



Drink drivers' views of a voluntary alcohol interlock programme for drink driving offenders in Sweden

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ABSTRACT

A permanent alcohol interlock programme was introduced in Sweden in 2012. The programme is voluntary and allows drink driving offenders to keep their driving licenses if they install alcohol interlocks in their vehicles. The duration of the programme is one or two years, depending on the severity of the drink driving offence. This study aims to improve our knowledge of drink drivers' views of the programme, among both participants and those who chose not to participate. These views were collected through paper questionnaires mailed to the drink drivers' residences. Of 1550 questionnaires mailed to participants and 1492 to non-participants, 689 and 408 were completed, for response rates of 45% among participants and 28% among non-participants (excluding returns because of incorrect addresses or because the respondent was deceased). For participants who were employed or had their own business ($n = 513$), the main reasons for choosing the alcohol interlock were the need to operate a vehicle at work (69.6%, 95% CI: 65.6–73.6%) and to get to/from work (69.4%, 95% CI: 65.4–73.4%). For those not working ($n = 153$), the main reasons for participating were that the driving license was required to have a social life and meaningful leisure time (79.7%, 95% CI: 73.3–86.2%) and for shopping (65.4%, 95% CI: 57.7–73.0%). For non-participants, the main reasons for not applying were programme costs (64.4%, 95% CI: 59.5–69.3%), being afraid of being considered alcoholics (37.1%, 95% CI: 32.2–42.1%), and doing well without a license (26.5%, 95% CI: 22.0–31.0%). The results also indicate improved health after the drink driving offence. The largest improvement was found in participants in the two-year programme, in which the proportion of respondents who felt good or very good increased by 39.4% (95% CI: 34.2–44.5%) compared to before the drink driving offence.

1. Introduction

The alcohol interlock programme in Sweden started as a trial in three counties in 1999. Four years later, the programme was extended to the whole country. During the trial, a programme evaluation showed that 11% of eligible drink driving offenders started the programme and 60% of those completed the whole period (Bjerre, 2005). The evaluation also demonstrated a positive effect on recidivism during the programme, with none of the participants completing the whole period being rearrested. The recidivism rate after the programme was 1.8% per year for programme completers, but 4.3% per year for drop-outs after they regained their driving licenses. The evaluation also included two control groups, the first comprising offenders from counties not included in the trial and the second offenders who chose not to participate in the programme; their recidivism rates were 4.4% and 3.7% per year during the revocation period and 4.0% and 2.5% per year after

regaining their licenses, respectively. In addition, Bjerre et al. (2007) showed that fewer programme participants needed hospital care and used sick leave than did members of the first control group (the second control group was not included in this study).

The results of the evaluation of the Swedish interlock programme during the trial period are aligned with those of the many studies, primarily from the United States (U.S.) and Canada, demonstrating a reduction in recidivism rates when installing interlocks (Elder et al., 2011; Marques et al., 2010; Vanlaar et al., 2017; Willis et al., 2004). Recent evaluations also indicate that interlock programmes lead to reductions in alcohol-related crashes (Kaufman and Wiebe, 2016; McCart et al., 2013; McGinty et al., 2017; Teoh et al., 2018; Vanlaar et al., 2017).

Based on experience from the trial, a permanent alcohol interlock programme was introduced in Sweden in 2012. The Swedish Transport Agency (STA) is responsible for the programme, which applies to all

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types of driving licenses. The programme is voluntary and offers a one-year and a two-year alternative. The two-year programme applies to offenders who: i) have committed an aggravated drink driving offence, i.e., were apprehended with a blood alcohol concentration (BAC) $\geq 1 \text{ g L}^{-1}$ (the legal limit in Sweden is 0.2 g L^{-1}); ii) had an earlier offence within the previous five years; or iii) are diagnosed with alcohol abuse or alcohol dependence. All others are assigned to the one-year programme. The corresponding license revocation period for those not participating in the programme is also one or two years. The cost of the programme is paid by the offender, and STA has estimated the cost to be EUR 2000–4000. To be eligible for the programme, one must be living in Sweden and one cannot drive outside Sweden. Also, participation is denied if one uses narcotic substances (a urine or hair drug test is conducted as part of the application process), although some exceptions are made for prescribed drugs.

The permanent programme incorporates some changes compared with the trial programme. The main changes were the introduction of a one-year programme, an extension of the revocation period for those not participating in the programme, and reduced costs due to fewer medical consultations and removal of an administrative fee charged by the STA. These changes were intended to increase the participation rate.

A previous study of the permanent programme found that about 30% of all drivers who had their licenses revoked due to drink driving applied for and were granted participation in the programme (Forsman and Gustafsson, 2016), so the aim of increasing the participation rate from the trial period was fulfilled. The participation rate was higher (just over 40%) for aggravated offenders (BAC $\geq 1 \text{ g L}^{-1}$) than for offenders with lower BAC levels (just over 20%). Looking at other countries, Robertson et al. (2018) reported, based on data from 25 U.S. states, that 31.8% of arrested drivers and 46.9% of convicted drivers had interlocks installed. From Canada, Chamberlain et al. (2013) reported rough estimates indicating that four of 13 provinces and territories have participation rates above 30%. An evaluation of the Dutch interlock programme, which applies to first-time offenders with a BAC over 1.3 g L^{-1} , found a participation rate of 48% (Houwling, 2016). However, it should be noted that the above programmes are mandatory, while the Swedish programme is voluntary.

This study aims to improve our knowledge of drink driving offenders' views of the alcohol interlock programme, among both participants and those who chose not to participate. Specifically, the topics of interest are their reasons for choosing or not choosing to participate in the programme and their views of the application process, doctors' appointments, and the installation and use of the interlocks. Other topics of interest are whether their health and drinking habits changed after the drink driving offence.

Some of these questions have been addressed in other studies. For example, Vehmas and Löytty (2013) conducted a questionnaire study of drink driving offenders in Finland who chose alcohol-interlock driving rights. Their questionnaire addressed the drivers' experiences and opinions of controlled driving rights and the use of interlocks. The answers indicate that the interlocks were viewed both as a problem and a shameful remainder of the offence as well as a helper preventing further mishaps. As part of evaluating the New Mexico interlock programme, a focus group study was conducted with drivers ordered to have an interlock (Marques et al., 2010); some of the participants found the monthly fees to be costly and that it was embarrassing to blow into the device in front of other people, but also that the interlocks kept them from drinking.

2. Method

2.1. Study procedure and sample selection

The views of the drink drivers were collected using paper questionnaires sent to a random sample of both participants and non-

participants. The questionnaire was sent by mail to their residences on 14 April 2015, together with a cover letter and prepaid return envelope. A reminder was sent about a month later (11 May). The reminder consisted of a new cover letter, the questionnaire, and a prepaid return envelope.

The sample provided by STA was selected from drivers registered for license revocation between 1 July 2013 and 30 June 2014. Names and addresses were provided by the Swedish Tax Agency, which retrieved data from the Swedish Population Register. Some drivers were removed from the sample because their addresses were incomplete; other drivers were removed because they were instead selected for a parallel interview study. The questionnaire was sent to all drivers in the STA sample who participated in the one-year ($n = 485$) and two-year ($n = 1065$) programmes. Among the non-participants, stratified sampling with two strata, men and women, was used. All women ($n = 332$) and a random sample of men ($n = 1160$) were selected, for a total of 1492. This means that the women had a higher sampling probability than did the men, which was accounted for in the data analysis. This procedure was used because the population of women was small, and by selecting all of them we could maximise the precision of the results from women as a group. This can be particularly useful if results for men and women are presented separately; as this is not the case here, the stratification will have only a marginal effect on the precision of the results.

2.2. The questionnaires

Different questionnaires were sent to participants and non-participants. Both questionnaires were written in Swedish only. The questionnaire sent to participants comprised 41 questions addressing topics such as: reasons for participating, information about the programme and application process, type of interlock installed, possible problems with the interlocks, costs, general health, and alcohol consumption. The questionnaire sent to non-participants comprised 31 questions addressing similar topics concerning general health and alcohol consumption, as well as other topics, such as reasons for not participating and whether they regretted not applying for the programme. Both questionnaires included background questions about type of residence area, education level, marital status, etc. In general, the questionnaires consisted of multiple-choice questions that were transformed into categorical variables. It was also possible to leave comments in conjunction with most questions, but these comments are not included in the results presented here.

The questions about alcohol consumption, alcohol abuse diagnosis, and treatment asked the respondents to describe their situations just before the offence and during the interlock programme (for participants) or the revocation period (for non-participants). As for general health, the respondents were asked to describe their situations just before the offence and at the time of completing the questionnaire. From these variables, we calculated changes in the situation from before to after the offence.

2.3. Data analyses

The analyzed variables are categorical, and the results are presented as the proportions, p , of respondents in particular response categories. Confidence intervals were calculated, and tests were conducted according to normal-approximation sampling theory formulas (see, e.g., Cochran, 1977). The proportions for non-participants were calculated using conventional formulas for stratified sampling (two strata): $p = p_M N_M / N + p_K N_K / N$, where p_M and p_K are the proportions of men and women, N_M and N_K are the numbers of men and women in the population of non-respondents, and N is the sum of N_M and N_K . Here, the proportions of men (N_M / N) and women (N_K / N) in the population are estimated as the proportions in the STA sample.

The variance of the proportions was estimated as: $p(1 - p)/(n - 1)$

for participants and $p_M(1 - p_M)(N_M/N)^2/(n_M - 1) + p_K(1 - p_K)(N_K/N)^2/(n_K - 1)$ for non-participants, where n is the number of respondents to the current question and n_M and n_K are the numbers of male and female respondents, respectively. These formulas assume that the finite population correction factor is negligible. Confidence intervals were then constructed, and significance tests performed using the t -distribution. When the number of respondents and/or proportions are low ($np(1-p) < 10$ is used here as the limit), the assumption of normal-approximation is questionable. In these cases, exact confidence intervals based on the binomial distribution were calculated. A significance level of 0.05 is used throughout the paper.

Chi-square tests were conducted to test whether participants in the one- and two-year programmes, differed in their experiences of different parts of the programme.

Binary logistic regression was used to examine the relationships between reasons for not applying for the programme and background variables (i.e., sex, age, type of living area, marital status, level of education, and occupation). Logistic regression was also used to examine the relationships between general health and drinking habits, treatment, and background variables. The logistic regressions were conducted in SPSS v. 21.

2.4. Ethical approval

The study was approved by the regional ethical review board of Linköping, Sweden.

3. Results

3.1. Respondent characteristics

In total, 3042 questionnaires were mailed out, 1550 to participants and 1492 to non-participants. Among participants, 23 questionnaires were returned because of incorrect addresses or because the respondent was deceased, and 689 questionnaires were completed, resulting in a response rate of 45%. Among non-participants, 60 questionnaires were returned and 408 were completed, resulting in a response rate of 28%.

The sociodemographic characteristics of the respondents are shown in Table 1. Most of the respondents, i.e., 86.6% of participants and 83.4% of non-participants, were men. The age distribution differed somewhat between the groups, with non-participants having higher proportions of younger (18–34 years) and older (65 years and older) respondents than did participants.

About half of the participants who responded to the questionnaire (49.8%) lived in small cities or villages. This proportion was lower for non-participants (38.0%), who, compared with participants, more often lived in medium-sized cities.

Being married/cohabiting (62.0%) was more prevalent than being single (38.0%) among participants in general, and was even more prevalent among participants in the one-year programme (i.e., 71.7% vs. 28.3% single). It was most common to have a medium level of education, among both participants (48.8%) and non-participants (44.4%). Most respondents were employed or had their own business at the time of the offence, though this was more common among participants (77.0%) than non-participants (59.4%).

3.2. Main reasons why participating respondents applied for the programme

The participants in the interlock programme were asked about their main reasons for applying for the programme. The results (see Table 2) show that most respondents who were employed or owned their own business indicated that they needed a driving license in their work (69.6%) or to get to/from work (69.4%); other commonly stated reasons were for shopping (47.0%) and to have a social life and meaningful free time (56.3%). For respondents who did not work, the need to have a social life and meaningful free time was the most stated reason

Table 1

Self-reported sociodemographic information about the respondents, the numbers and proportions reflect the conditions at the time the questionnaire was completed, except for occupation, which reflects the conditions at the time of the offence.

	Participants			Non-participants
	One-year programme, n (prop.)	Two-year programme, n (prop.)	All, n (prop.)	All, n (prop.) ^a
Total	200 (100%)	489 (100%)	689 (100%)	408 (100%)
Sex				
Men	174 (87.0%)	423 (86.5%)	597 (86.6%)	300 (83.4%)
Women	26 (13.0%)	66 (13.5%)	92 (13.4%)	108 (16.6%)
Age				
18–34	19 (9.5%)	68 (13.9%)	87 (12.6%)	68 (16.9%)
35–64	142 (71.0%)	332 (68.9%)	474 (68.8%)	236 (56.5%)
65+	39 (19.5%)	89 (18.2%)	128 (18.6%)	104 (26.6%)
Type of living area ^b				
Big cities	61 (30.8%)	124 (26.5%)	185 (27.8%)	125 (31.6%)
Medium-sized cities	59 (29.8%)	90 (19.2%)	149 (22.4%)	123 (30.4%)
Small cities/villages	78 (39.4%)	254 (54.3%)	332 (49.8%)	150 (38.0%)
Marital status				
Married/cohabiting	142 (71.7%)	272 (57.9%)	414 (62.0%)	197 (51.5%)
Single	56 (28.3%)	198 (42.1%)	254 (38.0%)	187 (48.5%)
Level of education ^c				
Low	43 (21.5%)	122 (25.5%)	165 (24.3%)	115 (29.6%)
Medium	106 (53.0%)	225 (47.1%)	331 (48.8%)	179 (44.4%)
High	51 (25.5%)	131 (27.4%)	182 (26.8%)	108 (26.0%)
Occupation				
Employed/own business	156 (79.6%)	357 (76.0%)	513 (77.0%)	228 (59.4%)
Does not work ^d	40 (20.4%)	113 (24.0%)	153 (23.0%)	153 (40.6%)

^a The proportions are calculated using formulas for stratified sampling, to compensate for a higher inclusion probability for women than for men.

^b Big cities: > 100,000 inhabitants; medium-sized cities: 25,000–100,000 inhabitants; small cities: < 25,000 inhabitants.

^c Low: elementary school; medium: upper secondary school; high: college degree or higher.

^d Comprises the following categories: student, retired, on sick leave, off duty, unemployed, and homemaker.

(79.7%) for applying for the programme. Significance test of the difference between the groups gave $P < 0.01$ for all four reasons mentioned above. Some respondents (12.7% and 15.7% for employed/own business and not working, respectively) thought that the interlock could help them come to terms with their alcohol problems; there was no significant difference between the groups in this respect ($P = 0.26$).

3.3. Main reasons why non-participating respondents did not apply for the programme

The non-participants were asked about their main reasons for not applying for the interlock programme, and the most common answer was that the costs were too high (64.4%, 95% CI: 59.5–69.3%; see Fig. 1). Two other reasons were also relatively common: 37.1% (95% CI: 32.2–42.1%) of respondents stated that they did not have an alcohol problem and did not want to be seen as an alcoholic, and 26.5% (95% CI: 22.0–31.0%) stated that they were doing well without a driving license. A binary logistic regression was applied to each of the three most common reasons for not applying. The dependent variable had the outcome 1 if the respondent agreed with the reason and 0 otherwise. The background variables presented in Table 1 were included as explanatory variables. The results for “I’m doing well without a driving

Table 2

Reasons why participants applied for the alcohol interlock programme based on employment status. Combined results for participants in the one- and two-year programmes, based on a multiple-choice question in which up to four reasons could be stated.

Response category	Employed/own business (n = 513)		Not working (n = 153)		Test of difference ^a P-value
	n	prop. (95% CI)	n	prop. (95% CI)	
Need a driving license in my work	357	69.6% (65.6–73.6%)	31	20.3% (13.8–26.7%)	< 0.01
Need a driving license to go to/from work	356	69.4% (65.4–73.4%)	44	28.8% (21.5–36.0%)	< 0.01
Need a driving license for grocery shopping and other purchases	241	47.0% (42.6–51.3%)	100	65.4% (57.7–73.0%)	< 0.01
Need a driving license to have a social life and meaningful free time	289	56.3% (52.0–60.6%)	122	79.7% (73.3–86.2%)	< 0.01
Need a driving license in order to drive others (e.g., children or other close relatives)	200	39.0% (34.8–43.2%)	62	40.5% (32.7–48.4%)	0.38
Need a driving license to avoid taking a new driving test	126	24.6% (20.8–28.3%)	52	34.0% (26.4–41.6%)	0.04
To help come to terms with my alcohol problems	65	12.7% (9.8–15.6%)	24	15.7% (9.9–21.5%)	0.26
A requirement from relatives	15	2.9% (1.5–4.4%)	8	5.2% (2.7–10.0%)	0.20

^a Test of difference in proportions between respondents in the two groups (Employed/own business and Not working).

license” are shown in Table 3. The only variable that contributed significantly to the outcome was type of living area. The odds ratio (OR) indicates that respondents living in medium-sized cities were more likely to do well without a driving license than were respondents in small cities/villages (OR = 2.282, 95% CI: 1.244–4.187). The OR for big cities is not significantly different from 1. The other reasons for not applying did not yield any significant results and are not shown here.

A few non-participants had applied for the interlock programme but were denied participation; however, 77.4% of non-participants (n = 299, 95% CI: 73.1–81.8%) had not applied and were content with this decision, while 14.6% (n = 56, 95% CI: 10.9–18.3%) had not applied but regretted this decision afterwards.

3.4. The participating respondents’ experiences of different parts of the programme and of using the interlocks

The participating respondents’ experiences with different parts of the programme did not differ significantly between participants in the one- and two-year programme (Fig. 2). Chi-square tests of the response distribution resulted in the P-values 0.81 (application procedure), 0.78 (reach contact person at STA), 0.37 (find provider of interlocks), and 0.33 (finding a doctor).

Looking at the participants in the one- and two-year programmes combined, the procedure for finding a provider of interlocks was the least difficult part. Only 9.3% (n = 63, 95% CI: 1.9–16.7%) of respondents found it difficult or rather difficult to find a provider, and this proportion differed significantly from the proportions of participants finding the three other parts of the programme difficult

(P < 0.01 for all three comparisons). Furthermore, 28.4% (n = 192, 95% CI: 22.0–34.9%) found the application procedure difficult or very difficult, 33.0% (n = 222, 95% CI: 26.8–39.3%) found it difficult or very difficult to reach the contact person at STA, and 31.8% (n = 215, 95% CI: 25.5–38.1%) found it difficult or very difficult to find a doctor who could conduct the necessary drug tests and examinations. There was no statistically significant difference between these three proportions.

About three quarters (74.3%, n = 479, 95% CI: 70.9–77.6%) of all respondents participating in the interlock programme had problems exhaling correctly into the interlock at least once (Fig. 3), and about one quarter (24.3%, n = 157, 95% CI: 21.0–27.7%) had this problem several times (number of times not stated). Over half (53.9%, n = 315, 95% CI: 49.9–58.0%) experienced problems with the interlocks during cold weather. Other problems were less common, but 25.6% (n = 143, 95% CI: 22.0–29.2%) reported problems at least once after intake of food/drink and 22.8% (n = 127, 95% CI: 19.3–26.3%) after using mouthwashes. Some respondents (19.9%, n = 111, 95% CI: 16.6–23.2%) also reported problems when using the interlocks after cleaning the windshield with washer fluid.

3.5. Alcohol abuse diagnosis and treatment among all respondents

The proportion of respondents diagnosed with alcohol abuse or alcohol dependence before the offence was lowest among participants in the one-year programme (1.5%) and highest among participants in the two-year programme (13.3%; see Table 4). The differences between the groups were significant for all comparisons (P < 0.01 for one-year vs.

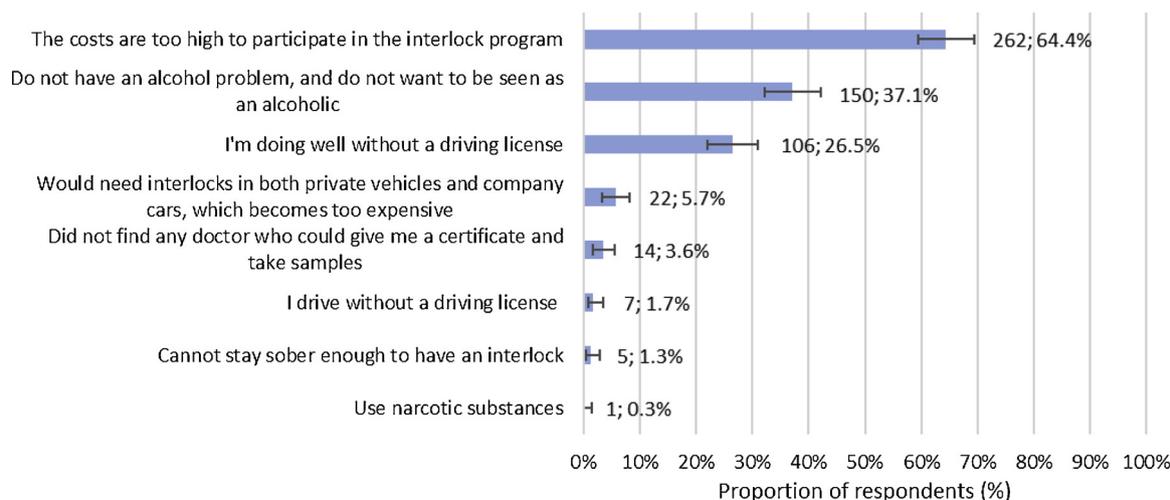


Fig. 1. Non-participants (n = 402) main reasons for not applying for the interlock programme, based on a multiple-choice question in which up to four reasons could be stated. The error bars represent 95% confidence intervals and the numbers beside the bars are the number and proportion of respondents.

Table 3
Results of binary logistic regression of non-participants, dependent variable is 1 if the non-participating respondent agrees with “I’m doing well without a driving license” and 0 if not.

	OR	95% CI	P-value ^a
Sex			0.77
Men	1.086	(0.622–1.896)	
Women	–	–	
Age			0.70
18–34	1.110	(0.464–2.652)	
35–64	1.312	(0.671–2.568)	
65 +	–	–	
Type of living area ^b			0.03
Big cities	1.737	(0.946–3.191)	
Medium-sized cities	2.282	(1.244–4.187)	
Small cities/villages	–	–	
Marital status			0.57
Married/cohabiting	1.154	(0.707–1.883)	
Single	–	–	
Level of education ^c			0.57
Low	0.722	(0.366–1.424)	
Medium	0.769	(0.429–1.378)	
High	–	–	
Occupation			0.22
Employed/own business	0.708	(0.409–1.227)	
Does not work ^d	–	–	

^a P-value of the Wald statistic for the overall significance of the variable.
^b Big cities: > 100,000 inhabitants; medium-sized cities: 25,000–100,000 inhabitants; small cities: < 25,000 inhabitants.
^c Low: elementary school; medium: upper secondary school; high: college degree or higher.
^d Comprises the following categories: student, retired, on sick leave, off duty, unemployed, and homemaker.

two-year participants and for one-year participants vs. non-participants, and $P = 0.01$ for two-year participants vs. non-participants). The proportions of respondents diagnosed after the offence were also highest among participants in the two-year programme, i.e., 16.2% ($P < 0.01$ compared with the other groups). The difference between participants in the one-year programme and non-participants was not statistically significant in this respect.

The results in Table 5 indicate that a few respondents were already in some kind of treatment before the offence: 1.6% of participants in the one-year programme, 14.4% in the two-year programme, and 8.7% of non-participants. The proportion of respondents who started treatment after the offence was highest among participants in the two-year programme, followed by non-participants and then participants in the one-

year programme. The differences between the groups were significant, $P < 0.01$ for all three comparisons. Among participants in the two-year programme, a comparison was made between treatment and diagnosis. The results indicate that 51.5% ($n = 69$, 95% CI: 42.9–60.1%) of respondents with a diagnosis (received before or after the offence) started treatment after the offence, versus 16.8% ($n = 53$, 95% CI: 12.7–21.0%) of those without a diagnosis.

3.6. Drinking habits among all respondents

The results of comparing drinking habits before the offence and during the interlock programme or revocation period are summarised in Table 6. Very few respondents stated that they drank more during the programme/revocation than before the offence, in terms of both number of drinking occasions and amount per occasion. At most, 4.1% reported drinking more often than before and 3.9% reported drinking a larger amount per occasion than before (both results apply to non-participants). The proportion of respondents who reported drinking less than before the offence was highest among participants in the two-year programme, 69.3% of whom drank less often and 54.6% drank less per occasion. The lowest proportions were reported by non-participants, i.e., 35.3% and 24.0%, respectively. T-tests show that the groups differed significantly from each other, $P = 0.01$ for the comparison between the one- and two-year programmes regarding drinking amount and $P < 0.01$ for all other comparisons.

3.7. General health among all respondents

The respondents were also asked about their general health condition, and the results are shown in Fig. 4. Before the offence, participants in the two-year programme had the worst self-assessed health, with 29.5% ($n = 140$, 95% CI: 25.4–33.7%) rating their health as bad or very bad. This proportion was higher than among both participants in the one-year group (8.5%, $n = 17$, 95% CI: 4.6–12.5%) and non-participants (21.6%, $n = 93$, 95% CI: 17.6–25.7%). All groups improved their health after the offence in terms of the proportion rating their health as good or very good. The improvement (calculated as the proportion of respondents that rated their health as good or very good after the offence minus the proportion before the offence) was 14.0% (95% CI: 7.6–20.4%) among participants in the one-year programme, 39.4% (95% CI: 34.2–44.5%) among participants in the two-year programme, and 19.0% (95% CI: 13.2–24.8%) among non-participants. The change was thus greatest among participants in the two-year programme ($P < 0.01$ for comparisons with both other groups). The difference in

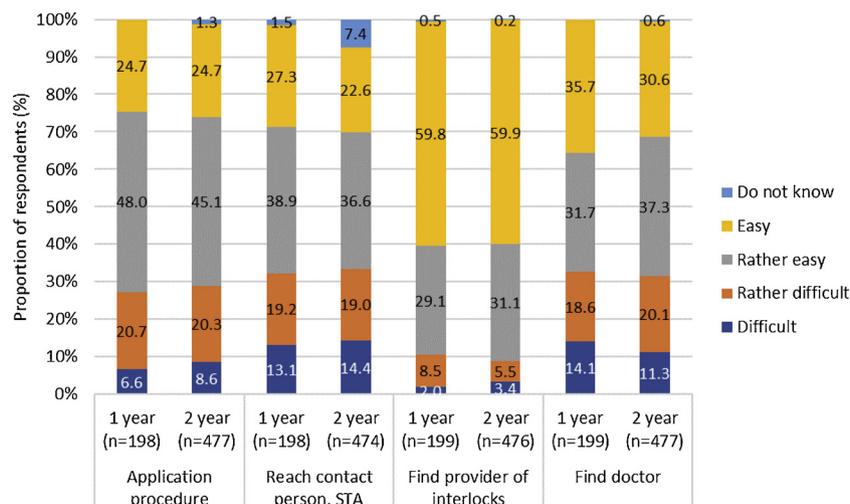


Fig. 2. The participating respondents’ experience of different parts of the interlock programme (i.e., application procedure, reaching contact person at STA, finding provider of interlocks, and finding a doctor).

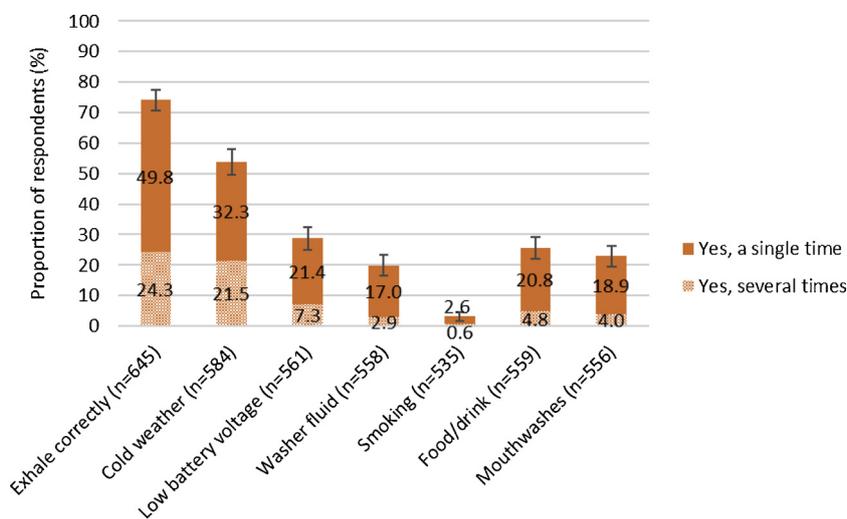


Fig. 3. Reported problems with the interlocks in different situations, experienced by participants in the one- and two-year programme combined. The error bars represent 95% confidence intervals for the proportions of respondents who responded “Yes, a single time” or “Yes, several times”.

Table 4
Numbers and proportions of respondents diagnosed with alcohol abuse or dependence before and after the offence.

	Participants in the one-year programme (n = 195)		Participants in the two-year programme (n = 458)		Non-participants (n = 387)	
	n	prop. (95% CI)	n	prop. (95% CI)	n	prop. (95% CI)
Known diagnosis before the offence	3	1.5% (0.6–4.4%)	61	13.3% (10.1–16.5%)	30	7.7% (5.0–10.5%)
Diagnosed after the offence ^a	12	6.2% (2.7–9.6%)	135	16.2% (12.7–19.6%)	17	4.3% (2.2–6.4%)
Total	15	7.7% (3.9–11.5%)	196	29.5% (25.2–33.7%)	47	12.1% (8.7–15.5%)

^a Only respondents with no prior diagnosis.

Table 5
Numbers and proportions of respondents in treatment before the offence or starting treatment after the offence.

	Participants in the one-year programme		Participants in the two-year programme		Non-participants	
	n	prop. (95% CI)	n	prop. (95% CI)	n	prop. (95% CI)
In treatment before the offence	3	1.6% (0.6–4.5%)	66	14.4% (11.2–17.7%)	33	8.7% (5.9–11.6%)
Started treatment after the offence	11	5.7% (2.4–9.0%)	125	27.4% (23.2–31.5%)	51	13.3% (9.9–16.7%)
Total in treatment after the offence	13	6.7% (3.2–10.3%)	172	37.6% (33.2–42.1%)	77	20.1% (16.1–24.2%)

improvement between participants in the one-year programme and non-participants was not significant ($P = 0.21$).

Improved health at the individual level was further analysed using binary logistic regression. The explanatory variables were the

background variables presented in Table 1, whether or not the respondents were in treatment and whether or not they had changed their alcohol consumption. The results indicate the overall significance of the variables *Participation in interlock programme*, *In treatment after the offence*, and *Change in alcohol consumption* (Table 7). Health was more likely to improve among participants in the one- and two-year programmes than among non-participants (OR = 3.019 and 8.651, respectively). Health was also more likely to improve among participants in some kind of treatment after the offence (OR = 2.541). Reduced alcohol consumption was also related to improved health (OR = 2.396). There was no overall significant effect of age ($P = 0.07$), but the ORs for the 18–34-year and 35–64-year age classes compared with the 65+ age class were significantly different from 1. Health was thus more likely to improve in the younger age classes.

4. Discussion

The rate of participation in the Swedish alcohol interlock programme is about 30% (Forsman and Gustafsson, 2016), meaning that most offenders are still outside the programme. Results of the questionnaire study presented here indicate that the main reason for not applying to the programme was cost (64.4% of non-participating respondents). STA estimates that the programme costs EUR 2000–4000, covering the purchase, installation, and service of the interlocks as well as the required medical appointments and blood samples. The cost of installing the interlock has also previously been noted as a problem by offenders (Marques et al., 2010; Vehmas and Löytty, 2013), and Voas and Marques (2003) identified cost as a barrier to interlock implementation in both voluntary and mandatory programmes. However, cost was not the only reason for not participating in the programme. About 37.1% of non-participating respondents reported that they were afraid of being regarded as alcoholics. This is in line with the results of Marques et al. (2010) and Vehmas and Löytty (2013), who found that participants mentioned the embarrassment of blowing into the device in front of other people or in public. Logistic regression could not explain these reasons with reference to background information about the respondents (i.e., sex, age, living area, marital status, education level, and occupation). The proportion of drivers who did well without a driving license and therefore did not participate in the interlock programme could partly be explained by living area. Participants living in medium-sized cities were more likely (OR = 2.282) to do well without a license than were drivers living in small cities or villages, possibly because of lack of alternative transport modes in small cities and villages.

Table 6
Change in drinking habits from before the offence until during the programme or revocation (i.e., after the offence).

	Participants in the one-year programme		Participants in the two-year programme		Non-participants	
	n	prop. (95% CI)	n	prop. (95% CI)	n	prop. (95% CI)
Number of drinking occasions^a						
Drink less often during the programme/revocation than before	106	55.2% (48.1–62.3%)	319	69.3% (65.1–73.6%)	139	35.3% (30.3–40.2%)
Drink as often during the programme/revocation as before	85	44.3% (37.2–51.4%)	137	29.8% (25.6–34.0%)	228	60.7% (55.6–65.7%)
Drink more often during the programme/revocation than before	1	0.5% (0.1–2.9%)	4	0.9% (0.3–2.2%)	16	4.1% (2.0–6.1%)
Amount of alcohol per occasion^{b, c}						
Drink less per occasion during the programme/revocation than before	63	41.4% (33.5–49.4%)	172	54.6% (49.1–60.1%)	75	24.0% (19.0–28.9%)
Drink the same amount per occasion during the programme/revocation as before	87	57.2% (49.3–65.2%)	135	42.9% (37.4–48.4%)	219	72.1% (66.9–77.3%)
Drink more per occasion during the programme/revocation than before	2	1.3% (0.4–4.7%)	8	2.5% (1.3–4.7%)	12	3.9% (1.7–6.2%)

^a The comparison is based on two questions, concerning the period before the offence and during the programme/revocation, respectively. The response categories are: never, once a month or more rarely, 2–4 times a month, 2–3 times a week, and 4 times or more per week.

^b The comparison is based on two questions, concerning the period before the offence and during the programme/revocation, respectively. The response categories are: 1–2, 3–4, 5–6, 7–9, and 10 or more standard drinks per occasion.

^c Does not include respondents who never drink.

The main reasons for participating in the programme differed between those who were employed or had their own business and those not working. In the first group, the main reasons for participating were because they needed a driving license in their work (69.6%) and to get to/from work (69.4%). Among those not working, the main reasons for participating were that the driving license was required to have a social life and meaningful leisure time (79.7%) and for making purchases (65.4%). The overall main reasons for participating are in line with results of Vehmas and Löytty (2013); the main reasons for participating according to that study were the need to use a car at work (62%), followed by the need to use a car to get to work (48%) and during leisure time (47%).

The results clearly indicate that participants found it more difficult to find an appropriate doctor than to find a service centre to install and maintain the interlock. STA states that the doctor should be a specialist in psychiatry or have another specialty entailing good knowledge and experience of substance abuse issues (STA, 2018). No further guidance is provided, and it is up to each applicant to find a doctor with the right competence, which apparently was a problem for many.

The self-assessed general health status of the respondents was better after the drink driving offence than before. The proportion of

respondents reporting improved health was analysed using logistic regression, and the results indicate significant effects of alcohol consumption, programme participation, and treatment. The respondents were more likely to improve their health if they reduced their alcohol consumption and received treatment after the offence. Also, participants in the interlock programme were more likely to improve their health than were non-participants, especially in the case of participants in the two-year programme. Regarding changes in alcohol consumption, many respondents reportedly drank more rarely during the programme/revocation than before the offence. The largest such improvement was noted among participants in the two-year programme (i.e., 69.3% vs. 55.2% among one-year programme participants and 35.3% among non-participants). Many also drank less on each occasion. However, it is known that respondents tend to underreport socially unacceptable behaviour (the so-called social desirability bias), such as alcohol consumption. The health status and alcohol consumption results should therefore be interpreted cautiously.

Participation in the Swedish interlock programme does not require attendance in any treatment programme or support activity. Nevertheless, 37.6% of respondents participating in the two-year programme and 20.1% of non-participants received treatment of some kind

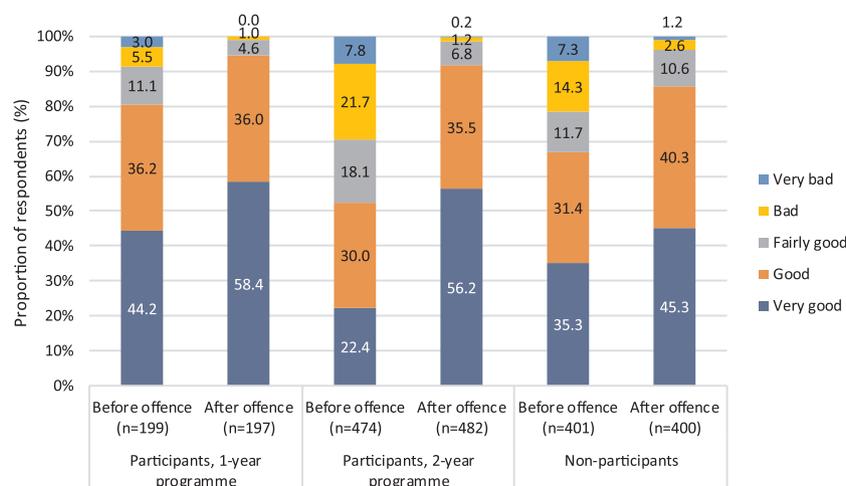


Fig. 4. Self-assessed general health condition before and after the offence.

Table 7
Results of binary logistic regression where dependent variable is 1 if the respondent's general health improved after the offence^a and 0 if not.

	OR	95% CI	P-value ^b
Sex			0.27
Men	0.766	(0.480–1.223)	
Women	–		
Age			0.07
18–34	2.092	(1.076–4.068)	
35–64	1.736	(1.020–2.955)	
65 +	–		
Type of living area ^c			0.95
Big cities	1.034	(0.693–1.542)	
Medium-sized cities	0.962	(0.634–1.460)	
Small cities/villages	–		
Marital status			0.19
Married/cohabiting	1.255	(0.892–1.768)	
Single	–		
Level of education ^d			0.19
Low	1.364	(0.833–2.233)	
Medium	1.471	(0.967–2.237)	
High	–		
Occupation before offence			0.43
Employed/own business	0.834	(0.534–1.304)	
Does not work ^e	–		
Participation in interlock programme			< 0.01
Yes, one-year	3.019	(1.736–5.249)	
Yes, two-year	8.651	(5.504–13.599)	
No	–		
In treatment after the offence			< 0.01
Yes	2.541	(1.720–3.753)	
No	–		
Change in alcohol consumption ^f			< 0.01
Reduced	2.396	(1.590–3.612)	
Unchanged or increased	–		

^a Respondents were regarded as having improved their health if their condition after the offence was at least one category (i.e., very bad, bad, fairly good, good, and very good) better than before the offence.

^b P-value of the Wald statistic for the overall significance of the variable.

^c Big cities: > 100,000 inhabitants; medium-sized cities: 25,000–100,000 inhabitants; small cities: < 25,000 inhabitants.

^d Low: elementary school; medium: upper secondary school; high: college degree or higher.

^e Comprises the following categories: student, retired, on sick leave, off duty, unemployed, and homemaker.

^f The consumption was regarded as reduced if the number of occasions decreased and the amount of alcohol per occasion was the same or less, or if the number of occasions was the same and the amount per occasion was less.

during the programme/revocation period. The proportion was lower (6.7%) among participants in the one-year programme. This was expected, because participants diagnosed with alcohol abuse or dependence and thus in need of treatment should be assigned to the two-year programme. It is not known from the study how such treatment was initiated. Some respondents were in treatment already before the offence and the treatment could also be the result of a court decision. Another possibility is that the offenders were offered treatment as part of a joint action method called SMADIT (an acronym for its Swedish name: Samverkan mot Alkohol och Droger i Trafiken, which translates roughly to “Joint Action against Alcohol and Drugs in Traffic”), in which the police quickly offer help from social services or the dependency care and treatment service to suspected drink drivers (Forsman et al., 2011; Gustafsson et al., 2016). This method is used in most parts of Sweden, although the implementation level can vary between regions and over time.

4.1. Limitations

This study has several limitations. First, since the interlock programme is voluntary, recruitment to this study was based on self-

selection. The results indicating that programme participants improved their health and decreased their alcohol consumption more than did non-participants cannot be interpreted as effects of the interlock programme, as the drivers choosing to participate in the programme might have changed their behaviour even without participation.

Another limitation is the rather high non-response, especially of non-participants. The non-respondents' opinions and behaviour might differ from those of respondents, leading to bias in the results. Also, the confidence intervals and significance tests reflect only the random error and not the bias.

The time elapsed between the offence and questionnaire completion differed between respondents. Some respondents may have received the questionnaire when they had only recently started the programme and others when they had already finished the programme or revocation period. This may have influenced how they responded to the questions. For example, if a long time had elapsed, the respondents might have forgotten about the situation before the offence. On the other hand, if the respondents had recently started the programme, they might not have had time to change their behaviour. However, we know that the time between the offence and when the questionnaires were sent out was at least nine and a half months.

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