems

DUI offenders rated their problems in the same direction, but higher, than the interviewers in the following domains: Medical condition, Employment and support and Legal status, but underestimated their alcohol problems (Figure 4). Female DUI offenders rated their problems as more evident, than their male counterparts did, except in Employment and Alcohol use.

There is a consistent trend of differences between male and female DUI offenders in the ASI, yet not statistically significant due to the small proportion of females in the sample. Nevertheless, more problems among females than among males were observed in the following domains: Medical condition, Drug use, Family and social relations and Psychiatric condition. The probability that all these sex differences would go in one direction given a random process, is quite small.

Problem ratings by interviewer in relation to Medical condition, Family and social relations, and Psychiatric condition, were insignificantly higher in the case of female drivers than male drivers. The same trend was observed in index scores of the Family and social relations problem domain. According to the interviewer ratings, severe DUI offenders had more problems with Alcohol use than the other DUI offenders ($p < 0.05$).

Figure 4. Addiction Severity index - self- ratings (means) of 290 Swedish DUI offenders.



There was also a non-significant trend in the same direction in Employment and support and Legal problems (p=0.08). In sum, there was a consistent trend of more problems with Alcohol and Employment and support among male DUI offenders, and more problems with Medical and Psychiatric condition, Drug use and Family and social relations among female DUI offenders (Table 11).

Table 11. Number and proportion of DUI offenders with moderate or severe problems according to ASI in percent (interviewer ratings, client ratings and mean index scores) by gender.

ASI domains	Men (n = 257)					Women (n = 33)				
	Interviewers		Clients		Index	Interviewers		Clients		Index
	n	%	n	%	m	n	%	n	%	m
Medical condition	28	11	54	21	0.20	6	18	11	33	0.28
Employment and support	43	17	56	22	0.67	3	9	5	15	0.63
Drug use	15	6	4	2	0.03	3	9	1	3	0.08
Alcohol use	67	26	52	20	0.20	8	24	5	15	0.19
Legal status	15	6	22	9	0.18	2	6	4	12	0.17
Family and social relations	24	9	22	9	0.11	5	15	6	18	0.17
Psychiatric condition	41	16	43	17	0.11	6	18	11	33	0.16

Positive psychosocial harm index – a parent with alcohol problems or psychiatric disorder, was found among 61% female DUI offenders and 32% male DUI offenders.

Psychosocial harm index is strongly associated with substance abuse and relapse into DUI (Nochajski and Stasiewicz 2006). In the present study, 69% of DUI offenders who relapsed to DUI during the following two years had a positive value in the "family harm index" in contrast to 33% DUI offenders without relapse. ($p < 0.05$).

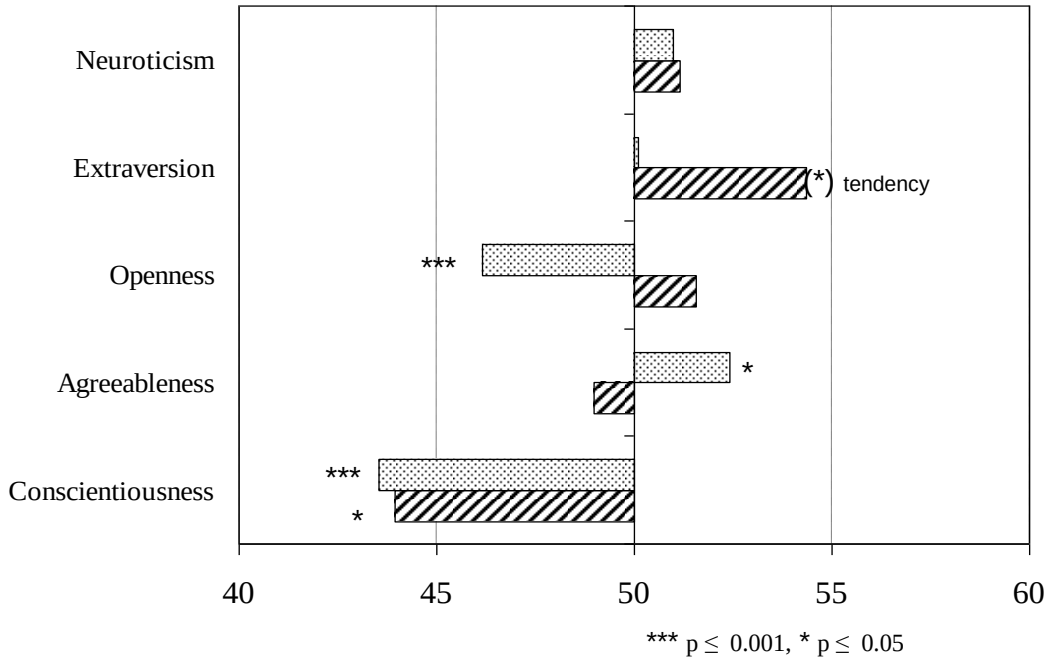
The psychosocial findings are consistent with those of other studies, where DUI offenders are also reported as more disadvantaged than drivers in general (Nochajski and Stasiewicz 2006). This is particularly true in the case of female DUI offenders (Maxwell et al. 2007ab; LaPlante et al. 2008). DUI offenders have a quantity of psychosocial problems (men who relapsed had worse family and social relations), which is contributing factor to relapse and should be addressed to increase their quality of life and decrease the risk of DUI relapse. The possibility of the skew selection must be taken into consideration. Since DUI offences are strongly condemned in Sweden and the remuneration of 250 SEK had little attraction for subjects earning more per hour, it is possible that a group of economically privileged DUI offenders was partly lost.

4.5 PERSONALITY TRAITS AND MENTAL HEALTH - STUDY V

4.5.1 Personality characteristics of Swedish drunk drivers

The results corroborated earlier findings on substance abusers that DUI offenders in the same way show low scores on Conscientiousness (McCormick et al. 1998; Ruiz et al. 2003). One new finding in the present study, but consistent with the overall image of the DUI offender, is, in addition to low scores on Conscientiousness, also low scores on the Openness (to experience) domain. The Openness domain includes opportunity for intellectual curiosity, receptivity to the inner world of fantasy and imagination, appreciation of art and beauty, openness to inner emotions and active experiences, in the end readiness to reconsider one's own values. There were significant differences between DUI offenders as compared to the normative sample of the Swedish population. DUI offenders scored significantly lower on the gender-corrected T-scores of the Openness to experience and Conscientiousness ($p< 0.01$ respective $p< 0.001$) but higher on the Agreeableness ($p< 0.05$) domains of NEO-PI-R. Apart from these domain differences there were significant differences ($p< 0.001$) in the following facets: higher on Depression, Vulnerability (to stress), Gregariousness, Modesty, Tender mindedness, but lower on Ideas (intellectual curiosity), Competence, Achievement striving and Self Discipline. The personality profile of the Swedish severe DUI offenders by gender is presented in Figure 5.

Figure 5. Personality profile of 162 severe DUI offenders (143 men /19 women) assessed by NEO-PI-R.

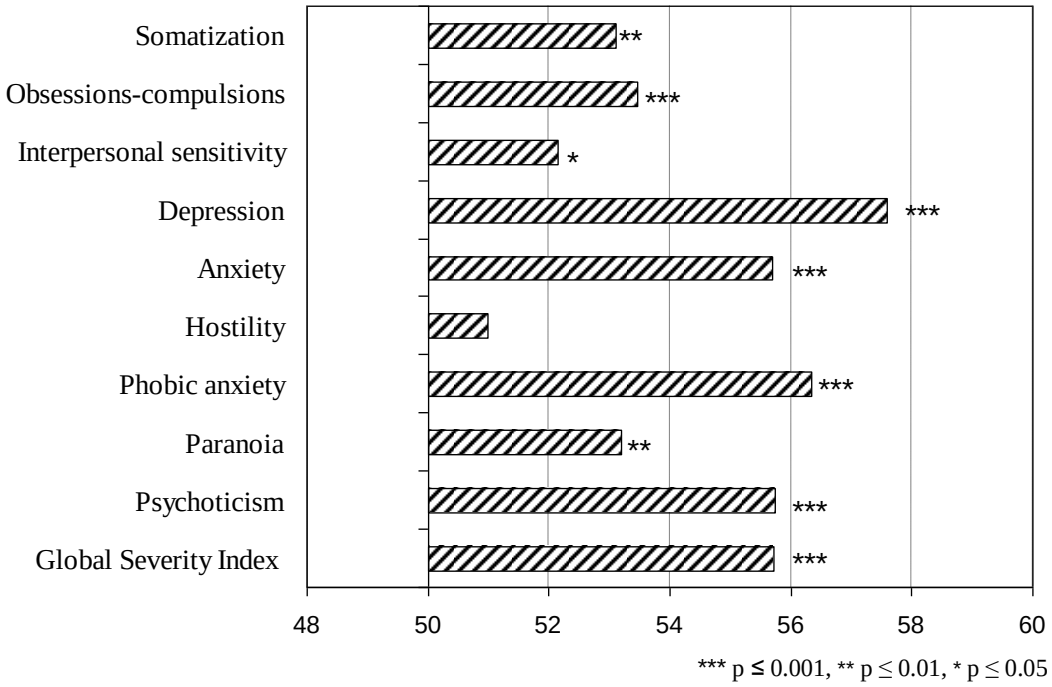


Some significant differences between male and female offenders were also observed. Female DUI offenders scored higher than male DUI offenders on the Extraversion (tendency) and Openness to experience (p=.057) domains. Female DUI offenders scored higher than male DUI offenders on the following facets of NEO-PI-R; Excitement-seeking ($p< 0.01$), Actions ($p< 0.05$), Ideas ($p< 0.05$) and Values ($p< 0.05$). These gender differences were observed despite the fact that all NEO-PI-R scores are gender-corrected.

4.5.2 Mental health among Swedish DUI offenders

The differences between sample (DUI group) means on SCL-90 scales and T-50 Swedish normative values are significant except on the Hostility scale. Depression scale scores are highest, (Figure 6). Female DUI offenders displayed the tendency to score higher than male DUI offenders on Somatization, Interpersonal sensivity and Paranoia. Since there were no significant differences between the male and the female DUI offenders, they were put together in the further analyses. The lack of significant subscale gender differences is partly due to the fact that the T-scores are already age- and gender-corrected. Psychiatric comorbidity among DUI offenders was found in other studies (Lapham et al. 2006; LaPlante et al. 2008; Maxwell and Freeman 2007ab; McMillan et al. 2008).

Figure 6. Mental health profile of 162 severe DUI offenders as assessed by SCL-90.



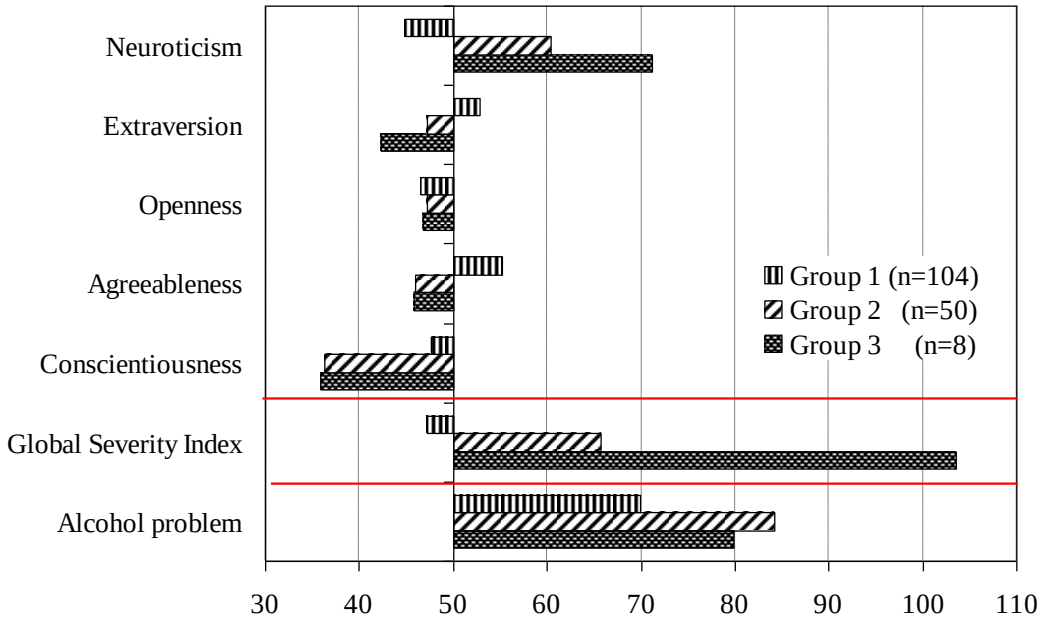
4.5.3 Subgroups of DUI offenders as assessed by NEO-PI-R factors, SCL-90 scales and AUDIT

The Swedish sample of severe DUI offenders was found to score low in Openness and Conscientiousness but as a whole group not high in Neuroticism. When subgroups were extracted, one-third of DUI offenders had high scores on Neuroticism, and was characterized by frequent binge drinking and depression.

DUI offender typology was explored on the basis of NEO-PI-R domain scores, the SCL-90 scale scores and the AUDIT results (both age- and gender-corrected). The cluster analysis indicated that a 3-group solution was the most plausible. Group 1 (n = 104) was characterized by NEO-PI-R and SCL-90 scores near the normative value of 50 but high alcohol problems according to AUDIT (mean T = 70). Group 2 (n = 50) and in particular Group 3 (n = 8) had profiles typical for substance abusers, that is high scores on Neuroticism and low scores on Conscientiousness in combination with severe alcohol problems. Group 3 resembles Group 2 with the difference in pronounced psychiatric symptoms on all SCL-90 subscales, all DUI offenders in this subgroup were depressive ($p < 0.001$). The results partially confirmed a two-cluster solution as optimal for defining separated subtypes of DUI offenders, (Ball 2000). Type A/B alcoholism distinction among DUI offenders fitted the sample which was otherwise heterogeneous

with regard to the level of alcohol involvement, personality traits and mental health, (Figure 7).

Figure 7. Subtypes of DUI offenders as constructed by NEO-PI-R factors, SCL-90 scales and AUDIT



4.5.4 Relapse predictors

In the Binary Logistic Regression the NEO-PI-R domains, the SCL-90 scales and the AUDIT results were used as predictors, and relapse of DUI in the 2-year period after investigation was used as an outcome variable. The Depression scale was found to have prognostic value for future relapses of drunk driving, (Odds ratio = 6.65). No one in cluster Group 3 (n = 8) in which all offenders were depressed, relapsed. Interestingly, despite being high in Neuroticism and low in Conscientiousness in combination with severe alcohol problems, the drivers in Group 2 relapsed insignificantly more often than the “normal” drivers in Group 1 with fewer alcohol problems (9.3% vs. 12.6%).

In combination with previous criminality per se, previous traffic violations and previous DUI offences “family harm index” is still the strongest predictor for DUI re-offence. High level of Neuroticism (NEO-PI-R) predicted the alcohol problem itself, Exp B = 3.176, $p < 0.01$, but not relapse.

Swedish severe DUI offenders as a group seem to differ from persons with an Antisocial Personality Disorder since they do not score high on the Neuroticism and low on the Agreeableness domains. Swedish DUI offenders do somewhat resemble both substance abusers and persons with an antisocial personality disorder since they

scored low on the Conscientiousness domain and all its facets: Competence, Order (personal organization), Dutifulness, Achievement striving, Self Discipline and Deliberation. Scores in the Conscientiousness domain inform generally whether the subject is a “good citizen” or not. Antisocial traits and attitudes ascribed often to DUI offenders increase the risk of skew selection. Under such circumstances, many DUI offenders with antisocial personality characteristics were lost and the true results of a severe DUI group are more evident than those presented here.

Another risk of skew selection must be taken into consideration particularly in Sweden. Since the DUI offence is condemned in Sweden and the remuneration of 250 or 500 SEK was not always attractive for subjects earning more per hour, it is possible that a group of privileged “white collar” workers were lost and subjects with psychological problems and psychiatric comorbidity were more interested in participating not only for economical reasons.

5 SUMMARY AND CONCLUSIONS

5.1 SUMMARY

Study I

More than half of suspected DUI offenders have alcohol problems and among these 24% have severe alcohol problems. The observation that almost half (46%) of the assumed DUI offenders with a BAC below the Swedish legal limit of 0.02% have alcohol problems and that this prevalence does not increase until a BAC of 0.10-0.15% is quite remarkable. BAC level per se is a bad predictor of alcohol problems except on very high levels. Even the mere suspicion of drunk driving indicates alcohol problems. The proportion of female DUI offenders is increasing. AUDIT T-scores indicate more severe alcohol problems among female drunk drivers, particularly among middle-aged and older women.

Study II

Both the mode and time of detection of the DUI offence were found to be important for what kind of offender is identified, from the alcohol problem aspect. The greatest impact on the prevalence of alcohol problems emanated from the following predictors: high BAC, unlicensed driving, detection hours 12.00 - 18.59 age under 26. Age over 55 years and detection in general traffic controls were the two strongest factors negatively correlated to alcohol problems' prevalence. The differences between regions with regard to alcohol problems' frequency could only partly be explained by police routines and resources.

Study III

The criminality of Swedish DUI offenders from official records during the five years before enrolment in the study was 40%, substantially higher than the national average of 10%. The male and female DUI offender criminality differs; 41% for males and 21% for females.

During the two years following enrolment in the study, 14% of DUI offenders had relapsed into drunk driving. Significant predictors of relapse among Swedish DUI offenders are: prior traffic violations, prior DUI offences, other previous criminality, alcohol problems, BAC below 0.1% and detection hours 12.00 - 18.59.

Study IV

Male DUI offenders have more problems with Employment and Alcohol use than their female counterparts. Drinking, drug use and psychiatric problems among the parents of the DUI offenders are much more common among female than among male drivers. Female DUI offenders report evident psychiatric comorbidity and problems within the Family and social relations area. DUI offenders as a group seem to be generally underprivileged in social dimensions including education and financial standing.

Study V

Results only partly confirmed findings that DUI offenders show high scores on Neuroticism and low scores on Conscientiousness typical for substance abusers. One new finding of this study, but consistent with the generally held image of the DUI offender is that despite low scores on Conscientiousness, they show low scores on the Openness (to experience) domain. Results also partly confirmed a two-cluster solution as optimal for defining separated subtypes of DUI offenders with a more severe course of alcoholism and high psychiatric comorbidity in one of the groups. Using as predictors personality traits, psychiatric comorbidity and alcohol use on their own, only the Depression factor had prognostic value for future relapses.

5.2 CONCLUSIONS

In Sweden, it is compulsory for drivers who have committed a severe drunk-driving offence (with BAC of 0.1% or above) to accept a re-licensing evaluation of their alcohol problems. On the basis of the results presented here, it can be argued that this level should be reduced and applied in all cases involving a DUI offence. From a public-health point of view, the results do not support the Swedish legal limit of BAC (0.02% as compared to a limit of zero) since the prevalence of alcohol problems is about the same for all BAC levels up to the BAC level of a severe DUI offence. The results should have implications for the legal BAC limit for a DUI offence and the conditions for the mandatory certificate of sobriety in connection with driving license retrieval.

The time of the day and detection manner, and to a lesser degree BAC level affect the prevalence of identified DUI offenders with alcohol problems and/or legal problems in need of intervention from society. Detection manner and time contain selection bias which in turn determines what kind of offender is identified. Hence arrests rely only on the available resources, the “true” relapse rate – share of drivers who continue but are not arrested is unknown. Since the majority of DUI offences are never identified, it is

important to optimize the detection strategies with the purpose of reducing public expense and applying optimal intervention strategies.

DUI violations observed among Swedish DUI offenders constitute only some of the law-breaking behaviours in their history of criminal convictions of many categories. The proportion of convictions varies contingently on the manner of detection. For example DUI offenders detected with an unlicensed driving differed exceedingly in their crime records from those detected in the other detection manners. Not only the BAC level but even the circumstances when detected should have then an impact on intervention. Rehabilitation programmes ought to include an educational component - information about risks, attitude changes, treatment component for accompanying substance abuse, deterrence component – sanctions (sentence) and preventive measures.

Severe DUI offenders have more problems with Employment and support, Alcohol use and Legal status than drivers with lower BAC. Thus, to a certain extent the BAC level when detected, often indicates the profile of psychosocial problems among drunk drivers.

Many of male and female severe DUI offenders have different personality characteristics compared to normal population and have a wide range of psychiatric symptoms that might have important implications for treatment, rehabilitation and prevention of DUI and in DUI recidivism. Drunk driving is not only a symptom of alcohol problems, but is also interconnected with psychiatric comorbidity, criminality and psychosocial problems. Thus rehabilitation programmes ought to take into account alcohol dependence, but also the mental health and antisocial traits among DUI offenders in conjunction with social services, if needed.

The small number of respondents made the generalization for female severe DUI offenders questionable. However with this being a constantly increasing minority group, from 7% to 11% over five years, female DUI offenders might need interventions and rehabilitation models designed specifically for them. Future investigation of female DUI offenders' characteristics should be therefore conducted.

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8 APPENDIX

Studies on alcohol problems among drunk drivers – overview

Study	Sample	Operational definitions	Assessment method	Results
Beck, K.H. and Summons, T.G. (1987)	2000 high school students	Problem drinking	Anonymous, questionnaire on frequency of drunk driving, and alcohol consumption	10% problem drinkers
Bergman, H., Hubicka, B. and Laurell H. (2005)	2100 DUI offenders	Alcohol problems	AUDIT	58.4% men, 55% women with alcohol problems
Chang, I., Lapham, S. C., and Wanberg W. (2001)	1644 DWI first offenders, from New Mexico not spanish	Severity of alcohol abuse	concisted of AUI, structured intervev,	45% males 40% females met DSM criteria for alcohol dependence
Cavaiola, A.A., Strohmetz, D.B., Wolf, J.M. and Lavender, N.J. (2003)	209 DWI offenders out of convicted offenders	Alcoholism	MAST Mac Andrews Alcoholism Scale	20% of first offenders, 31% of multiple offenders scored indicative alcoholism Similary, not clear data, on MAS
Conley TB. (2001)	126 multiple DUI offenders	Alcoholic Alcohol-use disorder	MAST AUDIT DSM-IV	91.6% resp. 80.3% resp 88.0%
Hasin, D., Van Rossem, R., McCloud, S. and Endicott, J. (1997)	876 NY resid. ages 18-65 7.6% Alc. abuse 27.3% Alc.dep. criteria	Alcohol abuse Alcohol dependence	AUDADIS DSM-IV	78% hasardous drivers met criterions for abuse
Lapham, S.C., Skipper, B.J., Owen, J.P., Kleyboecker, K. et al (1995).	2317 first DWI offenders	"Alcoholic" category	MAST STS MAC DSM-III counsellors	48% men, 37% women 21% men, 19% women 18% men, 6% women alcohol abuse 21% alcoholdependence19%
Lapham, S.C., Chang, I., Skipper, B.J. and Berger, L. (2000)	1184 convicted DWI offenders	Alcohol-use disorder	DSM-IV	58%, 66%, 72% for BAC< .15, resp <.20, resp>.20

Study	Sample	Operational definitions	Assessment method	Results
Lapham S.C, Smith E, C'de Baca J, Chang I, Skipper B.J, et al (2001)	612 women and 493 men, convicted of DWI	Alcohol-use disorder	interview using the Diagnostic Interview Schedule DSM-III-R	85% of female and 91% of male offenders reported a lifetime alcohol-use disorder.
Lapham, S.C., C'de Baca, J., Chang, I, et al (2002)	583 females and 495 males convicted of DWI	Drug use, Drug abuse Drug dependence	DSM-III Non-coerced interview by master-level counsellors	unclear
Lapham S.C., Smith E., Chang I., Skipper B.J., et al (2003)	760 female first DWI offenders 636 male first offenders	Lifetime Alcohol Dependence	in-person interviews examining the course of alcohol problems	61% females and 70% males estimated as having Lifetime Alcohol Dependence
Lucker, G.W. and Gold, J.D. (1995).	1283 male DWI offenders out of stationed in military base solders	DSM-III definition, -alcohol abuse -alcohol dependence	MAST Vaillant questionnaire DSM-III, MAS BAC	43% alcohol abuse 45% alcohol dependence
Michot F, Blum P, Schenker A (1984)	100 repeatedly convicted of drunken driving	WHO and Jellinek: problem drinkers addicted drinkers	MALT (Munich alcoholism test)	90% with alcohol problems
Miller, B.A., Whitney, R. and Washousky R. (1986)	461 convicted drinking drivers	Diagnosis of Alcohol Abuse or Alcohol Dependence	DSM-III Structured interview, Self-reported consumption levels	Approximately 74% had alcohol problems, received diagnosis of alcohol abuse 54% or dependence 19%
Parks, K.A., Nochajski, T.H., Wieczorek, W.F. and Miller, B.A. (1996).	812 DWI women offenders	Separated Alcohol abuse Alcohol dependence	DSM-III	68% with alcohol problems
Pristach, E.A., Nochajski, T.H., Wieczorek, W.F, et al. (1991).	184 convicted DWI offenders 81 first time 103 repeat DWI	Alcohol dependence	a DSM-III-R	66% first time 87% repeat DWI

Study	Sample	Operational definitions	Assessment method	Results
Snow R. W. (1996)	17 929 first time convicted DUI offenders	Presumptive evidence/ Strong evidence of a drinking problem	Mortimer-Filkins Score	Presumptive evidence of a drinking problem 50.6% Strong evidence 26%
Spiller B, and Rosenberg H. (1987)	70 certified DUI evaluators	"Clients" alcohol problem in connection with arrest	MAST DSM-III certified DUI evaluators	30%, 15% resp 50% yielded alcohol diagnoses in absence of DSM-III criteria
Zung, B.J. (1984)	156 apprehended drunken drivers	Lifetime: misuse alcohol problem drinking,	MAST (as verbal interview)	90% scored indicative of problematic drinking