



The impact of in-vehicle speed camera warning systems on driving speed and road safety

¹Dons, E.

¹evi.dons@vias.be, Vias institute, Belgium

Introduction:

The enforcement of speed limits through speed cameras has long been a method to promote road safety. However, the effectiveness of cameras is facing challenges as drivers search ways to evade fines, initially through radar detectors and jammers. With advancements in technology, smartphones now commonly feature navigation systems that incorporate speed camera warnings. Consequently, several countries have responded by implementing stricter laws and restrictions on the use of speed camera alert features in smartphone apps and similar devices. This raises the question: What effects do in-vehicle speed camera warning systems have on drivers' speeds and overall traffic safety?

Research methodology:

Two complementary approaches were applied. Firstly, an online questionnaire in over 2000 representative Belgian drivers reveals current ownership and use of different systems, but also attitudes and behaviour with respect to speed. The second analysis utilizes data from hidden, temporary speed cameras operated by the police on two locations along highways in Belgium providing data on speeds of passing vehicles, vehicle type, and exact time. For the same locations and times as the speed controls, alerts for speed cameras from the popular smartphone app Waze were retrieved. This allows for a comparison of speeds with and without active alerts to assess changes in driving behaviour.

Results:

The survey shows that 37% of Belgian drivers habitually use one or multiple speed camera warning systems (mostly free smartphone apps, but 7% also pay for the system). The prevalence of illegal systems (radar detectors and jammers) is low (<3%). The share of users is remarkably higher in younger drivers. Drivers with a speed camera warning system, despite being warned about most upcoming speed cameras, get more speeding tickets per 10,000 kilometres: 0.38 speeding fines per 10,000 kilometres versus 0.26 in non-users. Users of a speed camera warning system also have less strict opinions about speed. For instance, they are less supportive of 30 km/h zones, more likely to agree that exceeding the speed limit is safe on empty roads, and more inclined to drive faster when they are certain that there is no speed camera in the vicinity. 23% of current users agree that speed camera warning systems pointing to the exact location of a speed camera harm road safety, but this share is significantly higher in non-users (51%). In total, 40% of Belgian drivers agree that speed camera warning systems pointing to the exact location of a speed camera harm road safety.



In the observational part of the study, valid data were retrieved for 22 speed enforcement sessions with a mobile speed camera. The average duration of one session was 2.96 ± 1.10 hours (mean \pm sd). All sessions were discovered by Waze users at some point. Across all sessions, 93.7% of the time with actual speed measurements from the police, there was an active Waze alert to notify other Wazers about the presence of a mobile speed camera. On average, the alert stayed active 19.6 minutes after the end of the speed measurements. The average deviation from the actual location of the camera was ~ 175 m (positional accuracy). A mobile speed camera deployment session got 267 ± 211 'Thumbs up' (all individual alerts linked to the same session combined). From an unpaired two-tailed t-test, it could be concluded that at times with an active Waze alert, the average speed was significantly lower than at times without an active alert ($p < 0.05$, 95% CI [-0.81; -1.43]). In addition, a linear regression model was fitted that also takes into account 1-minute traffic volumes. Indeed, 1-minute traffic volume is related to speed, however, also the presence of a Waze alert is a significant and independent predictor of measured speed. When a Waze alert is active, the average driving speed (Waze users and non-users) is 1.15 km/h lower on those two sites on a highway in Belgium. In the full sample, 20.1% of the vehicles drove at a speed above 120 km/h which is the speed limit. At times without a Waze alert, 23.4% of the drivers were speeding; at times with an active alert, 19.8% of the drivers were above the speed limit. The speed distribution plot reveals that it's mainly cars travelling above 120 km/h that lower speed to just below the speed limit, with a similar observation for trucks around 90 km/h.

Discussion and conclusion:

While originally being a niche market, current technology with free smartphone apps allows the general public to use speed camera warning systems. This research clearly shows the impact speed camera warning systems have on driving speeds. Although Waze-users lower speed when they receive a speed camera alert, on all other occasions they tend to drive faster, even being above the speed limit and receiving speeding tickets.

A limitation of the observational study is that the speed measurements from the police cannot discriminate between drivers using the Waze application and non-users; nevertheless we see an impact on the average speed (change in speed is expected to be larger in Waze users). We do not have information about speed camera alerts from other brands or apps; although our survey indicated that Waze is a very popular navigation system in Belgium ranking shortly behind Google Maps.

The primary focus of this study was the impact of speed camera warning systems on driving speed, serving as an indicator of road safety. However, these systems may have additional impacts on safety, for example, the visual and audio alerts could lead to distraction. The alerts can interrupt drivers and encourage them to engage with their navigation system or mobile phone while driving, either to report or confirm the presence of police enforcement. Furthermore, it sends the wrong message when well-established companies offer features designed to evade police enforcement; whereas the aim of the police is to protect the safety of all road users.

To enhance road safety, governments should adapt their legislation on speed camera warning systems in consultation with relevant stakeholders.