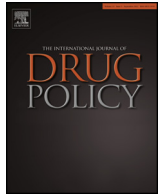




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### Research paper

# Benefits of short educational programmes in preventing drink-driving recidivism: A ten-year follow-up randomised controlled trial

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### ABSTRACT

**Background:** One fifth of drivers convicted of drink-driving for the first time will be convicted again for the same offence in subsequent years. Lecture-based educational programmes are believed to reduce recidivism. Little is known about the modalities of enhancing the benefits of such programs.

**Methods:** This parallel randomised controlled trial measured the effects of the duration of lectures and the presence of a close relative 'in class' on rates of recidivism during the ten years following an initial drink-driving conviction. Of 1588 drivers in the Canton of Geneva convicted of a first-time offence with a blood alcohol concentration (BAC) of between 0.80 and 2.49 g/kg from May 2001 to February 2004, 727 agreed to participate and were randomly assigned to either a seven-hour series of lectures, a four-hour series with a friend or close relative, or a brief two-hour lecture. Time until recidivism was retrieved from a national registry that contains details of recidivism that took place up to ten years after the first offence.

**Results:** Significant effects of briefer lectures over the standard day-long series of lectures were observed only during the most influential time period with regards to recidivism levels—the two years following the intervention. Replacing the usual one-day series of lectures by briefer two-hour lectures would reduce, by 25% (CI95%; 3–44%), the risk of recidivism.

**Conclusion:** This study does not support policymakers' decision to rely on a seven-hour series of lectures to decrease DUI recidivism. The advantages of shorter lectures over no lecture still need to be evaluated.

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### Introduction

Worldwide, harmful use of alcohol leads annually to the deaths of 320,000 young people between 15 and 29 years of age (WHO, 2010). It is the cause of 3.8% of all deaths and is therefore one of the most important avoidable, known risk factors affecting health (Rehm et al., 2009). In Europe, the 12-month prevalence rate of alcohol use disorder is 6.1% for males and 1.1% for females (Rehm,

Room, van den Brink, & Jacobi, 2005). It is particularly influential in contributing to motor vehicle accidents. In Europe, one quarter of automobile accidents are alcohol related (Schulze, Schumacher, Urmeew, & Auerbach, 2012) and alcohol is implicated in at least one fatal accident out of five (Fell, Tippetts, & Voas, 2009). An alcohol-related traffic fatality occurs every 31 min in the United States, representing 39% of total traffic fatalities (Chou et al., 2006). The number of drivers self-reporting having driven after having drunk to excess varies considerably between countries, with a year period prevalence of 2.9% in the US (Chou et al., 2006) and 21.8% in Switzerland (Fink & Ducommun Vaucher, 2006), and a six-month period prevalence of 32.9% in Queensland, Australia (Freeman & Watson, 2009). First-time offenders and multiple recidivists are equally at risk of multiple violations of road traffic regulations (Rauch et al., 2010).

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In Switzerland, driving under the influence of alcohol (DUI) was considered to be an offence for blood alcohol concentrations (BACs) of 0.8 g/kg and upwards until 2005. This threshold was then lowered to 0.5 g/kg. Prior recorded DUI convictions are erased from official records after ten years and are not taken into consideration with regards to administrative sanctions after five years. For those not having committed a DUI offence during the five previous years (i.e. first-time offenders), the duration for which their driving licence is suspended depends on the circumstances of the offence (i.e. prior offences, violation of other traffic regulations, BAC) with a minimum duration of three months for BACs of 0.8 g/kg or higher. Offenders with a BAC of 2.5 g/kg or higher need to prove that they no longer have a drinking problem before they can recuperate their driving licence.

In addition to the fines and prison sentences used to discourage DUI recidivism, educational programmes address the problem of drinking and aim to change attitudes towards drinking and driving (Gache et al., 2006). These types of interventions have been shown to be more efficient for social drinkers than for those who are alcohol dependent (Berjeron, 2003). In a meta-analysis (Wells-Parker, Bangert-Drowns, McMillen, & Williams, 1995) of 215 studies, educational programmes were one of the most frequently studied interventions and their general effect was a relative reduction of approximately 10% in drink-driving recidivism; however, most of these studies were subject to selection bias given the comparison was made with those who refused to participate in the programmes. Furthermore, these education programmes ran over an average of five weeks and generally relied on individual sessions that lasted less than one hour. By comparison, school education programmes that aim to change behaviour are built around short sessions of generally 30 min (Bramlett, Cates, Savina, & Lauinger, 2010). In Switzerland, the Canton of Fribourg has implemented a seven-hour lecture series organised on a single day. The same programme can be delivered in a shorter time, thereby reducing the resources required. A short 30-min intervention given at the hospital following admission due to injury caused by drink-driving has showed promising results, with a 50% reduction in DUI offences (Schermer, Moyers, Miller, & Bloomfield, 2006). Experimental designs—randomized clinical trials—are, however, scarce in this field, making it difficult to identify the influential components of such programmes. It has never been clearly demonstrated that an intensive or protracted intervention was more effective than a short one. We therefore designed a randomized clinical trial to test the effects of different programme durations and the possible influence of having a proxy follow the same programme as the offender.

## Methods

### Objectives

Before implementing the programme run by the Canton of Fribourg to prevent DUI recidivism, the Canton of Geneva ran a full-scale equivalence randomised trial to assess the effectiveness of two briefer alternatives to the programme. This parallel randomised controlled trial with a 1:1:1 ratio of allocation had the primary objective of testing whether alternative educational programmes (i.e. having a proxy also attend a four-hour lecture or giving only a brief two-hour lecture) were as efficient in reducing the risk of DUI recidivism as was the standard seven-hour series of lectures.

Secondary objectives were to estimate the reduction in the risk of DUI recidivism due to having followed each of these education programmes as compared to drivers who did not follow a programme (nested cohort design).

### Population

Participants were first-time DUI offenders with a BAC superior to 0.8 g/kg but inferior to 2.5 g/kg, whose prosecution and sentencing was managed by the canton of Geneva between June 2001 and February 2004. The first-time offender category, however, also included those who may have been convicted of a DUI offence up to five years earlier or in another country. For simplicity, all drivers considered by the authorities as 'first-time offenders' will be referred to as such. First-time offenders were invited, by mail, to participate by the Geneva Cantonal Vehicle Licensing Office. The inclusion criteria were being over 18 years of age, having had one's driving licence suspended, understanding French, and being able to read and write. All participants provided their informed consent to participate in the study.

### Interventions

We adopted a purely teaching approach to the effects of alcohol, DUI individual's conduct, the legal implications of a repeat offence, and the possibility of progressing from social drinking to dependency. Participants were invited to follow an educational programme on drinking and driving in exchange for a reduction, of one month, of the time for which their licence had been suspended. Programme costs were paid by the individual drivers (CHF 250). In the context of the programme, first-time DUI offenders were interviewed by a research psychologist. This hour-long, private interview verified eligibility, collected baseline characteristics, investigated drinking habits, and identified an eventual underlying drinking problem. Drivers were informed of their drinking status and could receive counselling. Each DUI offender was then allocated randomly to one of the following three education programmes: a standard seven-hour series of lectures, a shortened four-hour lecture with a proxy, or a brief two-hour lecture.

#### Standard programme—seven-hour series of lectures

This series of lectures was based on a one-day educational programme running in the Canton of Fribourg since the late 1990s. It was delivered by three lecturers: a jurist, a physician and a psychologist. Participants were informed regarding accident statistics, offence-related legal procedures, the consequences of DUI for insurance cover, the medical consequences of heavy drinking, the psychological aspects of alcohol consumption, and behavioural strategies for avoiding DUI recidivism. Class size was limited to 12 participants. Participants received printed materials summarizing the course content at the end of the series of lectures.

#### Four-hour series of lectures with a proxy

This series of lectures was shortened to four hours. Participants were asked to choose, nominate, and bring with them a close relation (proxy) such as their spouse, a companion, or a friend. A previous study had shown the improved capacity of interventions to reduce alcohol consumption when subjects were accompanied by a friend or close relation (McKay, Longabaugh, Beattie, Maisto, & Noel, 1993). The content of this lecture series was similar to that of the standard seven-hour series of lectures but was delivered by two lecturers instead of three: a jurist and a psychologist, the latter of which also provided summarized information usually delivered by the physician in the standard seven-hour series of lectures. The learning objectives remained the same but the teaching material was summarized as per a consensus reached between all lecturers.

#### Brief two-hour lecture

The content of the programme was shortened to two hours and was delivered by a psychologist with educational experience. The

teaching objectives remained the same but the content was reduced to a minimum.

**Outcomes**

The primary outcome was DUI recidivism over the five years following the first DUI offence. Secondary outcomes were DUI recidivism over periods of two and ten years following the offence, respectively. DUI recidivism was defined as having been found guilty of a second DUI offence during the ten-year follow-up period with a blood alcohol concentration of 0.8 g/kg or more. The national registry of traffic offences was consulted first in July 2008 and then a second time in July 2014. Recidivism was verified for the ten years following the first reported DUI offence. Dates of offences and corresponding BACs were extracted.

**Randomisation**

Stratified randomisation was used balancing gender, age and BAC—at the time of the first offence—between groups. For each stratum, prior to recruitment, randomisation lists of randomly permuted blocks of six were prepared by an independent researcher. These remained confidential, and were kept in the possession of a jurist from the Geneva Cantonal Vehicle Licensing office. At the end of the first interview, after baseline values had been collected, the psychologist was informed of the treatment allocation by phone. Allocation was then revealed to the participant.

**Blinding**

Study participants were not blinded to their allocation group. The clerk and the jurist who collected the data on recidivism from the national registry were, however, blinded to the allocation. Finally, the research psychologist who recorded the baseline characteristics was blinded to the allocation at the time the psycho-medical evaluation took place.

**Statistical methods**

The sample size was estimated (Lachin & Foulkes, 1986) for a ten-year follow-up period and a DUI rate of 30 per 1000 person-years. To detect a hazard ratio of 2 (0.03 vs 0.015) with a power set at 0.9, a significance level at 0.05, and a loss to follow-up of 1% per year, 238 offenders are required in each group. The study therefore aimed to recruit at least 714 participants.

The survival analysis compared the hazard of DUI recidivism over ten years across groups. Hazard is the measurement of risk over time. DUI offenders who had followed the long course served as the reference group. Respecting intention-to-treat procedures, the initiation of the follow-up period started at the date of allocation. After verifying the hazard proportionality assumption using Therneau and Grambsch's test of the non-zero, we computed hazard ratios using Cox regression. The Breslow method was used for ties. Intention-to-treat analysis was carried out unless otherwise stated. The significance level when comparing hazards between groups was computed using a likelihood ratio test and was set at  $p < 0.05$ .

To compare the rates of DUI recidivism of those guilty of a first DUI offence who did not follow any of the courses with rates for those who did (observational design) we relied on Cox regression analysis to measure the adjusted hazard ratios of DUI rates starting at the date of the first offence. Adjustment was made for BAC at first offence, level of addiction, years of experience as a driver, and gender.

**Ethical standards**

All participants gave their informed written consent to participate in the study prior to their inclusion. The study was performed in accordance with the ethical standards of the 2008 amended Declaration of Helsinki (Seoul). The full protocol—in French—is available, on request, from the corresponding author.

**Results**

**Population description**

All 1588 drivers who committed a first DUI offence in the Canton of Geneva between June 2001 and February 2004 were invited to participate in the study. 733 (46.2%) responded favourably and were screened for eligibility. Compared to those who declined the invitation, those that accepted were slightly older (37.1 years vs 34.1 years, on average) and had committed the offence with a higher average BAC (1.57 g/kg vs 1.49 g/kg). Two DUI volunteers were excluded as they did not master French sufficiently well, and—once they received further information regarding the study—a further four refused to enter the study. The remaining 727 were allocated randomly to one of the three teaching methods. Participants attended their lecture on average 43 days later. Compliance seemed to be unequal between groups (Fig. 1) with an increased prevalence of dropouts with increasing lecture length ( $p = 0.012$ ).

Randomisation was successful in correctly balancing education level, professional activity, and driving habits (Table 1). More

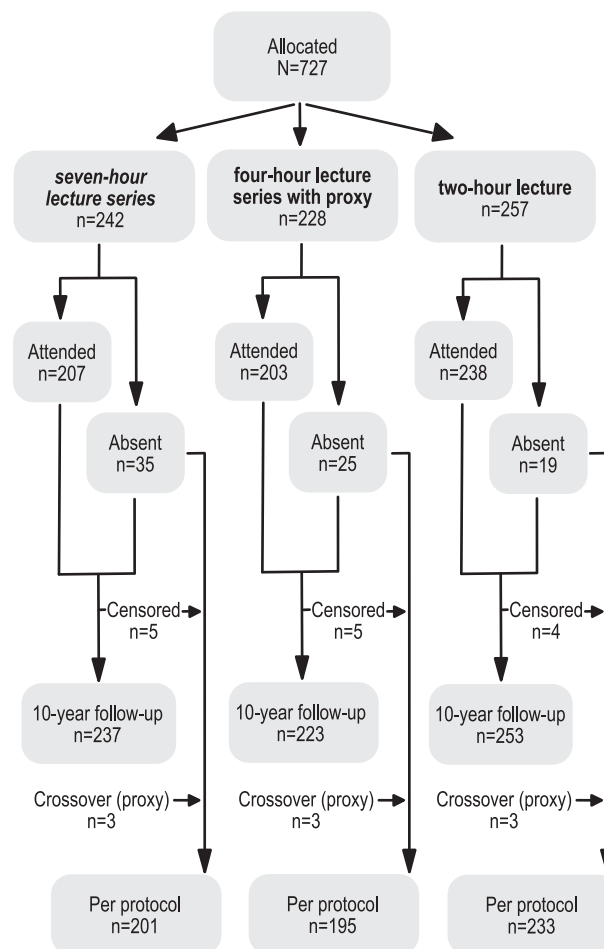


Fig. 1. Flow diagram.

**Table 1**  
Baseline characteristics of studied population.

|                                    | Educational programmes (series of lectures) |       |                        |       |             |       |
|------------------------------------|---|-------|------------------------|-------|-------------|-------|
|                                    | 7-h (n=242)                                 |       | 4-h with proxy (n=228) |       | 2-h (n=257) |       |
|                                    | %   | (n)   | %                      | (n)   | %           | (n)   |
| <i>Gender (male)</i>               | 89.3%                                       | (216) | 88.2%                  | (201) | 87.6%       | (225) |
| <i>Driving experience</i>          |   |       |                        |       |             |       |
| <2 years                           | 9.7%  | (22)  | 7.6%                   | (16)  | 16.7%       | (43)  |
| 2–10 years                         | 30.0%                                       | (68)  | 31.3%                  | (66)  | 45.2%       | (116) |
| 11–20 years                        | 26.0%                                       | (59)  | 25.6%                  | (54)  | 35.8%       | (92)  |
| >20 years                          | 34.3%                                       | (78)  | 35.5%                  | (75)  | 2.2%        | (6)   |
| <i>Distance driven yearly</i>      |   |       |                        |       |             |       |
| <5000 km                           | 9.7%  | (22)  | 7.6%                   | (16)  | 16.7%       | (43)  |
| 5000–9999 km                       | 30.0%                                       | (68)  | 31.3%                  | (66)  | 45.2%       | (116) |
| 10,000–19,999 km                   | 26.0%                                       | (59)  | 25.6%                  | (54)  | 35.8%       | (92)  |
| 20,000–29,999 km                   | 34.3%                                       | (78)  | 35.5%                  | (75)  | 2.2%        | (6)   |
| ≥30,000 km                         | 34.3%                                       | (78)  | 35.5%                  | (75)  | 2.2%        | (6)   |
| <i>BAC at first offence</i>        |   |       |                        |       |             |       |
| 0.8–1.19 g/kg                      | 19.7%                                       | (47)  | 17.1%                  | (39)  | 18.7%       | (48)  |
| 1.2–1.99 g/kg                      | 63.2%                                       | (151) | 64.9%                  | (148) | 63.8%       | (164) |
| 2.0–2.49 g/kg                      | 17.1%                                       | (41)  | 18.0%                  | (41)  | 17.5%       | (45)  |
| <i>Circumstance of DUI offence</i> |   |       |                        |       |             |       |
| Identified after road accident     | 41.3%                                       | (100) | 43.4%                  | (99)  | 38.5%       | (99)  |
| After drinking alone               | 4.1%  | (10)  | 2.2%                   | (5)   | 10.1%       | (26)  |
| Felt impaired                      | 74.3%                                       | (179) | 77.2%                  | (176) | 71.6%       | (184) |
| <i>Drinking habits – AUDIT</i>     |   |       |                        |       |             |       |
| 0–7 (No intervention)              | 75.9%                                       | (183) | 72.7%                  | (165) | 71.2%       | (183) |
| 8–15 (Basic advice)                | 22.8%                                       | (55)  | 24.2%                  | (55)  | 27.2%       | (70)  |
| 16–19 (Brief counselling)          | 0.8%  | (2)   | 2.2%                   | (5)   | 0.8%        | (2)   |
| 20–40 (Investigate dependence)     | 0.4%  | (1)   | 0.9%                   | (2)   | 0.8%        | (2)   |
| <i>Alcohol addiction – CIM-10</i>  |   |       |                        |       |             |       |
| Social drinker                     | 53.5%                                       | (129) | 52.2%                  | (119) | 56.0%       | (144) |
| Hazardous drinker                  | 32.8%                                       | (79)  | 33.3%                  | (76)  | 30.4%       | (78)  |
| Addiction                          | 13.7%                                       | (33)  | 14.5%                  | (33)  | 13.6%       | (35)  |

participants allocated to the short two-hour lecture reported having drunk alone and because they felt alone at the time of their offence compared to the participants allocated to the other teaching methods. The prevalence of alcohol addiction was, nevertheless, similar between all groups (Table 1).

#### Follow-up

The 727 first time DUI offenders totalled 6077 person-years of follow-up. The overall period prevalence of DUI recidivism was 9.1% (66/727) at two years, 17.1% (125/727) at five years, and 21.7% (158/727) at ten years. The median duration of follow-up was 3596 days ranging from 11 days to 3647 days. The first participant entered the study on 20 June 2001 and the last was censored on 31 July 2013. The death of 13 participants and the fact that one participant emigrated led to them being censored before the end of the follow-up period of ten years. Fig. 2 illustrates the cumulative hazard of DUI recidivism.

Over the ten-year follow-up period, hazard ratios between the alternative teaching methods and the standard seven-hour series of lectures were not stable through time (LR test of time-variance-composant:  $p = 0.0321$ , and test on non-zero:  $p = 0.0356$ ). We therefore analysed each time period of interest separately (i.e. 0–2 years, 2–5 years, 5–10 years).

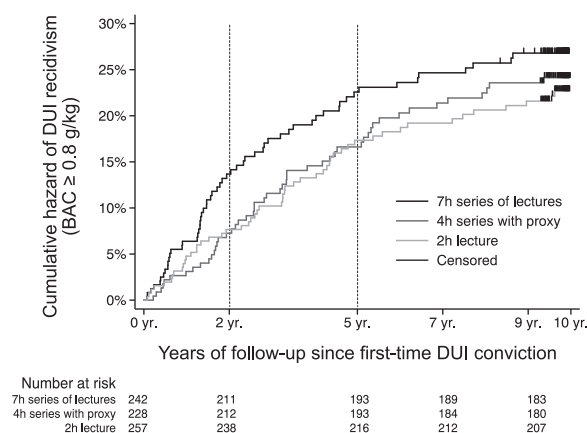
#### Efficiency of a four-hour series of lectures attended with a proxy

The characteristics of 128 of the 228 proxies were available. Their median age was 40 years (ranging from 14 to 71), and 56.6% were women. Proxies were most often the DUI offender's friend (45.3%), their partner (24.2%), one of their parents (21.8%), or one of their children (3.1%). A total of 42.3% of proxies did not have a driving licence.

Compared to a standard seven-hour series of lectures, reducing the duration of the educational programme to four hours and adding a proxy resulted in a reduction of 47% [CI95%; 3–71%] in DUI recidivism during the two years following the first offence (Table 2). This improvement, however, ceased to have an effect after the second year and there was even a non-significant trend towards a worsening effect after five years (HR = 1.78,  $p = 0.191$ ).

#### Efficiency of a brief two-hour lecture

Compared to a standard seven-hour series of lectures, reducing the duration of the lecture to two hours resulted in a reduction of 25% [CI95%; 1–44%] in DUI recidivism during the two years



**Fig. 2.** Nelson–Aalen cumulative hazard function of drink-driving recidivism comparing three educational programmes over ten years.



**Table 2**  
Hazard ratio of DUI recidivism following alternative educational programmes compared to standard seven-hour series of lectures.

|   | Follow-up period  |                  |                  |
|---|-------------------|------------------|------------------|
|   | 0–2 years         | 2–5 years        | 5–10 years       |
|   | HR [CI95%]        | HR [CI95%]       | HR [CI95%]       |
| <i>Intention to treat</i>               |                   |                  |                  |
| Four-hour series of lectures with proxy | 0.53 [0.29;0.97]* | 1.06 [0.56;2.02] | 1.78 [0.75;4.25] |
| Two-hour lecture                        | 0.75 [0.56;0.99]* | 1.03 [0.76;1.42] | 1.11 [0.70;1.75] |
| <i>Per protocol</i>                     |                   |                  |                  |
| Four-hour series of lectures with proxy | 0.53 [0.28;0.99]* | 1.18 [0.58;2.41] | 1.48 [0.61;3.63] |
| Two-hour lecture                        | 0.69 [0.51;0.94]* | 1.09 [0.78;1.54] | 1.00 [0.63;1.60] |

\*  $p < 0.05$ .

following the first offence (Table 2). This improvement, however, ceased to have effect after the second year.

### Sensitivity analysis

Per protocol analysis provided similar results to intention-to-treat analysis (see Table 2). In Switzerland, the legal limit for DUI of alcohol passed from 0.8 to 0.5 g/kg on 1 January 2005. This change was accompanied by sizeable communication programmes on the effects of alcohol on driving performance and the legal consequences of being caught driving under the influence. We therefore performed a stratified analysis measuring the effects of interventions before and after 1 January 2005. We measured the hazard ratio of recidivism from the thirteenth month to the thirty-sixth month of follow-up prior to 1 January 2005 and after the same date.

Compared to the standard seven-hour series of lectures, the effects of both alternative programmes remained similar independently of the changes to the legal BAC limit (HR 0.47 before vs 0.64 after for the four-hour lecture series with a proxy, and HR 0.40 before vs 0.50 after for the brief two-hour lecture).

### Comparing recidivism between those who had and those who had not followed any course

During the same period as that covered by the experimental trial, 940 first-time DUI offenders did not follow any educational rehabilitation programme and served as a control group. The overall period prevalence of recidivism in that control group was 9.0% [CI95%; 7.7–10.5%] at two years, 17.3% [CI95%; 15.5–19.3%] at five years, and 23.1% [CI95%; 21.0–25.2%] at ten years. After adjusting for age, gender, and BAC at the time of the first offence, there was a non-significant 47% increase [CI95% –5% to 203%;  $p = 0.082$ ] in the risk of DUI recidivism within two years of the first offence for those having attended the seven-hour series of lectures when compared to those that refused to participate in the study. In our model, recidivists were more likely to be younger drivers (i.e., <25 years of age; HR = 2.1, CI95%; 1.5–3.0), have an initial BAC level of 2.0 g/kg or above (HR = 2.3, CI95% 1.5–3.4), and be male (HR = 2.4, CI95% 1.1–5.5). Adjusting for all these factors, compared to no intervention, those in the brief two-hour lecture showed a non-significant reduction of recidivism of 27.8% (CI95% –25.4% to 58.4%,  $p = 0.248$ ).

## Discussion

### Overview of results

Compared to a day-long lecture series, a brief two-hour lecture reduced, by 25%, the hazard of drink-driving recidivism. This

beneficial effect only occurred, however, during the two years following the intervention. After that, the effects of the intervention seem to be overtaken by natural changes occurring over time (e.g. age, changes in social norms, number of times BAC was measured during the period) (Meesmann, Martensen, & Dupont, 2015). For those who attended the lecture with a proxy, we cannot know whether the reduction in DUI recidivism during the two years following the intervention was due to the shortening of the length of the series of lectures or to the presence of the proxy. We observed an increase in the incidence of DUI during the first three months that followed the five-year probation period during which sanctions for recidivism were higher (after five years, offences are considered once again as first-time offences and sanctions become less restrictive). This might be related to the relaxing of peer pressure but could also be due to chance alone. When compared to those who did not volunteer to participate in the programme, we observed that those that followed the seven-hour series of lectures were 47% more likely to become DUI recidivists whereas those that followed the two-hour lecture were 28% less likely to become DUI recidivists ( $p = 0.248$ ). It is therefore very unlikely that the apparent lack of advantage of the seven-hour series of lectures over no intervention was due to residual confounding. This study was planned as an equivalent study. However, our results lead us to seriously suspect the total lack of effects on DUI recidivism of the seven-hour series of lectures compared to no intervention. Our results even suggest that these lectures might make things worse by having a negative impact on drivers and aggravating their behaviour with regards to drinking and driving. They also question the true benefits of the shorter programmes over no intervention.

### Comparability to existing literature

The five-year prevalence of drink-driving recidivism identified by our study was similar to that observed in a study in Denmark (17.1% vs 17.0%) (Moller, Haustein, & Prato, 2015). Observed effects after a single, brief lecture given to first-time offenders were more important (25% vs 10%) than those revealed by a meta-analysis (Wells-Parker et al., 1995) and similar to those observed after individual motivational interviews (Brown et al., 2010). In the field, a 25% reduction is still important and is similar to that exhibited by most other interventions that are regarded as efficient. Similar success rates are observed for reducing drinking levels by the use of medical treatments (Miller, Book, & Stewart, 2011) or general practitioner interventions (Bertholet, Daepfen, Wietlisbach, Fleming, & Burnand, 2005), and for education programmes that address teenagers (Elder et al., 2005). Community interventions were able to reduce, by 51%, the number of self-reported DUI offences in California and South Carolina, with numbers falling from 77% to 38% (Holder et al., 2000); but a similar intervention had no effect (RR = 1.00) on traffic accidents in Australia (Shakeshaft et al., 2014). Finally, multicomponent programmes have been shown to achieve between a 9% and a 42% reduction in accidents (Shults et al., 2009), but require more resources. In terms of costs, reducing the length of lecture series from one day to two hours has major advantages. The important effects of the intervention even in the absence of a proxy leads us to favour the brief two-hour lecture, given that adding a proxy increases the drop-out rate. Screening drivers for depression, social marginalisation and alcohol dependence could however remain useful for targeting specific interventions at those more at risk (Ouimet et al., 2013). If our results were to be confirmed, when compared to other existing interventions, short two-hour lectures would undeniably be cost-effective given that they require very few resources. Recent advances in the development of complex interventions aimed at behavioural changes suggest that working in smaller groups and having participants engage in the process of problem solving,

action planning and goal setting may further improve the cost-effectiveness of the programme (McKay, Sumnall, McBride, & Harvey, 2014).

Short educational programmes delivered on a single day only seemed to have an effect during the following two years. Programmes addressing teenagers are also believed to have effects only over a short period of time (Elder et al., 2005), like most educational or motivational interventions (Stein et al., 2006). Efforts to reduce early recidivism should however be maintained given that close to half of all recidivism occurs during the two years following a first offence. Furthermore, for an intervention to have an impact on recidivism it must effect major behavioural change as drivers commit, on average, 200 DUI offences before they are caught (Beitel, Sharp, & Glauz, 2000; Ducommun Vaucher & Allenbach, 2009). In our study, this would mean that for every 100 drivers, approximately 400 offences could have been prevented during the first two years following participants' entry into the programme.

### Interpretations

Negative confrontation, enhanced negative effects, peer pressure, and attention deficit are possible explanations as to why briefer, two-hour lectures could be more efficient than those organised over an entire day. Longer lectures might enhance non-acceptance and a negative confrontation that limits attendees' ability to initiate changes (Miller, Benefield, & Tonigan, 1993; Patterson & Forgatch, 1985). Furthermore, feelings of hopelessness and negative mood, which might be increased by the longer lecture, could be counter-productive and discourage DUI offenders from changing their behaviour (Wells-Parker, Dill, Williams, & Stoduto, 2006; Wells-Parker et al., 2009). Grouping DUI offenders might also have led, through peer-group interaction, to a minimizing of the perceived consequences and dangers of DUI (Gaughan, 2006). This could have minimized the impact of preventive messages in longer series of lectures given that participants were more likely to interact during breaks. Lastly, a brief lecture might have made it easier to identify and retain important information. By comparison, the long series of lectures could have impeded attention (Johnstone & Percival, 1976).

During the past ten years, important methodological advances have been made with regard to how to develop and implement new policies designed to change people's behaviour (De Silva et al., 2014; Michie et al., 2015; Moore et al., 2015). Our study suggests that the seven-hour series of lectures that was believed to prevent DUI recidivism might even encourage it. This programme—implemented in the Canton of Fribourg without prior testing—could therefore be counterproductive. Introducing new programmes progressively and monitoring their effects across randomised groups does not require extensive additional resources. In this study, collaboration between the Canton of Geneva authorities and university academics proved beneficial. Our pragmatic applied approach using experimental research reveals how such collaborations can help the authorities and the political milieu make decisions. Following the issuing of our report, the canton agreed to extend the programme and test the benefits of a brief two-hour lecture with or without proxy compared to no intervention. Evidence-informed policies might, it seems, be becoming the rule rather than the exception.

### Strengths and limitations

This study reduced observation bias to its minimum given that DUI offenders were randomised to education programmes and members of all groups were just as likely to be arrested when drink-driving. This study is one of the largest randomised

controlled trials assessing the effects of educational programmes on DUI recidivism. The low loss to follow-up and the duration of observation (ten years) provided important insights into short- and longer-term effects. The major limitation is the lack of a proper control group without any intervention, making it difficult to estimate the true effects of intervention compared to no intervention. Furthermore, our design made it impossible to differentiate the effects of having a proxy accompany attendees to the lecture series from the effects of shortening the intervention to four hours. External validation can be limited by two factors. First, conviction for the offence of DUI is not necessarily representative of behaviour. Reckless drivers are more likely to commit other types of violation and are therefore more likely to be identified than those who are drinking and driving. Second, our results might not be generalizable to drivers who do not voluntarily attend such lectures. We cannot exclude that making these courses compulsory for all DUI offenders, as planned in Switzerland, would reduce the efficiency of the intervention.

### Conclusion

When considering lecture-based educational programmes aiming to prevent short-term DUI recidivism, policymakers should take into account the existing evidence. Educational programmes should not replace other measures such as frequent and highly publicised sobriety checkpoints and alcohol ignition interlocks (Ferguson, 2012). Our results suggest that at best the seven-hour series of lectures has no effect. Shorter lectures and having DUI offenders attend them with a peer could be more beneficial. These benefits are, however, limited in time and cease to have an effect after two years.

### Author contributions

PV planned the analysis, analysed data, interpreted the results and drafted the manuscript. WM applied for grants, planned the study, monitored data collection, verified data entry, and interpreted the results. SJL coordinated those working on the study, interpreted the results, and managed the data. NF and BP helped plan the study, managed data extraction from the national registry, and helped interpret the results. AB completed missing data and helped interpret the results. BF validated the analysis plan, supervised the ten-year data collection, interpreted the results and drafted the article with PV. PG applied for grants, planned the study, served as medical investigator during the study, and helped interpret the results. All authors have given their approval for the final version of this paper.

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### Conflicts of interest

None declared.

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