DRIVING UNDER DRUGS IN SWITZERLAND

A DESCRIPTIVE CROSS-SECTIONAL STUDY

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BACKGROUND

Many drugs, both illicit or for medication, are known to influence driving abilities and increase risks of accidents (**Figure 1**).[1-3] In Switzerland, national statistics for driving under the influence (DUI) of drugs are drawn from condemned offenses identified by the justice.[4] However, little is known on abilities of police controls to identify use of cannabis, cocaine or other illicit drugs, and no data is available for drivers under prescribed medicinal drugs as this is not a legal offense.

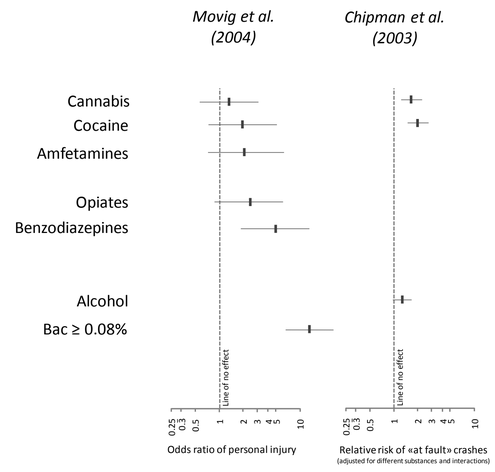

Figure 1: *Increased risks (CI95%) of road casualties under the influence of drugs (literature review)*

OBJECTIVES

The main goal of this cross-sectional study is to measure the prevalence of drivers under the influence of drugs in Western Switzerland using a representative sample and explore the association of drug use with age, gender, weekdays and time of the day. Secondarily, this study explores the ability of police roadside controls to detect DUI offense, and assesses the validity of self-reported drug consumption.

METHODS

Saliva samples from 1034 drivers were collected at different times of the day, at 24 different locations **(Figure 2**) in Western Switzerland for complete toxicological analysis.

Twenty-seven police controls were organised for the study between October 2006 to April 2008. Police officers selected a representative sample of drivers using a consecutive sampling method considered equivalent to a random sample. Usual roadside controls procedures, including BAC investigation, were applied before drivers were invited by an independent medical team to participate anonymously to a survey. Oral consent for participation was collected. Consent for taking a sample of saliva was however only sought after the questionnaire was completed to limit selection bias. Drivers arrested for DUI were not questioned but results from their toxicological investigations were made available.

Blood and saliva were analysed for ethanol by HS-GC-FID (Agilent, USA). Blood alcohol concentrations (BAC) were measured in g/kg. Urine and blood were screened by immunoassays (EMIT, Siemens Healthcare Diagnostics, USA and ELISA, Mahsan, Germany) and GC-MS (Agilent, USA) for drugs. Drug concentrations in blood or urine were determined by GC-MS or LC-MS/MS (AB Sciex, Canada). Saliva was screened for drugs by LC-MS/MS using SmileMS (GeneBio, Switzerland).

Illicit drugs for driving was defined by the Swiss legislation.[5] Medicinal drugs affecting driving performance were defined using ICADTS categorisation system.[6] The study was approved by the official state ethical committee.

Figure 2: *Highway above Montreux*

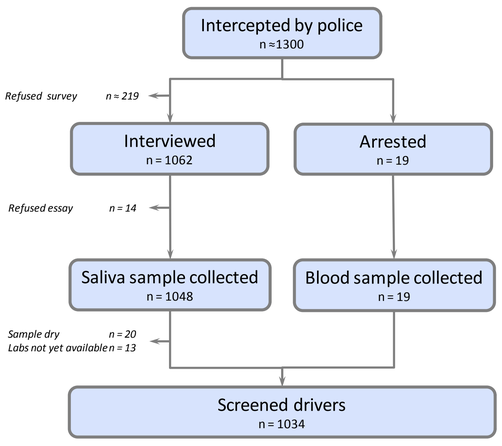

Figure 3: *Drivers screened for drugs*

RESULTS

Toxicological findings were available for 1,034 (**Figure 3**). In Western Switzerland, DUI offense was observed for 5.3% (CI95% 4.0 to 6.9%) of drivers. Details of substances detected are given in **Figure 3**. Cocaine was the most common offense (3.0%), followed by excessive alcohol consumption (1.4%) and cannabis (1.0%).

Medicinal drugs affecting driving performance were present in 77/1,034 drivers (7.4%; CI95% 5.8 to 9.1). Benzodiazepines (BZP) were taken by 2.8% of drivers. Prevalence of other medicinal drugs are given in **Figure 4**. Twenty drivers (1.9%) were under the influence of at least two different medicinal types of drug, whereas ethanol and medicinal drugs were detected in 5 drivers (0.5%).

Young, male drivers were more likely to drive under the influence of illicit drugs whereas older drivers were more likely to be under medicinal drugs (**Table 1**).

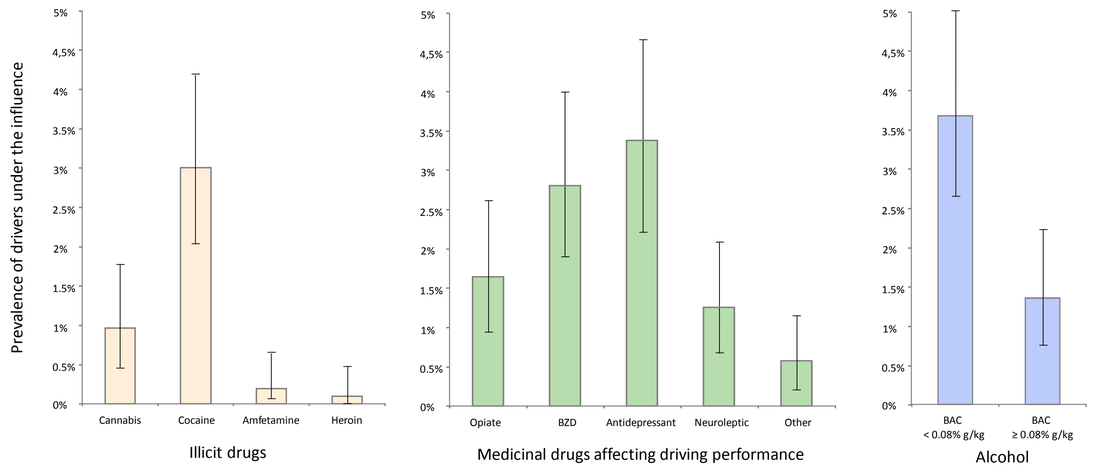

Figure 4: *Prevalence with CI95% of drivers under the influence of drugs*

Police control identified 19 of the 55 drivers who committed a DUI offense (34.5%). Breath analyser was efficient in detecting DUI offenders for alcohol when systematically used; blood samples confirmed all positive findings (14/14). For illicit drugs, police detected one driver out of two under the influence of cannabis, but none of the 31 drivers under cocaine. Both police interceptions and self-reported consumption were shown to be a poor indicators of drug use for roadside studies (**Table 2**).

	DUI n% with vs, n% without	OR (CI95%)	OR adj (CI95%)	p-value*
Alcohol (= 0.02%)				
Gender (male)[†]	42 (6.0%) vs. 9 (3.0%)	2.1 (1.0 to 4.4)	2.1 (1.0 to 4.4)	p = 0.050
<35 yrs of age[†]	18 (4.7%) vs. 34 (5.3%)	0.89 (0.49 to 1.6)	0.75 (0.41 to 1.4)	p = 0.337
Night[†]	41 (7.4%) vs. 11 (2.3%)	3.4 (1.7 to 6.6)	3.8 (1.9 to 7.8)	p = <0.001
Weekends	15 (4.8%) vs. 37 (5.1%)	0.94 (0.51 to 1.7)	1.1 (0.6 to 2.1)	p = 0.689
Illicit drugs				
Gender (male) [†]	35 (5.0%) vs. 7 (2.3%)	2.2 (0.98 to 5.1)	2.3 (1.0 to 5.3)	p = 0.046
<35 yrs of age[†]	26 (6.8%) vs. 16 (2.5%)	2.9 (1.5 to 5.4)	2.6 (1.3 to 4.9)	p = 0.004
Night[†]	29 (5.2%) vs. 13 (2.7%)	2.0 (1.0 to 3.8)	1.8 (0.9 to 3.5)	p = 0.104
Weekends	17 (5.5%) vs. 25 (3.5%)	1.6 (0.86 to 3.0)		
Medicinal drugs				
Gender (male) [†]	52 (7.5%) vs. 20 (6.6%)	1.1 (0.67 to 1.9)	1.1 (0.64 to 1.9)	p = 0.699
<35 yrs of age[†]	15 (3.9%) vs. 60 (9.3%)	0.40 (0.22 to 0.71)	0.40 (0.22 to 0.74)	p = 0.003
Night[†]	35 (6.3%) vs. 41 (8.6%)	0.71 (0.45 to 1.1)	0.80 (0.49 to 1.3)	p = 0.368
Weekends	22 (7.1%) vs. 54 (7.5%)	0.94 (0.56 to 1.6)	1.0 (0.58 to 1.7)	p = 0.994

* Significant test is given by the likelihood ratio test for each factor within the model.
[†] Gender was not reported on questionnaires for 36 drivers (n=999), and age for four drivers (n=1,031), and time of control for two drivers (n=1,033).

Table 1: *Odds ratio of DUI depending of gender, age, time of the day and weekdays*

	Self-reported consumption*			Police control		
	Prevalence of positive answers n (%)	Sensitivity % (CI95%)	Specificity % (CI95%)	Prevalence of tests n (%)	Sensitivity** % (CI95%)	Specificity** % (CI95%)
Illicit drugs[†]	49 (4.9%)	27.8 (14.8 to 45.4)	96.0 (94.5 to 97.1)	6 (0.6%)	11.9 (4.5 to 26.4)	99.9 (99.3 to 100)
Cannabis[‡]	47 (4.7%)	100[‡] (46.3 to 100)	95.8 (94.3 to 96.9)	6 (0.6%)	50.0 (20.1 to 79.9)[‡]	100 (99.4 to 100)
Cocaine	3 (0.3%)	6.7 (11.6 to 23.5)	99.9 (99.3 to 100)	6 (0.60%)	0.0 (0 to 13.7)	99.4 (98.6 to 99.8)
Other	0 (0%)	0.0 (0 to 0.7)	95.1 (93.6 to 96.3)	6 (0.60%)	33.3 (1.8 to 87.5)	99.5 (98.8 to 99.8)
Medicinal drugs	420 (40.6%)	63.2 (51.3 to 73.7)	61.2 (58.0 to 64.3)	6 (0.6%)	0.0 (0 to 6.0)	99.4 (98.6 to 99.7)
Alcohol**	501 (49.7%)	31.4 (17.4 to 49.4)	49.6 (46.4 to 52.8)	1034 (100%)	100[††] (73.2 to 100)	0[††] (0 to 0.4%)

* n = 1,009 instead of 1,034 as questionnaires were not available from those having been arrested by the police and 10 questionnaires are missing.
[†] For illicit drugs, life-time consumption was used as no driver reported having taken illicit drugs within the previous 12h; for medication we used reported administration within the previous 24h, for alcohol, we used consumption of any dose within the previous 4h.
[‡] Temporary results. Not all the results from screening have yet been analyzed by hand to detect cannabis from saliva.
** For Self-reported consumption, data was only available for those with BAC values under 0.08% g/kg as the 14 drivers who were above were arrested and did not answer the questionnaire.
[††] Sensitivity and specificity were measured for detecting BAC of 0.8 g/kg or more.

Table 2: *Sensitivity and specificity of self-reported consumption and police control for detecting DUI*

CONCLUSIONS

Like in other developed countries, driving under the influence of psychoactive substances is common in Switzerland.[7] Cocaine is the most frequent illicit drug detected in drivers but remains largely undetected by usual police roadside controls. Given the number of drivers under medicinal drugs, there is a need to legislate and define acceptable risks for driving under the influence of medicinal drugs. Further studies are required to develop rapid, reliable and cheap roadside screening methods for cocaine and benzodiazepines.

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