

Drug use among Québec drivers : The 1999 roadside survey

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Abstract

As part of a major undertaking to establish the role of drugs in highway collisions, the Société de l'assurance automobile du Québec (SAAQ) conducted a roadside survey from August 9 to August 29, 1999 in order to determine drug use among Québec drivers. Using a two-stage stratified sampling procedure, the survey included 147 sites representative of the Québec driving population. During both daytime and nighttime, a total of 5 507 drivers participated in the survey among which 95.9% provided a breath sample (n = 5 281) and 41.4% a urine sample (n = 2 281). Among those who refused to provide a urine sample, 70.1% accepted to provide a saliva sample (n = 2 260). Thus, 82.5% of the drivers provided either a urine or a saliva sample (n = 4 541).

Regardless of time of day, a BAC above the legal limit (.08) was found in 0.8% of the breath samples. When using the same time period (9 PM to 3 AM, Wednesday to Sunday) as in previous alcohol roadside surveys, BAC > .08 was found in 1.8% (+/- 0.5%) of breath samples in 1999 (n = 2 724) which compares to 3.2% in 1991, 3.6% in 1986 and 5.9% in 1981. According to the toxicological analysis of the 2 281 urine samples, drugs were found in the following proportions: cannabis (5.22%), benzodiazepines (3.66%), cocaine (1.09%), opiates (1.08%), barbiturates (0.35%), amphetamines (0.07%), PCP (0.03%). However, large variations are observed depending on the time of day, sex and age.

Introduction

Over the last half of the XX^e century, alcohol has been identified as a major hazard on the road and numerous papers have been published on this issue. This problem has drawn the attention of public bodies and several drinking and driving countermeasures have been implemented. In Québec, this effort culminated in 1996 when the National assembly adopted quite comprehensive legislation

(Bill #12) which encompasses administrative license suspension, vehicle impoundment, alcohol ignition interlock, mandatory evaluation for repeat offenders and zero BAC for new drivers.

While alcohol has justifiably captured most of the attention, the problem associated with other drugs has received little recognition. Contrary to alcohol, there is no reliable test to rapidly detect

drugs on the road, the relationship between the drug concentration and the level of impairment is usually not well-known, and thus, the contribution of drugs to road crashes remains an unknown quantity (Simpson and Vingilis, 1992). However, a ballpark figure of roughly 10% of DUID with twice the risk of being involved in a crash is sometimes mentioned (Lillsunde, 1998).

Consumption of illicit drugs among the Québec adult population is estimated to be in a 9%-13% range and as high as 25%-32% among 15-24 year-olds (CPLT, 1999). Given the well-established overrepresentation of young drivers in traffic crashes, a relatively high level of drug use among youth could become a major concern. On the other end of the spectrum, an aging population requires a more frequent use of medication which may also pose a problem.

It is with this context in mind that the Société de l'assurance automobile du Québec (SAAQ), a Québec government agency responsible for road safety promotion, decided to undertake a major endeavor in order to establish the role of alcohol and other drugs in traffic crashes. First, there is clearly a need to reassess the more precisely possible the magnitude of the DWI problem after the implementation of the several countermeasures contained in Bill # 12. Second, the problem of DUID, although its magnitude is essentially unknown, is suspected of being significant enough to warrant investigation.

The research plan includes two studies. The first one involves the determination of alcohol and drug use among all fatally injured drivers (using both blood and urine samples) during a two-year period, from April 1999 to March 2001 (expected $n \cong 700$), and the utilization of the results in a responsibility analysis (Terhune, 1986). The second one aims at the estimation of the prevalence through roadside surveys. Since the intent is also to compare results between fatally injured drivers and the general driving population, two roadside surveys must be done, one in 1999 and another in 2000 (expected $n \cong 6000$). This paper focuses on the results of the 1999 survey.

Methods

The roadside survey design used a two-stage stratified sampling procedure with 147 sites representative of the Québec driving population.. The first level of stratification divided the province of Québec in 4 main regions: Northeastern, Central/Eastern, Central/Western, Western. The second level involves 7 categories of municipalities starting with a 2 500 to 4 999 inhabitants cluster and up to a more than 1 000 000 inhabitants cluster. The sample was also distributed proportionately to the number of fatal accidents per time of day (eight 3-hour periods) and day of week (seven days). For obvious practical reasons – including winter conditions from November to April - it was not possible to account for monthly variations. The August 9-29, 1999 period was selected for its favorable weather and availability of nursing students (interviewers).

On each site, a roadblock was set up and drivers were directed to an adjacent emplacement with enough space to simultaneously process 3 vehicles. In order to ensure that drivers were chosen on a random basis, police officers were instructed to intercept the first vehicle that can be stopped safely when an interviewer indicates she/he is available. Interviewers were mostly students in nursing and all received four-days' training. Seven teams of 4 students were formed with 3 interviewers and one supervisor per team. Being a student in policing techniques, the supervisor was responsible for managing the logistics and handling problems.

After a brief introduction, respondents were asked to answer a brief questionnaire and to provide a breath sample, and then a urine sample. Two well-maintained portable toilets (men/women) were available on each site. In case of a refusal to provide a urine sample, the driver was asked to provide a saliva sample which was basically used as a control for non-response. All urine and

saliva samples were placed in small containers with icepacks. At the end of the period, the samples were transported to the lab located in Montréal and kept frozen (-15⁰C) until analysis.

All toxicological analysis were performed by the Laboratoire de sciences judiciaires et de médecine légale (Forensic laboratory of Québec ministry of public safety) under contract for the SAAQ. Preliminary screening was performed directly on urine samples (without treatment) using Abbott AXSYM system and applying the followings cutoffs: cannabis (THC, THC-COOH): 25 ng/ml, cocaine (benzoyl ecgonine): 300ng/ml, opiates: 100 ng/ml, PCP: 25 ng/ml, benzodiazepines: 50 ng/ml, barbiturates: 200 ng/ml, amphetamines: 300 ng/ml. All positives were confirmed by mass spectrometry (HPLC-MS and GC/MS).

Results

During both daytime and nighttime, a total of 5 507 drivers participated in the survey among which 95.9% provided a breath sample (n = 5 281) and 41.4% a urine sample (n = 2 281). Among those who refused to provide a urine sample, 70.1% accepted to provide a saliva sample (n = 2 260). Thus, 82.5% of the drivers provided either a urine or a saliva sample (n = 4 541). Since the toxicological analysis of saliva samples was not completed when this paper was prepared, only results of urine samples and breath samples are presented.

Drugs other than alcohol (urine samples):

According to the toxicological analysis of the 2 281 urine samples, drugs were found in the following proportions: cannabis (5.22%), benzodiazepines (3.66%), cocaine (1.09%), opiates (1.08%), barbiturates (0.35%), amphetamines (0.07%), PCP (0.03%). However, large variations are observed depending on the time of day, sex and age.

Regardless of sex and age, table 1 shows that presence of a drug during daytime (6:00AM- 9:00PM) and nighttime (9:00PM – 6:00AM) may vary substantially depending on each group of drugs. This appears particularly the case for an illicit drug like cannabis for which the presence doubles during nighttime. On the contrary, barbiturates (prescription drug) – known for their hypnotic and somnolence effects – are three time more present during daytime. The thin difference between daytime and nighttime observed for cocaine is essentially attributable to the two 3-hour periods which take place immediately before and after the nighttime period. Cocaine was found in 2.24% of the cases during the 6:00AM - 9:00AM period and 2.07% in the 6:00PM-9:00PM period. No significant differences are observed for other drugs.

Table 1: Drugs found in urine samples according to time of day

Period	N	cannabis	benzodiazepines	cocaine	opiates	barbiturates	amphetamines	PCP
Daytime	829	4.41%	3.77%	1.06%	1.10%	0.40%	0.08%	0.00%
Nighttime	145	8.72%	3.19%	1.23%	0.99%	0.13%	0.00%	0.16%
Total	2281	5.22%	3.66%	1.09%	1.08%	0.35%	0.07%	0.03%

Table 2 indicates that large differences can be observed between men and women. Presence of illicit drugs (cannabis, cocaine) is clearly more frequent among men than women. On the opposite, prescription drugs (benzodiazepines, barbiturates) are slightly more prevalent among women. For

other three groups of drugs (amphetamines, PCP and opiates), the numbers are small and differences appear marginal.

Table 2: Drugs found in urine samples according to sex and time of day

2a. Nighttime (9:00PM - 6:00AM)

Gender	N	cannabis	benzodiazepines	cocaine	opiate	barbiturates	amphetamines	PCP
Male	1084	9.66%	2.42%	1.49%	0.56%	0.03%	0.00%	0.12%
Female	363	5.87%	5.98%	0.15%	2.53%	0.44%	0.00%	0.30%

2b. Daytime (6:00AM – 9:00PM)

Gender	N	cannabis	benzodiazepines	cocaine	opiate	barbiturates	amphetamines	PCP
Male	592	5.81%	3.30%	1.44%	1.26%	0.38%	0.11%	0.00%
Female	233	0.73%	4.15%	0.00%	0.57%	0.57%	0.00%	0.00%

Although spreading the data over several categories can produce some discrepancies due to a lack of statistical power (smaller number of observations in each cell), Table 3 reveals that the most substantial differences are observed between age groups. Clearly, the presence of cannabis declines with age from 21% among the 16-19 age group to 0.48% among the 55 plus age group. Cocaine use appears more stable among age groups, with the exception of the 55 plus age group for which no case of cocaine presence was found. The few PCP cases were observed only among the 16-24 age group.

Prescription drug usage appears to increase with age. The pattern is quite clear for benzodiazepines with a growing prevalence from 0% among the 16-19 age group up to 8.8% among the 55 plus age group. Albeit less evident, a similar pattern could also be observed for barbiturates. Opiates were found in roughly equivalent proportions among all age groups and the rare cases of amphetamines were limited to the 45-54 age group.

Table 3: Drugs found in urine samples according to age and time of day

3a. Nighttime (9:00PM - 6:00AM)

Age	N	cannabis	benzodiazepines	cocaine	opiate	barbiturates	amphetamine	PCP
16-19	164	15.17%	0.00%	0.09%	0.44%	0.00%	0.00%	1.19%
20-24	297	21.09%	0.94%	1.41%	1.21%	0.74%	0.00%	0.49%
25-34	274	10.51%	0.48%	1.47%	0.08%	0.07%	0.00%	0.00%
35-44	308	4.03%	2.89%	1.90%	1.24%	0.03%	0.00%	0.00%
45-54	23	0.81%	7.76%	1.61%	1.98%	0.00%	0.00%	0.00%

55 +	9 17 1	2.57%	6.37%	0.00%	0.89%	0.00%	0.00%	% 0.00 %
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3b. Daytime (6:00AM – 9:00PM)

Age	N	cannabis	benzodiazepines	cocaine	opiates	barbiturates	amphetamines	PCP
16-19	30	22.34%	0.00%	5.36%	0.81%	4.40%	0.00%	0.00%
20-24	60	9.22%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
25-34	13	4.98%	0.00%	1.40%	1.40%	0.00%	0.00%	0.00%
35-44	18	5.81%	2.84%	1.68%	1.60%	0.45%	0.00%	0.00%
45-54	20	3.69%	4.53%	2.16%	0.62%	0.20%	0.37%	0.00%
55 +	21	0.00%	9.36%	0.00%	0.25%	0.66%	0.00%	0.00%

Alcohol (breath samples):

A total of 5 281 breath samples were obtained during the survey. Regardless of time of day, a BAC above the legal limit (.08) was found in 0.8% of all cases. Since previous alcohol roadside surveys conducted in 1981, 1986 and 1991 used a 9:00PM to 3:00AM, Wednesday to Sunday time period, a sub-sample of the 1999 survey was created using the same period (n = 2 724).

Table 4: Proportion of BAC > .08 observed during 1981, 1986, 1991 and 1999 surveys – 9PM to 3AM, Wednesday to Sunday

	1981	1986	1991	1999
Observations (n)	6099	5214	6668	2724
Participation rate	96.5%	94.4%	98.0%	96.4%
BAC > .08	5.9%	3.6%	3.2%	1.8%
95% margin of error	±0.4	±0.5	±0.6	±0.5

As indicated by the results of the 4 roadside surveys conducted during the last two decades, the proportion of impaired drivers (BAC > .08) has declined substantially in Québec. Although the 1999 result appears statistically different from the 1991 survey, it should be noted that the sample size in 1999 is roughly half of the 1991 survey. This was done on purpose since the design of the study requires that two surveys must be done (1999 and 2000) in order to match with the analysis of fatally injured drivers which will cover the same two-year period. The results of the two roadside surveys will be eventually aggregated.

Alcohol and drug use combined:

Table 5 indicates the presence of alcohol and drugs in combination or not. Since the results for drugs simply show presence and not impairment, it was decided to present the combined usage showing alcohol presence (BAC > .01) as well. In the vast majority of cases, alcohol or drug use has occurred separately. The combined presence of alcohol and another drug increases to 1.37% during nighttime for a total of 21.07% usage of alcohol and/or another drug in that period.

Table 5: Alcohol (BAC >.01) and drug use combined results (both daytime and nighttime)

Alcohol only (BAC > .01)	Drugs only	Alcohol and drugs (BAC > .01)	Total alcohol or drugs
3.75%	9.15%	0.62%	13.52%

Discussion:

Epidemiological studies of the relation between drug use and traffic accidents have been criticized for numerous reasons including lack of adequate control samples, inadequate sampling procedures, non-standardized specimen collection and handling techniques, insensitive screening methods, limited range of drugs detected, complicated relationship between dosage / concentration / behavioral effects and interaction between alcohol and other drugs (Lillsunde, 1998). More specifically, surveys of drug use in the general driving population have been mostly criticized for their lack of a representative sample and problems associated with the participation rate (Simpson & Vingilis, 1992). In the present survey, a major attempt was made with regard to the sampling design. However, two limitations appear to deserve more attention.

Firstly, the use of urine samples has obviously some advantages and drawbacks. Drug concentrations tend to be higher and stay longer in urine. Thus, the presence of a drug in urine is more indicative of exposure to the drug than impairment itself (Lillsunde, 1997). Among reasons which have prompted us to use urine samples in the roadside survey, it should be noted that the sensitivity offered by urine presents some clear advantages. Results obtained in a pilot project (n = 243) conducted during the autumn of 1998 (Lemire & al., 1998) where both urine and saliva for all participating drivers were collected showed a lack of sensitivity of saliva samples – especially for cannabis and benzodiazepines – that could not be solely explained by the fact that saliva indicates more recent consumption. Also, it should be remembered that both blood and urine samples are currently collected among fatally injured drivers (April 1999 to March 2001). Despite its limitations, a urine/urine comparison will thus be possible and eventually used to validate the results of the responsibility analysis.

Secondly, the participation rates for urine (41.4%) and saliva (70.1% of those who refused to provide urine) raise some concerns. In the autumn 1998 pilot project where main investigators attend all sites, participation rates of 96% for saliva and 73% for urine (60% without a \$20 incentive) were obtained. With a high participation rate for saliva, a more limited participation for urine may be considered as less disturbing. The common assumption is that there is a selection bias when someone refuses to provide a sample, namely that the driver is more likely to have used a substance. In all likelihood, this assumption does not hold, however, for a driver who refuses to provide a urine sample but agrees to provide a saliva sample. If the motive for refusing to provide a urine sample was the fear of being detected, the driver would normally also refuse to provide a saliva sample. Thus, saliva samples were basically used as a control for non-response. To summarize, the higher is the participation rate for saliva (as a control for non response), the more acceptable a limited participation rate for urine becomes. Since large differences were observed between interviewers, a special effort will be made to increase the participation rate for the 2000 survey to bring it back to the level obtained in the 1998 pilot project. Also, it should be mentioned that the participation rate may not be as crucial here as it is often thought. Indeed, the guarantee of confidentiality and the fact that no results for drugs are obtained on site may temper the selection bias.

Regarding the results of drugs found in urine samples, a preliminary comment should be that a good face validity, both in terms of prevalence and patterns, can be observed. In general, results are in

line with expectations. Illicit drugs (cannabis, cocaine) are linked to nighttime, males and youth while prescription drugs (benzodiazepines, barbiturates) appear to be more related to daytime, females and an older age. Completed toxicological analysis of saliva samples will permit an analysis of non-response. At this point, it appears that the initial assumption – the DUID problem is suspected of being significant enough to warrant investigation – was well-founded.

Concerning alcohol use, the participation rate in 1999 is very similar to that obtained in previous alcohol roadside surveys. The magnitude of the decrease (-43.8%) in the proportion of nighttime drivers (9:00PM to 3:00AM, Wednesday to Sunday) with an BAC >.08 between 1991 (3.2%) and 1999 (1.8%) could be attributable to an accumulation of factors since the two measures are 8 years apart. However, this impressive decrease concurs with an above 20% reduction in the number of fatalities since Bill #12 was passed in December 1996. Specific evaluations are underway to disentangle the respective effects of administrative license suspension, vehicle impoundment, alcohol ignition interlock, mandatory evaluation for repeat offenders and zero BAC for new drivers.

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