The effects of licence disqualification on drink-drivers: Is it the same for everyone?

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Abstract

Drink-driving remains a major road safety concern that creates a significant social burden. Licence disqualification continues to play a key role in drink driving deterrence and sanctions together with police enforcement to address the problem in most motorised countries. However, on-going questions remain regarding the differing effect of licence disqualification periods between first time and repeat offenders, and between other sub-groups of offenders. As a result, this study aimed to determine whether: (a) differences exist in re-offence rates of convicted drink-drivers between: the period between committing the drink-driving offence and licence disqualification (pre-licence disqualification), during the period of licence disqualification, and after being re-licensed (post-licence restoration); and (b) differential effects of offence rates are evident based on Blood Alcohol Content (BAC), gender, age, repeat offender status and crash involvement at the time of offence. The sample consisted of 29,204 drink-driving offenders detected in Victoria, Australia between 1 January 1996 and 30 September 2002. The analysis indicated that licence disqualifications were effective as drink-driving offenders had a significantly lower rate of offending (both drink-driving and other traffic offences) during licence disqualifications compared to pre-licence disqualification and post-licence restoration periods. The influence of licence disqualification appeared to extend beyond the disqualification period, as offence rates were lower during post-licence restoration than during pre-licence disqualification. Interestingly, the highest rate of offending (both for drink-driving and other traffic offences) was during the pre-licence disqualification period, which suggests offenders are particularly vulnerable to drink and drive while waiting to be sanctioned. A consistent pattern of results was evident across genders and age groups. Additionally,

those who were involved in a crash at the same time as their index offence had lower

offence rates (compared to those who were not involved in a crash) for all periods,

although for general traffic offences, the offence rate was highest in the post-licence

restoration period for those who had a crash at index offence. This indicates that being

involved in a crash may deter these offenders, at least in the short-term. The

implications of the results for managing both first time and repeat offenders are

discussed.

Keywords: drink-driving, drunk-driving, licence disqualification, sanctions, offences

Highlights

- 6.5 years of offence history data for 29,204 drink-driving offenders was considered.

- Licence disqualification was effective at reducing drink-driving offence rates, as well as reducing general traffic offences.

- Licence disqualification had residual benefits as offence rates were lower post- than pre-disqualification.

- Offences were most prevalent in the lag time between offence and application of sanction.

1. Introduction

Drink-driving continues to be a serious and persistent problem in all motorised

jurisdictions, as alcohol-related crashes result in substantial fatalities, injuries and

property damage. Alcohol-related crashes are one of the leading causes of death on the

roads, for example in Victoria, Australia 32% of driver fatalities between 2008 and

2011 had a Blood Alcohol Concentration (BAC) over zero. In fact, 28% of driver

63 fatalities had an illegal BAC ($\geq$ .05) and 10% had a BAC over .2. Nearly 23% of

64 motorcyclist fatalities had a BAC over zero (18% of motorcyclist fatalities had an

65 illegal BAC ($\geq$ .05) and 4% had a BAC over .2) (Coroners Prevention Unit, 2013). The

66 legal BAC limit in Victoria is less than .05. Of particular concern is the proportion of

67 repeat drink-driving offenders, for example within Victoria 30% of detected drink-

68 drivers had a previous drink-drive conviction (Boorman, 2012). In regards to crashes,

69 research has also demonstrated that repeat offenders are disproportionately represented

70 in crash statistics (Beirness, Mayhew, & Simpson, 1997; Brewer et al., 1994).

71 The gravity of the problem is reflected in the enormous amount of literature that has

72 focused on the personal and economic cost of drink-driving, as well as the development

73 and implementation of various countermeasures to reduce the prevalence of the

74 offending behaviour (Beirness et al., 1997). Countermeasures to address drink-driving

75 vary across different jurisdictions, although licence disqualification has historically

76 formed the foundation of many legislative responses to such offending behaviours. The

77 application of licensing sanctions has consistently proven an effective general and

78 specific deterrent (Peck, 1991; Ross, 1991), although questions remain as to whether the

79 sanction improves general driving behaviour for offenders post relicensing. *General* and

80 *specific* deterrence stem from the Classical Deterrence Doctrine, which remains the

81 mostly widely cited model for the study of sanctions effect(s) within road safety

82 (Freeman et al., 2015). *Specific deterrence* is the process whereby an individual who has

83 been apprehended and punished for a criminal act refrains from further offending

84 behaviour for fear of incurring additional punishment (Homel, 1988). This phenomenon

85 will remain the primary focus of the current study, in particular, the effect of licence

86 disqualification.

87   While there has been considerable focus on the impact of sanctions (Wagenaar, &

88   Maldonado-Molina, 2007), there has been limited consideration as to whether

89   apprehended drink-drivers re-offend during the period of time between apprehension

90   and application of sanction, despite waitlisting times to appear in court often being long

91   (e.g. six to twelve months on average). However, it is noted that some preliminary

92   research has focused on the positive impact of changes to administrative

93   suspension laws that has resulted in a reduction in the penalty application

94   timeframe (McArthur, & Kraus, 1999; Voas, Tippets & Fell, 2000). What is known is

95   that drink-drivers are not a homogenous group (Nochajski & Wieczorek, 2000), as

96   research has demonstrated that first time and repeat offenders often differ in both

97   characteristics and treatment needs (Stewart, Boase, & Lamble, 2004). These two

98   groups display a tendency to respond differently to the application of sanctions

99   (Ferguson, Sheehan, Davey, & Watson, 1999; Freeman, 2004), in particular, Norther

100   American research has demonstrated that the application of licence sanctions on repeat

101   offenders (in isolation) is relatively ineffective (Beirness et al., 1997; Coben & Larkin,

102   1999).

103   An important consideration for the current study was to not only identify the

104   effectiveness of licence disqualification, but also to assess the impact of this approach

105   on different groups of offenders. Currently, questions also remain regarding the impact

106   of licence disqualification periods on gender, age and BAC level at time of

107   apprehension. That is, whether motorists respond differently to the sanction depending

108   on their gender, age and level of alcohol consumption. Therefore, the project focuses on

109   drink-driving outcome data and also considers the general demographics of the

110   population (e.g., age, sex, drink-driving history). Without such a comprehensive

111 investigation, a deeper understanding into the specific impact of licence sanction on re-

112 offence rates cannot be achieved. This project considers all facets in order to maximise

113 the potential to obtain large safety gains through the on-going sanctioning of drink-

114 drivers.

115 The aims of this study were to determine whether:

116 • drink-drivers differ in re-offence rates during the licence period between offence

117 incidence and licence disqualification (pre-licence disqualification), during the

118 period of licence disqualification, and after being re-licensed (post-licence

119 restoration); and

120 • effects of licence disqualification on offence rates are differential based on BAC,

121 gender, age, repeat offender status and crash involvement at the time of offence.

2. Method

123 Drivers and riders convicted of a drink-driving offences committed between

124 1 January 1996 and 30 September 2002 (inclusive) were considered eligible persons for

125 analysis (N = 29,204). The time period was determined as part of a larger project to

126 coincide with a period prior to alcohol ignition interlocks coming into effect. This was

127 so that the unique effect of licence disqualification (without the influence of interlocks)

128 could be assessed. Data files relating to all offences, licence status changes,

129 disqualifications from driving, licence conditions, and driver and rider demographics

130 were provided from the VicRoads Driver Licensing System (DLS).

131 For each offender, the index drink-driving offence between 1 January 1996 and 30

132 September 2002 (the first drink-driving offence recorded) was identified. Offence rates

133 were calculated for the period between the index offence and the licence disqualification

134 (pre-licence disqualification period), the licence disqualification period, and the post-

135 licence restoration period. The rates of offences (drink-driving and other traffic

136 offences) were calculated per thousand person-years for all the licence/sanction periods.

137 This approach was based on previous research by Siskind (1996) to account for the

138 different length of disqualification periods for offenders (i.e. as a form of exposure

139 control). Other offences included speeding, unlicensed driving, using a mobile phone

140 while driving, violations of road rules and red-lighting running. In order to test for

141 statistical significant differences in these rates across the different licence/sanction

142 periods, rate ratios were calculated separately for drink-driving and general traffic

143 offence rates for:

144   • Licence disqualification versus pre-licence disqualification;

145   • Licence disqualification versus post-licence restoration; and

146   • Post-licence restoration versus pre-licence disqualification.

147 In order to determine the statistical significance of the rate ratios, confidence intervals

148 for all rate ratios were calculated as follows:

149   95% Lower confidence level $= Exp\ (\ln(Rate\ Ratio) - 1.96\ \times\ SE)$

150   95% Upper confidence level $= \text{Exp}\ (\ln(Rate\ Ratio) + 1.96\ \times\ SE)$

151   Where: $SE = \ \sqrt{\left(\frac{1}{X_1} + \frac{1}{X_2}\right)}$

152   Where: $X_1 =$ Number of offences in period 1 and $X_2 =$ Number of offences in

153   period 2.

154 Statistical significance was determined by the confidence interval not including 1.

155   Rate ratios were calculated and compared for each period by index offence BAC level

156   category (Low-range – between .001 and .070; Mid-range – between .071 and .149;

157   High-range – .150 and above), gender, age group (16-24, 25-49, 50+), repeat offender

158   status (at index) and involvement in a crash at index offence.

159   The weighted mean of the rate ratios across the strata (e.g., male versus female) was

160   calculated using the Cochran-Mantel-Haenzel for incidence rates. The rate ratios for

161   each variable stratum were then compared to the Cochran-Mantel-Haenzel rate ratio

162   using a Chi-square test for homogeneity. The formula is as follows:

163

$$\frac{\sum a_i (PY_{oi})/PY_i}{\sum c_i (PY_{ei})/PY_i}$$

164   Where: a_i is the number of offences/crashes for period 1 and c_i is the number of

165   offences/crashes in period 2, PY_{oi} and PY_{ei} are the person-years in each period

166   and PY_i is the total person-years for the stratum.

167   Then this average (pooled) rate ratio was used to calculate a Chi-square test for

168   homogeneity to determine if the rate ratios differ across strata. The formula for this was

169   as follows:

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$$\chi^2 = \sum \frac{(R_i - \hat{R})^2}{V_i}$$

171   Where R_i = stratum specific rate ratio; $\hat{R}$ = estimated pooled rate ratio; and V_i =

172   the variance ($V_i = \sum \frac{1}{x_i}$) with x_i = number of offences in the stratum. The Chi-

173   square was then assessed at a significance level of .05.

174 **3. Results**

175   The characteristics of the drink-driving offenders in the licence period are outlined in

176   Table 1. The majority of offenders were male. There was a greater prevalence of first

177   time than repeat offenders. Approximately, 5% of offenders were involved in a crash at

178   the time of their index offence.

179   *Table 1: Characteristics of the drink-driving offender sample*

Characteristic	N	%
Gender		
Male	25,391	86.9
Female	3,813	13.1
Age group		
16-24	11,474	39.3
25-49	15,687	53.7
50+	2,043	7.0
BAC level (index offence)		
Low-range (between .001 and .070)	3,269	11.2
Mid-range (between .071 and .149)	15,705	53.8
High-range (.150 and above)	4,155	14.2
Licence type		
Learner	813	2.8
Probationary	8,138	27.9
Open	20,253	69.4
Offender status at index		
First time offender	24,641	84.4
Repeat offender	4,563	15.6
Crash at index offence		
Yes	1,540	5.3
No	27,664	94.7

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181   Table 2 shows the re-offence and crash rates (drink-driving and other) for all drink-

182   driving offenders. The highest rates of re-offending were in the licence period between

183 the index offence and the licence disqualification, followed by the period post-licence

184 restoration.

185 *Table 2: Offence rates (per 1,000 person years) for all offenders for each licence period*

Time period	Drink-driving offences	General traffic offences[1]
Period between index offence and licence disqualification (pre-licence disqualification)	93.7	914.4
Period during licence disqualification	28.3	307.5
Period post-licence restoration	53.7	664.0

186 [1] Excluding drink-driving offences

187 As shown in Table 3 below, all drink-driving offenders had a statistically significantly

188 lower rate of offending (both drink-driving and other traffic offences) during licence

189 disqualifications compared to the pre-licence disqualification and post-licence

190 restoration periods. Also, the post-disqualification licensed period had a statistically

191 significantly lower rate of offending compared to the pre-licence disqualification period.

192 *Table 3: Offence rate ratios all drink-drivers*

Comparison	Rate ratio (95% CI)	
	Drink-driving offences	Other traffic offences
Licence disqualification vs. Pre-licence disqualification	0.30* (0.27 – 0.33)	0.34* (0.33 – 0.35)
Licence disqualification vs. Post-licence restoration	0.53* (0.49 – 0.57)	0.46* (0.45 – 0.48)
Post-licence restoration vs. Pre-licence disqualification	0.57* (0.53 – 0.62)	0.73* (0.71 – 0.74)

193 *Statistically significant rate ratios ($p < .05$)

194 *Gender*

195 As shown in Table 4, males had higher rates of offending for all licence periods. The

196 pattern of offending across periods was similar however, with both males and females

197 having the highest rate of offending (both drink-driving and other traffic offences) in the

198 pre-licence disqualification period, followed by the post-licence restoration period and

199 then the licence disqualification period.

200 *Table 4: Offence rates (per 1,000 person years) by gender for each licence period*

Period	Male		Female	
	Drink-driving	General traffic[1]	Drink-driving	General traffic[1]
Between index offence and licence disqualification (pre-licence disqualification)	96.3	952.7	75.3	643.0
During licence disqualification	29.0	314.2	23.0	259.4
Post-licence restoration	56.2	690.3	37.3	493.9

201 [1] Excluding drink-driving offences

202 Table 5 shows the rate ratios for drink-driving and other offences for each licence

203 period comparison stratified by gender. Chi-square tests for the homogeneity showed no

204 statistically significant differential effects of gender for any licence period comparisons.

205 *Table 5: Offence rate ratios by gender*

	Rate ratios (95% CI)			
	Male		Female	
Comparison	Drink-driving offences	Other traffic offences	Drink-driving offences	Other traffic offences
Licence disqualification vs. pre-licence disqualification	0.30* (0.27 – 0.33)	0.33* (0.32 – 0.34)	0.31* (0.22 – 0.42)	0.40* (0.34 – 0.45)
Licence disqualification vs. Post-licence restoration	0.52* (0.48 – 0.55)	0.46* (0.45 – 0.47)	0.62* (0.49 – 0.77)	0.53* (0.47 – 0.56)
Post-licence restoration vs. Pre-licence disqualification	0.58* (0.54 – 0.64)	0.72* (0.71 – 0.74)	0.50* (0.38 – 0.64)	0.77* (0.71 – 0.84)

206 *Statistically significant rate ratios for licence periods ($p < .05$)

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208 *Age*

209 As shown in Table 6, those offenders aged 16-24 years had the highest rate of offending

210 in all licence periods, followed by those aged 25-49 years. The pattern of offending

211 across periods was similar however, with all age groups having the highest rate of

212 offending (both drink-driving and other traffic offences) in the period between index

213 offence and the licence disqualification, followed by the post-licence restoration period,

214 and then the licence disqualification period.

215 *Table 6: Offence rates (per 1,000 person years) by age group for each licence period*

	16-24		25-49		50+	
	Drink-driving offences	**General traffic offences[1]**	**Drink-driving offences**	**General traffic offences[1]**	**Drink-driving offences**	**General traffic offences[1]**
Period between index offence and licence disqualification	97.2	1187.8	92.0	773.8	88.7	579.5
Period during licence disqualification	35.9	431.6	24.6	254.6	20.8	131.9
Period post-licence restoration	57.8	839.8	52.1	568.7	42.6	380.9

216 [1] Excluding drink-driving offences

217 Table 7 shows the rate ratios for drink-driving and other offences for each licence period comparison stratified by age group. For drink-

218 driving and other traffic offences, Chi-square tests for the homogeneity showed no statistically significant differential effects of age.

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223 *Table 7*: *Offence rate ratios by age group*

Comparison	Rate ratios (95% CI)					
	16-24 years		25-49 years		50 years+	
	Drink-driving offences	Other traffic offences[1]	Drink-driving offences	Other traffic offences[1]	Drink-driving offences	Other traffic offences[1]
Licence disqualification vs. Pre-licence disqualification	0.37* (0.32 – 0.43)	0.36* (0.35 – 0.38)	0.27* (0.23 – 0.31)	0.33* (0.31 – 0.34)	0.23* (0.16 – 0.35)	0.23* (0.19 – 0.27)
Licence disqualification vs. Post-licence restoration	0.62* (0.56 – 0.69)	0.51* (0.50 – 0.53)	0.47* (0.43 – 0.52)	0.45* (0.43 – 0.46)	0.49* (0.36 – 0.66)	0.35* (0.31 – 0.39)
Post-licence restoration vs. Pre-licence disqualification	0.59* (0.52 – 0.68)	0.71* (0.68 – 0.73)	0.57* (0.51 – 0.63)	0.73* (0.71 – 0.76)	0.48* (0.35 – 0.66)	0.66* (0.58 – 0.74)

224 *Statistically significant rate ratios for licence periods (p < .05)

225 [1] Excluding drink-driving offences

226 *BAC level*

227 As shown in Table 8, those offenders with a low-range index BAC had higher rates of offending across all licence periods, followed by

228 those with a mid-range index BAC, with the lowest rates of offending for offenders with a high BAC index offence. Again, the pattern of

229 offending was similar across licence periods with all BAC levels having the highest rate of offending (both drink-driving and other traffic

230 offences) in the period between index offence and the licence disqualification, followed by the post-licence restoration period, and then the

231 licence disqualification period.

232 *Table 8: Offence rates (per 1,000 person years) by BAC level for each licence period*

	Low-range		Mid-range		High-range	
	Drink-driving offences	**General traffic offences[1]**	**Drink-driving offences**	**General traffic offences[1]**	**Drink-driving offences**	**General traffic offences[1]**
Period between index offence and licence disqualification	90.4	1284.3	84.3	705.6	56.5	337.5
Period during licence disqualification	49.2	644.1	21.8	199.8	15.1	183.3
Period post-licence restoration	62.7	805.9	39.6	460.3	38.3	334.0

233 [1] Excluding drink-driving offences

234 Table 9 shows the rate ratios for drink-driving and other offences for each

235 comparison period stratified by BAC level at index offence. For other traffic

236 offences, Chi-square tests for the homogeneity showed some statistically significant

237 differential effects of BAC level. Specifically, low-range and high-range BAC

238 offenders had higher rate ratios for other traffic offending for the licence

239 disqualification period versus the pre-licence disqualification period [χ^2 (2) =

240 14.18, $p < .001$]. Further, for other traffic offences, high-range BAC offenders had

241 no statistically significant effect for post-licence restoration period versus the pre-

242 licence disqualification period, while low- and mid-range offenders had lower other

243 traffic offence rates during post-licence restoration period compared to the pre-

244 licence disqualification period [χ^2 (2) = 10.65, $p < .001$]. For drink-driving

245 offences, there was a differential effect for the licence disqualification period versus

246 the post-licence restoration period [χ^2 (2) = 9.78, $p = .008$] with low-range BAC

247 offenders having a higher rate ratio of offending compared with mid- and high-

248 range offenders.

249 *Table 9*: *Offence rate ratios by BAC level at index offence*

	Rate ratios (95% CI)					
	Low-range BAC		**Mid-range BAC**		**High-range BAC**	
Comparison	**Drink-driving offences**	**Other traffic offences[1]**	**Drink-driving offences**	**Other traffic offences[1]**	**Drink-driving offences**	**Other traffic offences[1]**
Licence disqualification vs. Pre-licence disqualification	0.54* (0.42 – 0.71)	0.50* (0.47 – 0.54)	0.26* (0.23 – 0.29)	0.28* (0.27 – 0.30)	0.27* (0.20 – 0.36)	0.54* (0.48 – 0.61)
Licence disqualification vs. Post-licence restoration	0.80* (0.65 – 0.95)	0.78* (0.76 – 0.84)	0.55* (0.50 – 0.61)	0.43* (0.42 – 0.45)	0.39* (0.33 – 0.48)	0.53* (0.50 – 0.57)
Post-licence restoration vs. Pre-licence disqualification	0.69* (0.56 – 0.87)	0.63* (0.59 – 0.67)	0.47* (0.42 – 0.52)	0.65* (0.63 – 0.68)	0.68* (0.53 – 0.87)	1.02 (0.92 – 1.13)

250 *Statistically significant rate ratios for licence periods (p < .05)
251 [1] Excluding drink-driving offences

Repeat and first offenders

253 Repeat offenders had lower offence rates compared to first offenders for all periods except

254 the post-licence restoration period (Table 10). The pattern of offending across licence

255 periods, however, was consistent as per all drink-drivers and the previous comparison groups.

256 *Table 10: Offence rates (per 1,000 person years) by repeat offender status at index for each*
257 *licence period*

	First offenders		Repeat offenders	
	Drink-driving offences	General traffic offences[1]	Drink-driving offences	General traffic offences[1]
Period between index offence and licence disqualification	97.1	938.7	78.6	807.8
Period during licence disqualification	30.2	332.8	22.7	232.2
Period post-licence restoration	53.2	663.3	56.6	667.9

258 [1] Excluding drink-driving offences

259 Table 11 shows the rate ratios for drink-driving and other offences for each licence period

260 comparison stratified by whether the offender was a repeat or first offender at index offence.

261 For drink-driving offences, Chi-square tests for the homogeneity showed a statistically

262 significant effect for the licence disqualification versus the post-licence restoration period [χ^2

263 $(1) = 4.50$, $p < .001$]. Specifically, while both groups had lower drink-driving offence rates

264 during a disqualification in comparison with post-licence restoration, the rate ratio was lower

265 for repeat drink-driving offenders at index offence. For other traffic offences, Chi-square tests

266 for the homogeneity showed no statistically significant effect.

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270 *Table 11: Offence rate ratios by repeat and first offender at index offence*

	Rate ratios (95% CI)			
	First offenders at index		**Repeat offender at index**	
Comparison	**Drink-driving offences**	**Other traffic offences**[1]	**Drink-driving offences**	**Other traffic offences**[1]
Licence disqualification vs. Pre-licence disqualification	0.31* (0.28 – 0.35)	0.35* (0.34 – 0.37)	0.29* (0.23 – 0.36)	0.29* (0.27 – 0.31)
Licence disqualification vs. Post-licence restoration	0.57* (0.52 – 0.61)	0.50* (0.49 – 0.51)	0.40* (0.34 – 0.47)	0.35* (0.33 – 0.37)
Post-licence restoration vs. Pre-licence disqualification	0.55* (0.50 – 0.60)	0.71* (0.69 – 0.73)	0.83* (0.59 – 0.88)	0.72* (0.78 – 0.88)

271 *Statistically significant rate ratios for licence periods (p < .05)
272 [1] Excluding drink-driving offences

273 *Crash at index offence*

274 Those who were involved in a crash at the same time as their index offence had lower offence

275 rates for all licence periods compared to those that did not have a crash at index offence

276 (Table 12). The pattern of results across licence periods was somewhat consistent. However,

277 for general traffic offences, the offence rate was highest in the post-licence restoration period

278 for those who had a crash at index offence (although still a lower rate than those who were

279 not involved in a crash at index).

280

Table 12: Offence rates (per 1,000 person years) by crash at index offence status for each licence period

	Crash involved		Non-crash involved	
	Drink-driving offences	**General traffic offences[1]**	**Drink-driving offences**	**General traffic offences[1]**
Period between index offence and licence disqualification	45.0	460.5	99.0	963.5
Period during licence disqualification	14.4	179.6	29.2	315.6
Period post-licence restoration	41.7	542.5	54.3	670.1

[1] Excluding drink-driving offences

Table 13 shows the rate ratios for drink-driving and other offences for each licence period comparison stratified by whether the offender was involved in a crash at the index offence or not. For other traffic offences, Chi-square tests for the homogeneity showed a statistically significant effect for the post-licence restoration period versus the pre-licence disqualification period [$\chi^2 (1) = 14.51$, $p < .001$]. Specifically, those offenders who were involved in a crash at the time of their index offence had a higher other offence rate during the post-licence restoration period compared to the pre-licence disqualification period, while those who were not involved in a crash had lower other offence rates during the post-licence restoration period. There were no other differential effects based on crash involvement at index offence.

294 *Table 13: Offence rate ratios by crash involvement at index offence*

	Rate ratios (95% CI)			
	Crash involved at index		Not crash involved at index	
Comparison	Drink-driving offences	Other traffic offences[1]	Drink-driving offences	Other traffic offences[1]
Licence disqualification vs. Pre-licence disqualification	0.32* (0.20 – 0.53)	0.39* (0.34 – 0.45)	0.29* (0.27 – 0.33)	0.33* (0.32 – 0.34)
Licence disqualification vs. Post-licence restoration	0.35* (0.23 – 0.51)	0.33* (0.30 – 0.37)	0.54* (0.50 – 0.58)	0.47* (0.46 – 0.48)
Post-licence restoration vs. Pre-licence disqualification	0.93 (0.63 – 1.36)	1.18* (1.05 – 1.32)	0.55* (0.51 – 0.60)	0.70* (0.68 – 0.71)

295 *Statistically significant rate ratios for licence periods (p < .05)
296 [1] Excluding drink-driving offences

4. Discussion

298 The primary aims of this project were to determine: (a) whether drink-drivers' re-offence

299 rates differed during the period between offence incidence and licence disqualification (pre-

300 licence disqualification), the period of licence disqualification and the post-licence restoration

301 period; and (b) identify if there are any differential effects of licence disqualification on re-

302 offence rates based on BAC, gender, age, repeat offender status and crash involvement at the

303 time of offence. The offences analysed were drink-driving offences and other traffic offences.

304 Key findings that emerged will be sequentially discussed below.

305 *Re-offending Between Apprehension and Sanctioning*

306 In regards to the rate of offending, the highest rate of offending (both drink-driving and other

307 traffic offences) was during the period between the index offence and the commencement of

308 the licence disqualification (pre-licence disqualification). This is a key finding to emerge

309 from the study that needs to be re-examined with other traffic offence data in other

310 jurisdictions in the future. In Victoria, we found that offenders are at the highest risk of

drink-driving (or committing other traffic offences) after they have been apprehended, but

before they receive the corresponding sanctions. This finding supports the assertion that the

celerity of punishment (in regards to deterrence models) is an important factor in maximising

a deterrent effect. However, the celerity of sanction application is commonly overlooked with

deterrence-based research (Freeman, 2004), except for preliminary research that has

focused on the positive impact of changes to administrative suspension laws (McArthur,

& Kraus, 1999; Voas, Tippets & Fell, 2000; Zador et al., 1988). For example, Wagenaar &

Maldonado-Molina (2007) reviewed the impact of mandatory preconviction licence

suspension laws in 46 American states and reported the policy had a statistically significant

reduction in alcohol-related crash involvement. This is despite models of learning and

experimental psychology reinforcing that the time between stimulus and response is vital for

learning new behaviours (Nagin & Pogarsky, 2001).

The Positive Effect while Disqualified

More encouragingly, drink-driving offenders had statistically significantly lower rates of

offending (both drink-driving and other traffic offences) during disqualification periods

compared to the pre-licence disqualification and post-licence restoration periods. In regards

to first time versus recidivist offenders, both groups had lower drink-driving offence rates

during disqualification in comparison with post-licence restoration. High BAC offenders also

had low rates of re-offending during disqualification relative to other BAC offender groups

contrary to perceptions that they are less responsive to countermeasures. This finding is

consistent with a large body of research that has generally demonstrated licence

disqualification periods to be one of the most effective methods for reducing further drink-

driving offences (Jones & Lacey, 1991; McArthur & Kraus, 1999; Nichais & Ross, 1991;

Sadler & Perrine, 1984; Wagenaar, Zoeck, Williams & Hingson, 1995). In fact, compared to

other sanctions, disqualification periods have proven to be the most effective short-term

336   countermeasure that can be applied to drink-drivers (Nichais & Ross, 1991; Sadler & Perrine,

337   1984; Siskind, 1996; Watson, 1998). The current finding is particularly encouraging in

338   relation to high BAC and recidivist offenders, as ongoing questions have remained regarding

339   the efficacy of applying sanctions to persistent offenders (Freeman, Liossis, & David, 2006)

340   and high BAC offenders who are perceived as difficult to influence – in contrast this study

341   clearly shows an impact of licence sanction on drink driving offenders during and following

342   licence disqualification for most detected offenders. However, there still was evidence that a

343   small minority of individuals were detected again for drink-driving even while disqualified

344   from driving as found for 4% of the sample. That is, they combined drink-driving with

345   unlicensed driving, demonstrating that licence disqualification does not have a positive

346   impact on all individuals. This is again consistent with research that has reported unlicensed

347   driving is often combined with other illegal behaviours such as drink-driving (Griffin &

348   DeLaZerda, 2000; Watson, 2004).

349   Further analyses revealed that there was in fact a greater effect of the disqualification on

350   repeat drink-driving offenders compared to first time offenders, as well as for high BAC

351   offenders. This is contrary to previous research that has demonstrated that licence sanctions

352   are least effective for repeat offenders (Beirness et al., 1997; Coben & Larkin, 1999).

353   Different theories can account for this finding. Firstly, it is possible that (for the current

354   sample) repeat offenders reduced their frequency of driving to a greater extent than first time

355   offenders, perhaps due to a magnified deterrence effect, as they had already been caught and

356   sanctioned more than once, and thus were more aware of the probability of apprehension e.g.,

357   objective certainty. Another hypothesis proposed by Pogarsky and Piquero (2003), that needs

358   to be further investigated, is whether first time offenders experience a "resetting effect" after

359   apprehension, whereby offenders believe they are less likely to be apprehended again soon

360   after coming in contact with the police. However, the above results should be interpreted with

361   caution as there is no comparison group; so, for example, it is not possible to tell if a

362   disqualification period is the most effective sanction compared to any other sanction (e.g.,

363   immediate interlock condition).

364   *Post Licence periods*

365   Another key finding was that there was also a statistically significantly lower rate of

366   offending (both drink-driving and other traffic) in the post-licence restoration period

367   compared to the pre-licence disqualification period (40% lower), both for first time and

368   repeat drink-drivers. In regards to first time offenders, this is consistent with previous

369   research that has demonstrated licence disqualifications have a specific deterrent effect post

370   licence restoration. (Homel, 1988; Siskind, 1996). That is, convicted offenders are less likely

371   to re-offend due to experience with the consequences of penalties. The results were also

372   positive for repeat offenders. While there has generally been consensus in the literature that

373   the application of legal sanctions alone does not produce long-term behaviour change for this

374   group (Ahlin, Rauch, Zador, Baum, & Duncan, 2002; Beirness et al., 1997; Brewer et al.,

375   1994; Frank, Raub, Lucke, & Wark, 2002; Homel, 1988; Marques, Voas, & Hodgins, 1998;

376   Yu, 2000), the current study has provided evidence that disqualifications can have a

377   corrective effect on tendencies to drink and drive among recidivist offenders. However, it

378   should be noted, that as there was no control group for this analysis (i.e., offenders who did

379   not have licence sanctions applied) the changes in offending rates may have been due in part

380   to other influences (e.g., enforcement practices). Furthermore, while the offending rate

381   decreased post-sanction, it is not possible to tell if this is a genuine positive effect of

382   experiencing the sanction or if, for example, offenders improved their ability to avoid

383   detection once they have experienced this sanction. In regards to the latter, previous research

384   has found that offenders, particularly repeat offenders, can drink and drive on numerous

385   occasions whilst avoiding detection (Wiliszowski, Murphy, Jones, & Lacey, 1996). For

386   example, Smith (2003) interviewed a small sample of repeat offenders who reported regularly

387   drink-driving whilst avoiding apprehension (e.g., ratios up to 100:1) as well as actively

388   attempting to evade police enforcement (e.g., Random Breath Testing).

389   *Differential Effects*

390   In regards to the differential offence rate effects, the second aim of the study, males had

391   higher rates of drink-driving offending for all licence periods, which is consistent with

392   previous research that has demonstrated that males are disproportionately represented in

393   drink-driving statistics (Beirness et al., 1997; Stewart et al., 2004; Voas & Tippetts, 2002).

394   However, while absolute rates of offending differed by gender and between age groups, the

395   pattern of rates of offending across the three study periods for each of these subgroups was

396   similar. No subgroups were more likely to drink and drive (or commit other traffic offences)

397   in the pre-licence disqualification period, the post-licence restoration period or the licence

398   disqualification period. The current findings indicate that disqualifications can have a positive

399   effect on both genders as well as motorists of all ages. This is one of the first studies to

400   specifically examine offence rates with respect to age and gender, and therefore further

401   research is required to confirm this finding.

402   There were however, some statistically significant differential effects of BAC level and of

403   repeat offender status. While all BAC groups demonstrated a reduction in drink-driving

404   offence rates during the licence disqualification period compared to the post-licence

405   restoration period, low-range BAC offenders had a higher offence rate ratio compared with

406   mid- and high-range offenders. Therefore, the disqualification period appeared to have a

407   lesser impact on the low-range BAC group for drink-driving and other traffic offences. This

408   could be considered an unexpected finding, as a higher range BAC could be considered

409   evidence of an alcohol problem, which has been demonstrated to be a significant predictor of

410   recidivism (Freeman et al., 2006). While it remains unclear why this was found, two possible

411 explanations can be proposed. Firstly, it may be because the disqualification period this group

412 received was not as severe (compared to high BAC range offenders) and thus, less of a

413 specific deterrent effect was experienced for the less severe sanction. Secondly, this group

414 may have experienced less of an overall experiential effect (e.g., number of times exposed to

415 punishment), and thus, have yet to be sufficiently deterred from drink-driving. Further

416 research is required to determine the significance of this finding, as it has historically been

417 hypothesised that low-range BAC groups predominantly involve social drinkers who may

418 make a judgement error in their decision to drive after drinking (Ferguson et al., 1999;

419 Howard & McCaughrin, 1996). As a result, these drivers are usually deterred from

420 committing further offences by their experience of both formal and informal sanctions such

421 as fines and licence loss, as well as peer disapproval from friends and family (Ferguson et al.,

422 1999). However, some low-range BAC offenders (apprehended in the morning) may have

423 consumed large quantities of alcohol the night before, and this phenomenon also deserves

424 further exploration.

425 There were also some differential effects for other traffic offending. High-range BAC

426 offenders had no statistically significant effect for post-licence restoration period versus the

427 pre-licence disqualification period, while low- and mid-range offenders had lower offence

428 rates during the post-licence restoration period compared to the pre-licence disqualification

429 period.

430 Importantly, offenders who were involved in a crash at the time of their index offence had a

431 higher general traffic offending rate during the post-licence restoration period compared to

432 the pre-licence disqualification period, while those who were not involved in a crash had

433 lower offence rates during the post-licence restoration period compared to the pre-licence

434 disqualification period. It is not clear whether this is a direct result of the disqualification or a

435 bias of having experienced a crash. For example, crash involved offenders may be injured

436 and unable to drive, or without a vehicle in the immediate period following the crash. These

437 factors may have a greater impact on influencing driving behaviour than the actual sanction.

438 There were a number of limitations associated with this study that need to be considered.

439 Firstly, as with any study of this nature, the sample only includes those who are caught for an

440 offence. It is possible that some offenders are not captured as they are able to avoid detection.

441 For example, an earlier study by Voas (1982) reported that the drinking driver is arrested

442 once out of every 5000 miles (approximately 8,000 kilometres) driven under the influence of

443 alcohol. A similar estimation in the Australian context offered by Homel, Carseldine, and

444 Kearns (1988) suggested that only 0.5% to 1.5% of intoxicated drivers are detected by the

445 police at any one time. While more recent calculations are not available, the deleterious

446 impact of 'punishment avoidance' on intentions to re-offend is well documented (Freeman &

447 Watson, 2006; Watling, Freeman, Palk, & Davey, 2011). In the current context, this would

448 result in an under-estimate of the drink-driving problem. It is also possible that particular

449 types of offenders are better at avoiding detection and thus the study may not capture all

450 types of drink-driving offenders. Some offenders within the study sample may also avoid

451 detection some of the time or even improve their avoidance over time. This may impact on

452 the re-offence rates for some of these offenders and bias the results to some extent if

453 particular types of offenders (e.g., repeat offenders) become better at detection avoidance

454 than others.

455 It should be noted that the BAC level for classification may lack some sensitivity to offender

456 differences within BAC groups. While BAC groupings in this study were consistent with the

457 legislative levels relating to sanctions as well as reflecting escalating trauma risk with higher

458 BAC levels, it could be argued that there may be some distinct differences within these level

459 classifications that were not able to be explored. For example, there may be little difference

460 between an offender with a BAC of .14 and one with a BAC of .15 (in different categories)

and a large difference between a person with a BAC of .08 and one with a BAC of .12 (in the same category for some analyses). Research suggests that drink-driving offenders are not a homogenous group even within these categorisations of low-, mid- and high-range BACs (Fetherston, Lenton, & Cercarelli, 2002; Nadeau, 2002; Nochajski & Wieczorek, 2000). Thus, differences explored between these groups may lack sensitivity. Additionally, some of the study's findings may be unique to the data set (and time period), and thus, the study methodology needs to be implemented with different datasets.

The present study has provided further confirmatory evidence that licence disqualification periods are effective at reducing drink-driving offending, both while drivers are disqualified as well as post relicensing. Encouragingly, the application of the sanction also had a positive effect on general traffic offending, recidivist drink-drivers and the effectiveness of the approach was not diluted by gender or age group. High BAC offenders had lower re-offence rates than moderate BAC offenders who both had lower rates than low BAC offenders. However, the study identified a significant area of concern. Specifically, the highest rate of offending (both for drink-driving and other traffic offences) was during the pre-licence disqualification period, which suggests offenders are particularly vulnerable to drink and drive whilst waiting to be sanctioned. There is a need to develop effective methods to deal with offenders when they are first apprehended, including consideration of immediate licence disqualification which has been shown to be effective in studies where such an administrative sanction has been applied and evaluated (National Highway Traffic Safety Administration, 2014). An additional method may involve a brief behaviour change intervention program, which has previously been suggested in Shults et al (2001) review of drink driving countermeasures. The importance for early intervention is also evident in the corresponding offending histories of motorists involved in alcohol-related crashes, which may again be utilised as a screening tool for referral to additional services.

486   The findings of this study show that the application of licence disqualification periods for

487   drink-drivers of all types appears to be an effective response to improve road safety. The

488   study was able to identify areas of opportunity where countermeasures could be applied to

489   further improve offenders' compliance with BAC limits, specifically the period immediately

490   following police detection, compliance by lower BAC and first offenders, and following the

491   licence disqualification period.

492   **Acknowledgements**

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