Review of European Investigations of Illicit Drug Prevalence in Road Traffic

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Abstract
This paper will summarise the literature on the prevalence of illicit drugs in road traffic in different European countries. Although a total of 23 studies published in the time period 1990-1998 were collected, only four large scale studies have been discussed in more detail. The results of these studies are not expected to completely reflect the present situation in different countries, but will indicate the scale of the magnitude of the problem in the driver populations involved in these studies both for illicit and licit drugs. It will be discussed why cross-national comparisons are impossible due to different approaches to the scope of the investigations (focus on particular driver populations), sample collection and data collection. The results of the four large scale studies indicate that cannabis and opiates are the most frequently detected drugs (less than 1% in the general driver population, and less than 7.5% in collision-involved drivers). The prevalence of licit drugs such as benzodiazepines (tranquillizers, hypnotics) is significantly higher than for illicit drugs. Therefore, it has been stressed that the contribution of medicinal drugs to the overall problem of drugs and driving can not be ignored when discussing illicit drugs and road traffic.

Introduction
The purpose of this review conducted with support of the Council of Europe (Pompidou Group), is to show the prevalence of illicit drugs in road traffic (alone or in combination with alcohol and/or other drugs) in different European countries. The literature search conducted to accomplish this review included articles in relevant scientific journals, institute's reports (published over the last decade) and the proceedings of the last two conferences organised by ICADTS (International Council on Alcohol, Drugs and Traffic Safety in 1995 and 1997). Since transport safety and public health are interrelated, road traffic accidents caused by drugs other than alcohol have become an important public health issue. It is widely recognised that alcohol use is a causal factor in 20-40% of fatal road accidents, but many licit and illicit drugs are also known to impair driving ability.
Epidemiological studies on the most widely used illicit drug cannabis indicated the presence of tetrahydrocannabinol (THC) in roughly 4-12% of drivers injured or killed in traffic accidents, even if the population at risk is probably less than 4% (Robbe, 1994). The THC incidence among injured or killed drivers is not conclusive evidence for establishing its role as a causal factor, since alcohol was present in the majority of THC positive accident victims. It has been suggested that cannabis and alcohol in combination constitute a greater risk potential than either of the two substances alone (Robbe, 1998). The independent contribution of cannabis use in impairing road safety is still dubious.
In a survey among experts it was estimated that the presence of illicit drug use in driving license holders probably varies from 1-2% in the different EU members states, whereas an average of 10% of the adult population drives under the influence of impairing medicinal

drugs, such as benzodiazepines, antidepressants, neuroleptics, narcotic analgesics and sedating antihistamines (De Gier, 1995). Available data allow one to conclude that the use of the most frequently prescribed impairing medication, the benzodiazepine tranquillizers and hypnotics, more than double the risk of injurious accidents (which is comparable with the risk of 0.5 g/l blood alcohol concentration – the legal limit in most countries). It is for this reason that, in discussing the traffic safety issues regarding illicit drugs and driving, the contribution of medicinal drugs to the overall problem of drugs and driving can not be ignored.

Methods

A complete understanding of the problem of illicit drugs and driving will only be achieved in two complementary approaches: experimentation and epidemiology (Simpson and Vingilis, 1992). Experimental studies focus on drugs effects on psychomotor performance, in particular the types of skills affected and the dosages used. However, it is fairly impossible to translate these effects into road crashes. Questions on the extent or magnitude of this problem, as well as the determination of which drugs are risk factors for collision involvement, can be answered in sound epidemiological research. In epidemiology two types of research approaches are frequently applied: descriptive and analytic epidemiology. The first approach provides insight into the relative importance of different types of drugs. In other words, which types of drugs are detected that contribute to a significant traffic safety problem. If reported evaluations are repeated in time, insight can be provided into changing patterns of drug use and driving within society. The second approach determines which drugs are overrepresented in persons involved in road accidents. Involvement of control groups of drivers allow researchers to provide relative risk data. In following this approach one has to keep in mind that the relationship established through the risk factors approach is one of association, not of causation. Experimental research into the causal links between drug dosages and levels and behavioral impairment remains necessary to draw conclusions on causation potentials of different drugs.

Epidemiological research of illicit drugs and driving can be classified according to the population under examination: general driver population, offender/DUI population, user/addict population and collision-involved population. In surveys of illicit drugs in the *general population* data-gathering is generally through the use of questionnaires and interviews. Two of the most common observed problems relate to representativeness and refusals. These surveys include both drivers and non-drivers and do not allow extrapolation to the driver population. In roadside surveys drivers are randomly or systematically selected to obtain information through self-reports on demographics, drug use, driving and drug use through toxicological analyses of body fluids. Since roadside surveys tend to be executed during late-night hours on weekends, drivers tested are generally not representative of the total driving population. Refusal rates can have profound effects on inferences about illicit drug use derived from roadside surveys because those substances are detected with less frequency than alcohol where refusal rates of 15% are observed. Refusal rates can actually exceed the proportion of drivers who score positive for illicit drugs.

In surveys of *offender populations* (charged with driving under the influence of alcohol or drugs), drug screens are usually carried out on a selection of drivers determined by the arresting officer, which introduces a variety of biases. For example drug testing is applied if the blood alcohol level is below the legal limit. This approach automatically excludes information on combinations of drugs with high levels of alcohol.

In investigations of *user/addict populations* sample are generally drawn from treatment facilities. These surveys can not be considered representative of the total user/addict populations, since only a small proportion will seek formal treatment.

In surveys of *collision-involved populations* information is gathered on a wide range of variables (e.g. characteristics of crashes, psychological/behavioural characteristics of drivers, drug use problem). Documentation of drug impairment is based on different perceptions and decisions of officers, which can introduce biases. In accident fatalities data are most of the time incomplete due to the fact that drug screens are not carried out on fatally-injured drivers found to be impaired by alcohol.

Generally speaking, the application of epidemiological research to drugs (other than alcohol) and driving can only permit meaningful cross-national comparisons if standardised data-gathering methods are used. However, several factors (such as political, legal, social, economic) determine the research capabilities of researchers in different countries. This will result in different approaches to the scope of the investigation, sample selection and data collection. In addition reporting of data very often takes place without application of a common convention how to present the prevalence data. The prevalence rate is normally expressed as the number of existing cases of illicit drug use in a defined population at risk at a given point in time or over a defined time period, divided by the number of people in that population at risk.

Results

A total of 23 studies related to research carried out in thirteen European countries have been critically reviewed in order to present the prevalence of illicit drug use alone or in combination with alcohol, as well as multiple drug use (De Gier, 1998). Only the most recent research efforts published in the time period 1990-1998 have been included. Most of the studies relate to collision-involved driver population (n=11), whereas 9 to drivers suspected of driving under the influence of alcohol or drugs. Two studies specifically focus on drivers stopped during weekend nights and only one study involved the general driving population. Only four large scale studies have been published and will be discussed in more detail. The evaluation of the 19 remaining studies is, however, important to complete the review. But, the risk of comparing prevalence presented in studies from different countries that are not comparable due to differences in the set-up of the studies is obvious in a short review presented in summarised format and therefore not very useful.

A German study was conducted by Krüger et al. (1996) to determine the prevalence of psychotropic drugs (illicit and licit) among the German general driving population. During the German Road Side Survey from 1992 to 1994, breath alcohol measurements were collected from more than 21,000 drivers in two German regions. In addition, 13,122 drivers were stopped at checkpoints by the police and asked for a saliva sample, whereas 12,213 (93.1%) agreed to participate. In 1992, a total of 3,027 samples were obtained for drug analyses (cannabinoids, amphetamines, opiates, cocaine, benzodiazepines, and barbiturates). Unfortunately not all saliva samples could be analysed.

In a large Italian survey conducted by Ferrara et al. (1990), drug use of 5,000 injured drivers and pedestrians hospitalised in Padua during a ten years period, was determined using blood, urine and saliva. The samples were used for screening on 72 different drugs (illicit and licit).

A second large study on collision-involved drivers is known as the Belgian Toxicology and Trauma Study (BTTS) and was conducted as a prospective, multi-centre survey in six hospitals (Meulemans, 1997). During the registration period (17 months) blood and urine samples were taken from 2,143 patients. The screening for drugs was focussed on amphetamines, barbiturates, benzodiazepines, cannabinoids, cocaine, methadone, opiates, and propoxyphene.

In a Norwegian study published by Skurtveit et al. (1996), blood samples from 2,819 drivers for suspicion of driving under the influence of drugs were received as a subset of a total of 8,429 samples by the National Institute of Forensic Toxicology in 1994. The samples were screened for the most commonly abused drugs if the blood alcohol concentration (BAC) was below 0.15 percent (1.5 g/l). Samples with BACs above 0.15% were analysed for drugs other than alcohol only after special request by the police. Hence, drug analyses were completed on 2,529 samples.

In the following tables the summarised results of these four studies are presented. These results are not expected to completely reflect the situation in other countries, for one thing because of societal and cultural differences that determine drug use patterns (licit and illicit drug use) and the impact of public campaigns, which is mostly unknown. Consequently the conclusions from these four studies are intended to be indicators for further discussion.

Table 1 Prevalence of illicit drugs and road traffic

Drug	*General driver population (D)*	*DUI suspected population (N)*	*Collision-involved population (I and B)*
Cannabis	0.6%	26%	5.5 %(I) 6.0% (B)
Opiates	0.7%	8%	3.5% (I) 7.5% (B)
Amphetamines	0.08%	21%	2.7% (I) 3.0% (B)
Cocaine	0.01%	0.04%	0.5% (I) 0.7% (B)

D: German Road Side Survey (n=3,207)
N: Norwegian Survey (n=2,529)
I: Italian Survey (n=5,000)
B: Belgian Toxicology and Trauma Study (n=2,143)

Obviously, cannabis and opiates are the most frequently detected drugs, whereas cocaine has been detected with a very low prevalence. The results of the screening for the most frequently used licit drugs that impair driving performance is presented in the same studies (Table 2). As has been mentioned before the contribution of medicinal drugs can not be ignored when discussing illicit drugs and road traffic.

Table 2 Prevalence of licit drugs and road traffic

Drug	*General driver population (D)*	*DUI suspected population (N)*	*Collision-involved population (I and B)*
Benzodiazepines	3.6%	31%	8.5% (I) 8.5% (B)
Barbiturates	0.5%	ND	3.4% (I) 1.3% (B)
Tricyclic antidepressants	ND	ND	1.5% (I) ND (B)

ND = Not detected
D: German Road Side Survey (n=3,207)
N: Norwegian Survey (n=2,529)
I: Italian Survey (n=5,000)
B: Belgian Toxicology and Trauma Study (n=2,143)

Although not all most frequently used impairing licit drugs are detected (e.g. ‘older’ antihistamines, neuroleptics) the prevalence of licit drugs such as the benzodiazepines (tranquillizers and hypnotics) is significant and considering the findings in the general driving population (the German study) several times higher than for illicit drugs.

The combination of drugs with alcohol and multiple drug use presented as prevalence in drug positive cases or all cases of the sample are given in Table 3.

Table 3 Prevalence of the combination of drugs with alcohol and multiple drug use in drug positive (DP) cases or all cases (AC) of the sample.

Drug	*General driver population (D)*	*DUI suspected population (N)*	*Collision-involved population (I and B)*
Drugs and alcohol	30% (DP)	25% (DP)	17.5% (I: AC) 27% (B: DP)
Multiple drug use	95% (DP)	NP	17.5% (I: AC) 20% (B: DP)

NP = Not presented
D: German Road Side Survey (n=3,207)
N: Norwegian Survey (n=2,529)
I: Italian Survey (n=5,000)
B: Belgian Toxicology and Trauma Study (n=2,143)

Caution should be given to the interpretation of the high percentages when the drug positive cases are being considered, since only very small sample sizes are involved. The high prevalence presented for the combination of drugs with alcohol and multiple drug use need to be studied in more detail in order to understand a possible higher accident risk by its users. Some findings give weight to this concern and tend to suggest a clear synergistic interaction for alcohol and medication/illicit drugs, if mortality was taken as the outcome variable. The results of the BTTS indicate a relative risk of 2.6 in the combined positive group, in which a mere additive effect would theoretically have led to a relative risk of 1.6.

Results of experimental studies indicate that, while the effects of marijuana alone in doses up to 300 µg/kg might be categorised as 'moderate' (by most users perceived as 'normal' high), they become 'severe' when low to moderate doses of alcohol (0.04% BAC) are consumed prior to smoking marijuana (Robbe, 1998). It is for these reasons that some experts suggest the possibility of establishing different per sé blood alcohol limits for drivers depending upon the presence of illicit drugs in the same samples: e.g. 0.5 g/l for alcohol alone and 0.2 g/l for alcohol with any illicit drug (de Gier, 1995).

Conclusion

In conclusion, prevalence data from different countries are not comparable due to differences in the set-up of the studies, which have been discussed above. The reason for selecting only four of the studies is because these include large samples of drivers in their respective study populations. The results of these studies will be meaningful for discussing the need to define action programs to resolve the methodological problems and to achieve more standardisation in detecting illicit drugs in road traffic in Europe.

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