Road traffic infringements and crash risk: Is there evidence of a deterring influence?

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Abstract

This paper presents the results of a case-case-time-control study that aimed to determine whether infringements for traffic offences have a deterring influence on driver behaviour, measured by crash involvement. Licensing, infringements and crash data from Victorian drivers aged 40+ was used. The risk of receiving an infringement in the period prior to a crash was higher than in a comparable period. Infringements may not be effectively changing driver behaviour, and thus reducing the risk of crash involvement. Other approaches to changing driver behaviour may be necessary in order to enhance safety on the roads.

Background

If identified, a person who performs an illegal driving behavior, such as speeding, may receive a traffic infringement. These infringements have a specific deterrence aim, meaning they seek to change the individual's patterns of behavior (McLaughlin, 2006; Muncie, 2004). Whilst looking at whether drivers receive further infringements can be used as an indicator of deterrence, research has also used subsequent crash involvement as an indicator, given risky driving can contribute to crashes (Penmetsa & Pulugurtha, 2016).

Previous studies have used a case-crossover approach to examine crash risk in the period that follows a traffic infringement (Redelmeier, Tibshirani, & Evans, 2003; Walter & Studdert, 2015). These studies revealed differing results, thus, it remains unclear whether traffic infringements are effective in reducing crash risk.

Methods

Using driver licence number, we linked VicRoads licensing, crash and infringements data for drivers aged 40+, to examine the association between infringements and crashes.

We used a case-case-time-control design, an extension of the case-crossover approach. The case-case-time-control design uses a case group who experience an outcome of interest, and a control group who experience the same event in the future (Wang et al., 2011). The odds of being exposed to a risk factor in two time periods are calculated for each group, before comparisons are drawn (Wang et al., 2011). By including future cases as controls, we are able to deal with reverse causation and differences in trends between the groups (Hallas & Pottegard, 2014).

Our event of interest was a crash. Exposure to an infringement was the risk factor. The case group were drivers who crashed between 2010-2012 and received an infringement in either the 30 days prior to their crash (event period), or the same 30 day period the year prior (reference period). The control group were drivers who crashed between 2013-2015. For consistency, the event and reference periods for the control group were the same as those for the case group. Once again, drivers had received an infringement in either period, but not both. Figure 1 provides a visual representation of the study design.

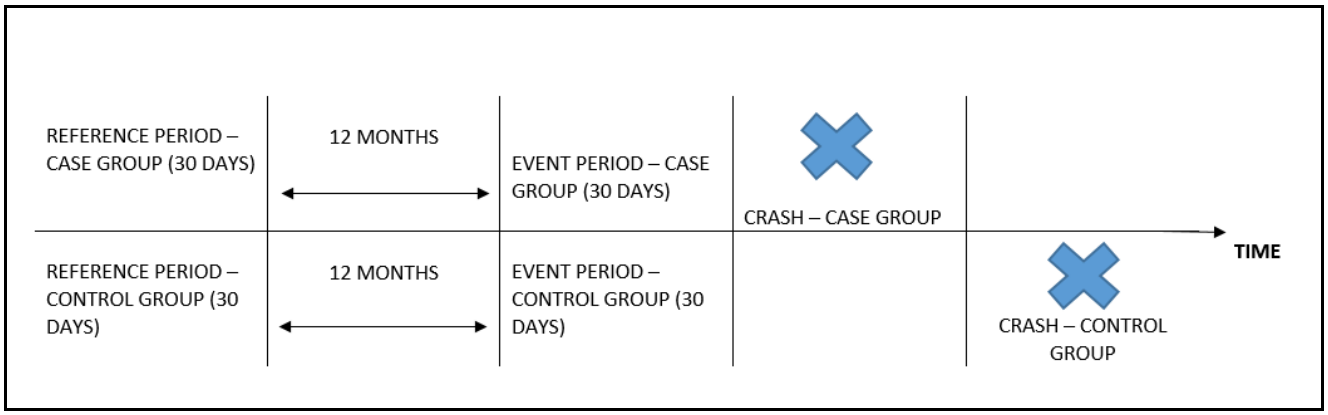

Figure 1 Visual representation of the case and control groups and study periods

Results

The case and control groups were compared on a number of key indicators, as shown in table 1. Chi-Squared tests were carried out on the age and gender variables, with no significant differences found. Results on other key indicators were also consistent between the groups (Table 1).

Table 1 also shows the period in which drivers in the case and control groups received their traffic infringement/s. The odds of receiving an infringement during the event period was 35% higher than in the reference period for the case group, adjusted for the change over time in the control group (Odds Ratio = 1.35, 95% CI 1.17-1.56, p<0.0001).

Table 1 Characteristics of case and control group drivers

	Case Group (n=1647)	**Control Group (n=1328)**
Gender		
Male	1038 (63%)	807 (61%)
Female	605 (377%)	521 (39%)
Unknown	4 (0%)	0 (0%)
Age at end of event period		
40-49	705 (43%)	567 (43%)
50-59	517 (31%)	426 (32%)
60-69	274 (17%)	224 (17%)
70-79	108 (7%)	86 (6%)
80+	43 (3%)	25 (2%)
Infringement Type		
Speeding (<25km/h)	1423 (78%)	1146 (81%)
Traffic light offences	169 (9%)	163 (12%)
Failure to stop/give-way	46 (3%)	4 (<1%)
Mobile phone offence	42 (2%)	40 (3%)
Seat and seatbelt offences	25 (1%)	17 (1%)
Careless driving	19 (1%)	7 (1%)
Overtaking, lane use and u-turn offences	17 (1%	9 (1%)
Speeding (25km/h+)	13 (1%)	8 (1%)
Alcohol offences	5 (<1%)	5 (1%)
Drug offences	4 (<1%)	1 (<1%)
Other	57 (3%)	7 (1%)
Crash Severity		
Fatal injury	6 (<1%)	8 (1%)
Serious injury	203 (12%)	162 (12%)

Other injury	513 (31%)	427 (32%)
Non-injury	925 (56%)	731 (55%)
Crash Type		
Collision with another vehicle	1355 (82%)	1124 (85%)
Struck pedestrian	123 (7%)	70 (5%)
Struck animal	4 (<1%)	4 (<1%)
Collision with fixed object	122 (7%)	98 (7%)
Collision with other object	2 (<1%)	3 (<1%)
Vehicle overturn	17 (1%)	18 (<1%)
Fall from.in moving vehicle	6 (<1%)	1 (<1%)
No collision and no object hit	17 (1%)	10 (1%)
Other accident	1 (<1%)	0 (0%)
Period Received Infringement		
Event	910 (55%)	634 (48%)
Reference	737 (45%)	694 (52%)

Conclusions

Consistent with the result found by Walter and Studdert (2015), we found crashes were more likely following infringements, indicating they may not be having the desired deterrent effect. There may be a need to develop other strategies to respond to drivers who perform illegal driving behaviours, in attempts to reduce the risk of subsequent crashes.

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