BAC Level and Alcohol Problems among Drivers Suspected of DUI

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Abstract
1.600 drivers suspected of DUI, recruited from different geographical regions of Sweden, were assessed by the Alcohol Use Disorders Identification Test (AUDIT). Information from the police regarding where, how and when the suspects were identified and their BAC was collected. A control group of 785 drivers not suspected of DUI was also investigated. Hazardous or harmful alcohol use according to the AUDIT was four times as common among the male and ten times among the female suspected DUI´s as compared to the control drivers. More than half (58%) of the suspected DUI´s had such drinking problems and 18% had severe problems. More interesting was the observation that almost half (46%) of the suspects with a BAC below the Swedish legal limit of 0.2 had such problems. Using the BAC level as an instrument for identification of drinking problems in suspected DUI´s has low sensitivity and specificity. The time, place and circumstances when arrested as predictors of BAC and drinking problems were analysed. Implications of the findings are discussed.

Introduction
It's generally believed that the BAC level indicates the severity of drinking problems. Thus, a high BAC in a DUI is regarded as a sign of high tolerance for alcohol as a consequence of long heavy drinking. Conversely and implicitly, a low BAC would indicate absence of drinking problems. However, in a previous study of DUI-drivers [2] we concluded that the BAC level is a poor such indicator since no clear correlation with the alcohol problems summary scale of the Swedish Alcohol Use Inventory could be established. We hypothesized that a great number of drivers with drinking problems can be found among "low BAC drivers". In the present study the following questions were dealt with: How large proportion of suspected DUI´s have drinking problems according to the AUDIT-test? How many have severe problems? How does this group differ from drivers who are not suspected of DUI? How common are drinking problems among ”low BAC drivers” (under 1.00 BAC) and among suspected DUI´s below the legal limit of 0.20 BAC? Can the BAC level be used as a screening test for identifying drinking problems? How are BAC and drinking problems related to the manner, location and time of detection?

Methods
Sample and procedure
So far 1.600 (127 female drivers) persons from 17 police stations representatively distributed from the north to the south of Sweden who are seized for suspected DUI and who agree to

respond to the AUDIT-test have been investigated. Information about the project and an AUDIT-form with a stamped return envelope were handed out to the suspected DUI at the police station, after the interrogation, in order to be responded to at home. Information about gender, age, BAC and the circumstances at detection (manner and time of detection, type of road, kind of vehicle) was also collected. Furthermore, 785 control drivers recruited by the same police stations not suspected of DUI were also investigated. Both groups received 100 SEK for responding.

The response rate was 30%. Comparisons of the BAC, gender and age distributions of the responders with the corresponding parameters of all suspected DUI´s brought to the participating 17 police stations revealed no statistically significant differences. This speaks in favor of the representativity of the investigated sample.

The AUDIT-test

Alcohol Use Disorders Identification Test, (AUDIT) is a self-report questionnaire, with 10 items concerning ”hazardous use” (quantity and frequency of use incl. binge drinking) and ”harmful use” in terms of dependency symptoms (lack of control and abstinence symptoms) and negative consequences (guilt feelings, blackouts, somebody hurt, other people worried). A maximum total score of 40 can be achieved. The cut-off score for hazardous or harmful alcohol use is 8+ in AUDIT and 19+ indicates severe drinking problems. Furthermore, based on the AUDIT responses of a simple random sample of about 1.000 Swedes (80% response rate) we also used age- and gender corrected non-normalized T-scores (M=50, SD=10) [1].

Results

Differences between gender and age groups

Mean age of the investigated sample was 40 years (range: 15-88 years). Using analysis of variance (ANOVA), statistically significant differences were observed in BAC (p=.013) and AUDIT raw scores (p=.032), and particularly in AUDIT (age- and gender corrected) T-scores (p=.000), see Table 1. The mean T-score of the youngest age group was no less than 10 points lower than that of the other age groups. This is due to the fact that in the general population young people drink much more alcohol than older people [1]. There was no difference between men and women in mean BAC (1.06+- 0.76 and 1.04+-0.79).

More than half of the drivers (59% of the males and 40% of the females) had hazardous or harmful alcohol use according to the AUDIT 8+ criterion compared with 15% of the male and 3% of the female control drivers and 18% of the men and 5% of the women in general population. The difference between groups was significant for both men and women (p=.000). Figure 1 shows that in comparison with the general population female suspected DUI´s have more drinking problems than male.

BAC level as an indicator of alcohol problems

Among 820 suspects with a BAC below 1.0 every second (46%) and among 773 with 1.0 BAC or above more than two thirds (70%) scored in the drinking problems region on AUDIT. According to the AUDIT 19+ criterion 11% among suspects below 1.0 BAC and 25% among those with 1.0 or more had severe drinking problems. The two groups differed significantly (p=.000) in hazardous and harmful alcohol use in terms of both raw scores and T-scores. See Figure 2. No less than 46% of the 144 suspects with a BAC below the legal limit of 0.2 BAC scored in the drinking problems region, i.e., had hazardous or harmful alcohol use!

Using the BAC level of 0.2 as screening test for identifying drinking problems (as defined by AUDIT) in suspected DUI´s resulted in acceptable sensitivity (0.93) but very low specificity (0.11) and low positive prediction value (0.60). In other words, a high proportion of true

Table 1: Number of suspected DUI´s, BAC and AUDIT result (rawscores, percent 8+ and T-scores) per age group.

Age	N	BAC	AUDIT		
		M+-SD	Rawscore, M+-SD	Percent 8+	T-score, M+-SD
15-25	284	0.97 ± 0.55	10.5 ± 6.7	62%	56 ± 11
26-35	349	1.00 ± 0.67	11.7 ± 8.8	60%	66 ± 21
36-45	382	1.16 ± 0.86	11.8 ± 8.5	60%	68 ± 22
46-55	367	1.09 ± 0.88	11.2 ± 8.2	57%	66 ± 21
56-88	205	1.04 ± 0.75	9.8 ± 7.7	47%	67 ± 23

Note. Complete data missing for 7 cases.

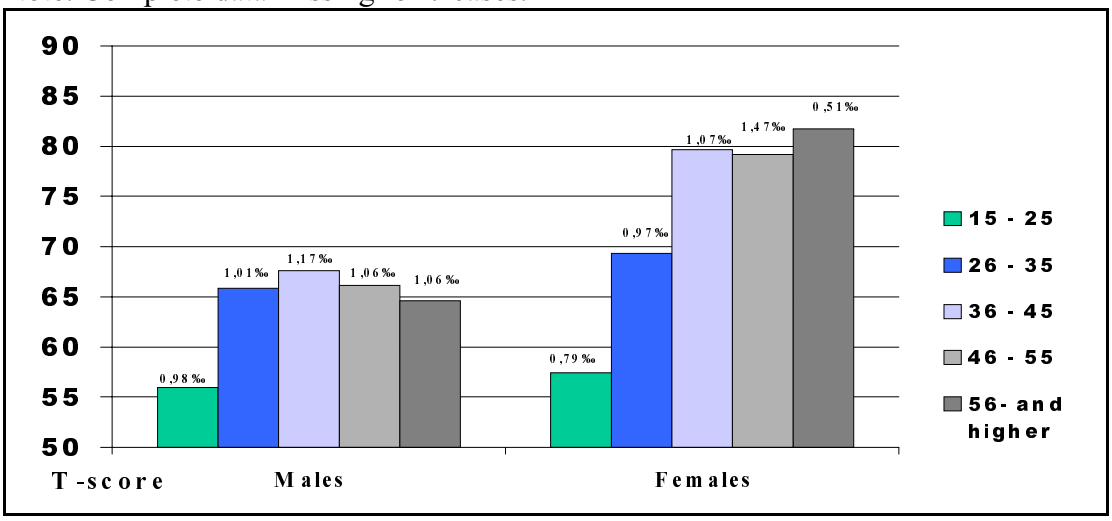

Figure 1:AUDIT T-score and BAC by gender and groups

positive cases were identified, while true negative cases were not adequately excluded. Using 0.5 BAC as cut-off point for positive cases decreased the sensivity to 0.78 but increased the specificity to 0.39 and positive prediction value to 0.65. A cut-off point of 1.0 BAC (legal limit for serious DUI crime in Sweden) further decreased the sensitivity to 0.58 and increased the specificity to 0.66 and the positive prediction value to 0.71. This is still an unsatisfactory result. Thus, using the BAC level, particularly the legal limit of 0.2, as an instrument to identify drinking problems among suspected DUI´s is not a valid enterprise.

The female suspected DUI´s scored lower on AUDIT, especially with regard to hazardous alcohol use, than their male counterparts, despite the same BAC. This is partly due to the fact that women are more sensitive to alcohol than men. For this reason the cut-off score for positive cases ought to be lowered with 25% for women, from 8 to 6 points [1]. This change increases the prevalence of drinking problems in the female suspects, from 43% to 53%, approaching the male prevalence of 59%. The need of gender corrected cut-off scores disappears when age- and gender-corrected T-scores are used instead of raw scores. Using such T-scores alcohol problems among female suspected DUI´s were even more pronounced than among male.

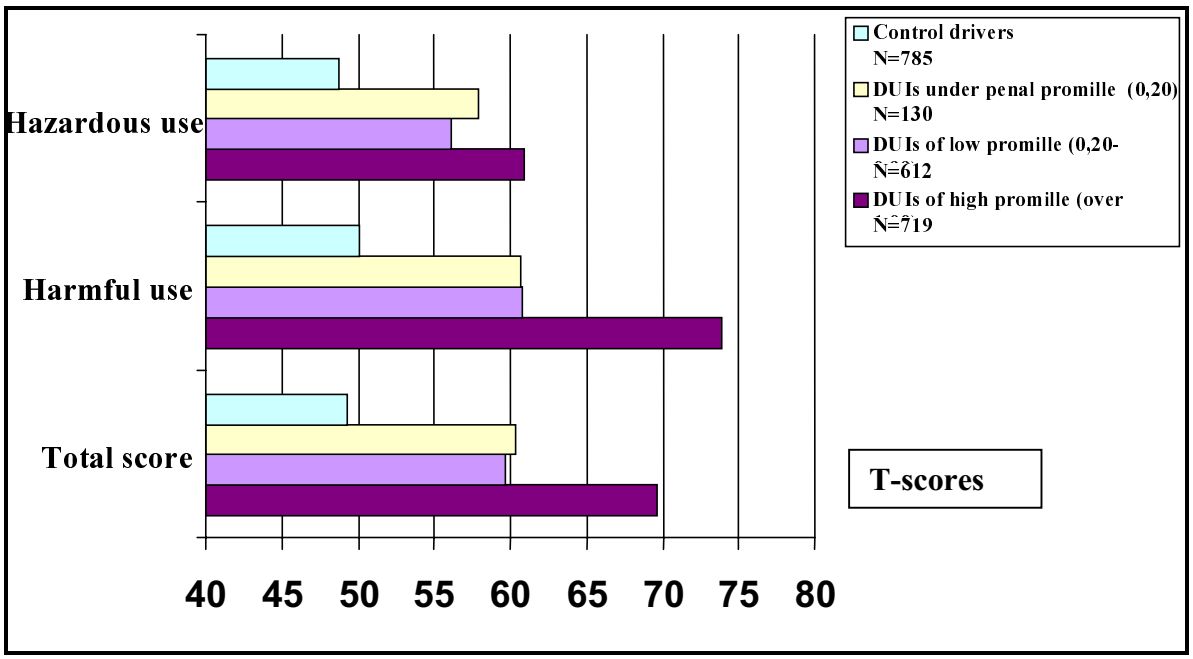

Figure 2: Age- and gender corrected AUDIT T-scores in 1.600 suspected DUI´s and 785 control drivers.

Circumstances at detection.
As expected, the BAC was higher for certain manners of detection, particulary at ”hints” from the general public, traffic accidents and negligent driving (ANOVA, p=.000). Drivers detected in those manners also had higher AUDIT-raw scores and age- and gender corrected T-scores (ANOVA, p=.000). Those detected in general traffic controls and at speed offences scored lower on AUDIT. See Table 2 and Figure 3. Again, the female DUI´s have more severe alcohol problems than the male as compared to the general population.

Drivers detected during the afternoon (between 12.00 and 18.00) had both the highest BAC and more drinking problems according to AUDIT. See Table 2 and Figures 3 and 4. These differences were significant in both cases (p=.000) as evaluated by ANOVA.

Discussion
In this type of studies the data quality and the influence of non-responders are of course important to consider. In previous studies [1, 3] and in the present the reliability and validity of the Swedish AUDIT version was found to be satisfactory. Despite a response rate of only about 30%, the investigated sample of suspected DUI´s seems to be representative for the whole population of such drivers at the police stations taking part in the study with regard to age, gender and BAC. Nonetheless, our sample is probably biased in the direction of more motivated persons and fewer "social outcast" drivers. However, a non-response rate of 70% does not differ from similar studies reporting 50-80% [4, 5, 6].

According to the generally accepted cut-off score (8+) on the AUDIT-test, drinking problems in terms of hazardous or harmful alcohol use were four times more common among the male and ten times among the female suspected DUI´s as compared to 785 control drivers. Every fifth DUI-suspect had severe drinking problems according to the 19+ score criterion. Our

results are similar to those of previous studies with prevalence rates varying between 48% and 74% according to the MAST-test [7].

Table 2: Number of suspected DUI´s, BAC and AUDIT-results at different manners and times of detection.

Circumstances when detected	N	BAC M ±SD	AUDIT Rawscore, M±SD	Percent 8+	T-score, M±SD
Detection manner					
General traffic controls	934	0.77 ± 0.62	10.3 ± 7.8	52%	63 ± 19
”Hints” from public	426	1.56 ± 0.77	12.8 ± 8.4	66%	71 ± 23
Traffic accidents	153	1.58 ± 0.76	11.8 ± 7.9	67%	68 ± 23
Unlawful driving	125	1.14 ± 0.75	15.1 ± 9.0	77%	73 ± 22
Speed offence	50	0.73 ± 0.50	9.9 ± 6.7	58%	62 ± 16
Times					
08-11	324	0.62 ± 0.62	9.5 ± 7.0	49%	62 ± 17
12-18	338	1.22 ± 0.89	13.0 ± 8.9	68%	72 ± 24
19-03	783	1.18 ± 0.71	11.3 ± 8.2	58%	65 ± 20
04-07	138	0.99 ± 0.64	9.3 ± 6.6	53%	59 ± 16

Note. Complete data missing for 13 cases.

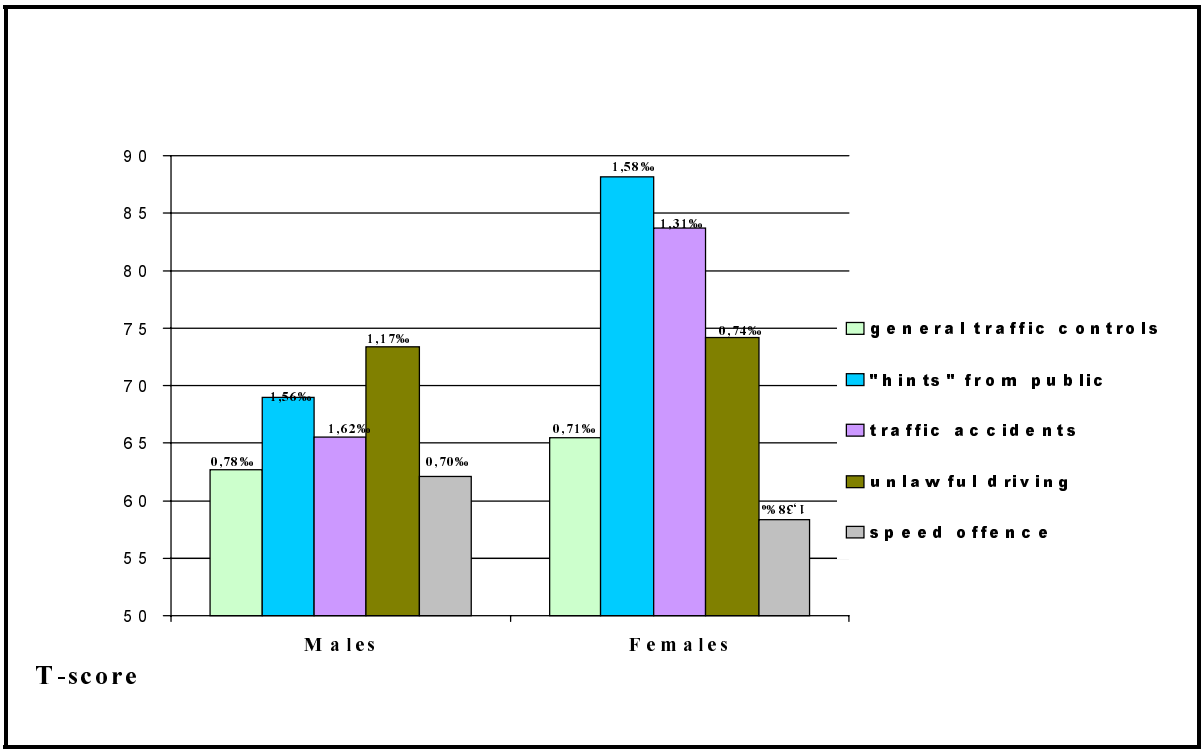

Figure 3: AUDIT T-scores and BAC by gender and ways of detection

As expected there was a positive relationship between AUDIT-score and BAC. However, less trivial was the finding that almost every second driver below the legal limit of 0.2 BAC scored 8+. In other words, drinking problems in terms of hazardous or harmful alcohol use are very common even in drivers released by the police without further consequences. Both from the traffic safety and the general health point of view, it would be desirable to use the use the detection as a means for preventive efforts in order to counteract a possible escalation of drinking problems in the released group.

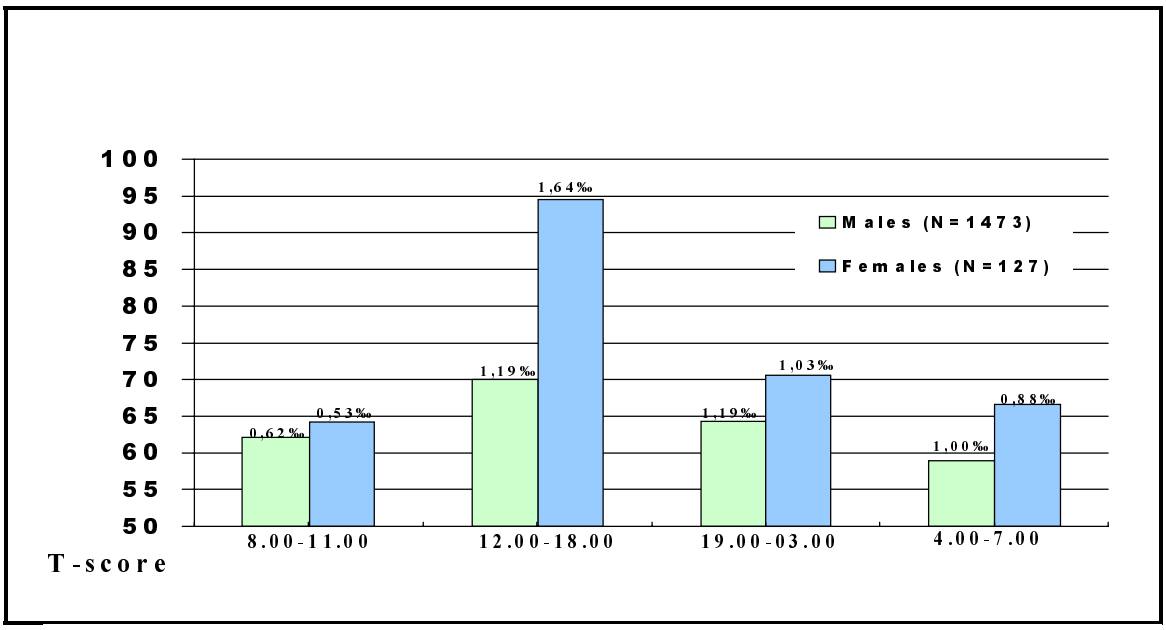

Figure 4: AUDIT T-scores and BAC by gender and time of detection

Three different BAC levels were used as "screening instruments" for detecting drinking problems according to AUDIT. Using the legal limit of 0.2 BAC as cut-off point resulted in a very low prediction value, the 0.5-level in a somewhat higher and the 1.0 in the highest, but still unsatisfactory value. Our hypothesis that hazardous or harmful alcohol use are common among "low BAC drivers" received additional support. Thus, already the mere suspicion of DUI rather than the BAC level itself suggest drinking problems. This conclusion is hardly surprising since it frequently is just a coincidence how long time has gone between alcohol consumption and when a person happens to be detected and seized for suspected DUI, and how much alcohol that has been metabolised by then. In Sweden, a special certificate of sobriety is necessary for re-licensing after DUI with a BAC of 1.0 or above. On the basis of our results it can be argued whether this level should not be lowered and applied in all cases of DUI. Furthermore, our results do not speak in favor of the Swedish 0.2 BAC legal limit as compared to a 0-limit from a public health point of view.

References

1. Bergman H, Källmen H. Befolkningens alkoholvanor enligt AUDIT-testet. Manuscript accepted for publication in Läkartidningen, 1999.
2. Bergman H et al. Rattfyllerister får vård i stället för fängelse. Läkartidningen 94;1997: 50. 4794-4801.
3. Bergman H et al; Tio frågor om alkohol identiferar beroendeproblem. Läkartidningen 95; 1998: 43. 4731-4735.
4. McMillen DL, Pang MG, Wells-Parker E, Anderson BJ. Alcohol, personality traits, and high risk driving. A comparison of young, drinking drivers groups. Addictive behaviors 17;1992: 6, 525-532.
5. Selzer ML, Barton E. The drunken driver: A psychosocial study. Drug and Alcohol Dependence 2; 1997. 239-253.
6. Selzer ML, Vinokur A, Wilson TD. A psychosocial comparison of drunken drivers and alcoholics. Journal of Studies on Alcohol 38; 1977. 1294-1312.
7. Vingilis E. Drinking drivers and alcoholics: are they from the same population? In R. G. Smart et al.eds Research Advances in Alcohol and Drug Problems. Volume 7. New York, Plenum Press,1983; 299-342.