

Does police traffic enforcement result in safer roads?  
A critically appraised topic.

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## **1.0: Background**

For many people, the term “police officer” is synonymous with the uncomfortable feeling of being pulled-over for committing a traffic infraction. Although the exact number of motor vehicle stops is unknown, this is one of the most common ways for police to interact with the citizens they have sworn to protect. It is also a big source of revenue for municipal and state governments, with a recent estimation showing that over \$405 million was generated through traffic infractions in a single State in the United States of America in 2015 (Herzog, 2016). The underlying assumption has always been that issuing motorists a ticket for violating the traffic safety laws would deter future violations and would result in safer roads for all. Recent events in the United States however, have called that assumption into question, suggesting instead that traffic law enforcement has simply been used as a means of generating revenue for cash-strapped municipalities (McCoy, 2015). This CAT will attempt to explore whether or not there is indeed a connection between enforcement of traffic laws and roadway safety.

## **2.0: Question**

### Main question:

What is known in the scientific literature about the effect of traffic law enforcement on roadway safety in first-world industrialized countries?

### Supplementary questions:

What counts as traffic enforcement? Definition?

What is the assumed causal mechanism? How is it supposed to work?

## **3.0: PICOC**

Population: Motoring public

Intervention: Traffic tickets & sanctions / arrests for violations of traffic laws

Comparison: Verbal warnings / lack of enforcement efforts

Outcome: Decreased fatalities / injuries

Context: Roadways in industrialized countries.

### **3.1: Inclusion criteria**

1. Date: published in the period 1980 to 2016 for meta-analyses and the period 2000 to 2016 for primary studies.
2. Language: articles in English.
3. Type of studies: quantitative, empirical studies.
4. Study design: only meta-analyses or controlled studies.
5. Measurement: a) studies in which the effect of traffic enforcement on roadway fatalities was measured or b) studies in which the effect of moderators and/or mediators on the outcome of roadway fatalities was measured.
6. Outcome: Effect of traffic law enforcement on number of roadway injuries or deaths.
7. Context: studies related to traffic enforcement and roadway safety.

### **3.2: Exclusion criteria**

1. Studies that pertain to under / less-developed nations.
2. Studies that examine alcohol specific interventions and/or drunk driving enforcement.

### **4.0: Search strategy**

#### ProQuest ABI/INFORM

An initial search was conducted using the ProQuest ABI/INFORM database. The following search terms were used in combination: Traffic Enforcement, Traffic Fine, Traffic Citation, Speeding Ticket, Crash, Injury and Accident. Initial searches using those terms in the ProQuest ABI/INFORM database produced a limited number of results. Both meta-analysis and longitudinal study filters were applied which resulted in a lower number of studies.

A review of the abstracts was conducted and 12 potentially relevant studies were identified from this search. Additional searching was conducted by reviewing the citations and references for those studies.

#### Google Scholar

A search was then conducted using the Google Scholar search engine. A search using the phrase "traffic enforcement and road fatalities" resulted in 49,800 results. A secondary search using the phrase "traffic enforcement and road fatalities meta-analysis" resulted in 11,700 results. A third search was conducted using the phrase "traffic enforcement" AND "road fatalities" AND meta-analysis which resulted in 94 results. A review of the title resulted in 15 studies being identified for further evaluation.

#### Science Direct

During the evaluation of the studies obtained through Google Scholar, a number were identified as appearing in the Science Direct database. As a result, a search was conducted

using “traffic enforcement” AND “injury” in the abstract, title or keyword section for the years 2007 to present. That search resulted in 127 results. A review of those titles resulted in 9 potential studies that required abstract review. An additional search was conducted using the terms “traffic enforcement” AND “meta-analysis” which resulted in 5 results.

ProQuest ABI/INFORM		
#	Search Terms	Results
S1	ti(traffic) AND ti(enforcement)	117
S2	ab(traffic) AND ab(enforcement)	1357
S3	ab(TI(meta-analy*) OR AB(meta-analy*) OR TI(systematic review*) OR AB(systematic review*))	127,027
S4	S1 AND S3	0
S5	S2 AND S3	0
S6	ab(traffic) AND ab(enforcement) AND ab(injury)	401
S7	ab(traffic) AND ab(enforcement) AND ab(crash)	370
S8	ab(traffic) AND ab(fine) AND ab(injury)	48
S9	ab(traffic) AND ab(fine) AND ab(crash)	32
S10	ab(traffic) AND ab(citation)	247
S11	ab(traffic) AND ab(enforcement) AND ab(accident)	231
S12	S6 AND S3	5
S13	S7 AND S3	4
S14	S8 AND S3	0
S15	S9 AND S3	1
S16	S10 AND S3	28
S17	S11 AND S3	1
S18	TI(experiment* OR controlled OR longitudinal OR randomized OR quasi) OR AB(experiment* OR "controlled stud*" OR "controlled trial" OR "control group" OR "control variable" OR "comparison group" OR "comparative stud*" OR quasi OR longitudinal OR randomized OR randomly OR laboratory OR "before and after stud*" OR "pretest post*" OR "time series" OR "case control" OR "case cohort" OR "cohort stud*" OR "prospective stud*")	3,176,692
S19	S1 AND S18	82
S20	S2 AND S18	174
S21	S6 AND S18	56
S22	S7 AND S18	75
S23	S8 AND S18	2
S24	S9 AND S18	2
S25	S10 AND S18	40
S26	S11 AND S18	27

## 5.0: Review of abstracts & selection

Selection took place in two phases. First, the titles and abstracts of all studies identified were screened for their relevance to this CAT. In the case of doubt, the study was included. Duplicate publications were removed. This first phase yielded 32 results (from the three search locations as noted above). Those results were reviewed and yielded 5 studies that were relevant to this question. A review of the works cited from an identified meta-analysis revealed 3 additional studies that were included in this CAT for a total of 8 reviewed studies.

## 6.0 Data extraction (included in larger size on page 12)

Makowski & Stratmann (2011)	Municipalities in Massachusetts	Examines municipal level traffic stop data for 300 towns in Mass between 2001-2003. Cross-	Study shows that an increase in the number of tickets written for traffic violations leads to a reduction in the number of MV accidents and accident-related injuries	No effect size provided	No "before" measurement. No way to control for other variables.	C
Redelmeir, Tribshirani & Evans (2002)	Canadian drivers involved in fatal crashes.	Identified and examined drivers in Ontario, Canada over 11 year period. (N = 8975 drivers)	Risk of a fatal crash one month after a conviction was 35% lower than no conviction. Benefit lessened in following months and was not significant after 4 months. Benefit greater for speeding tickets with points vs no points.	Small	No control group and no means of controlling other factors.	C
Rousseau & Blondiau (2013)	Published studies from developed	Literature Review (Not a systematic review)	Suggestion that a single approach to road safety enforcement is not effective. Multiple approaches must be used to address the	No effect size provided	Suggests a framework without any evidence. No search methodology or	B
Nghiem, Commandeur & Connelly (2016)	Queensland, Australia	State-space time-series model for period 1958-2007	Suggests that the introduction of random breath testing program in 1988 (expanded in 2004) was associated with reductions of	No effect size provided	No control group and no means of controlling for factors other than RBT.	B
Blais & Dupont (2005)	Drivers in developed countries	Systematic Review. Looked at 38 studies surrounding road safety enforcement efforts in 6 categories: RBT, Sobriety checkpoint, auto speed cameras, red-light cameras,	Study found that all categories of enforcement examined resulted in a reduction of accidents with injuries between 23-31% with the exception of the automated speed & red-light cameras where no significant impact was noted.	Moderate	Regression to the mean bias - discuss that enforcement efforts typically take place at high risk areas. Publication bias - only reviewing published studies - more likely to show significant results.	B
Brubacher et al. (2014)	Drivers in British Columbia, Canada	Non - controlled before/after comparison study comparing 2 years of post implementation	A change to more immediate sanctions for speeding and drunk drivers led to a 21% decrease in fatal crashes, 8% reduction in hospital admissions and 7.2% decrease in EMS calls for alcohol related crashes.	Moderate	Did not control for other variables. Simple before/after comparison without a control group.	B
Blais & Gange (2010)	Drivers in Quebec, Canada.	Time-series and descriptive analyses	Determined that during a 21 month period where fewer tickets were issued by police officers, there was a corresponding 61% increase in accidents with injuries when	No effect size provided	Did not control for other variables. Simple before/after comparison without a control group.	C
Phillips et al. (2011)	Broad review of driving crash literature.	Meta-Analysis of 67 studies from 1975 to 2007.	Found that the weighted average effect of road safety campaigns is a 9% decrease in accidents.	No effect size provided	This 9% decrease represents a meta-analysis of over 119	B

## 7.0 Methodological appropriateness

After critical appraisal of the identified studies, 8 studies were included in this CAT. Most studies were excluded because they did not meet in the inclusion criteria, had serious methodological shortcomings or focused on a specific and narrowly tailored intervention. Of the included studies, 2 meta-analyses were conducted of existing literature with clear search and inclusion criteria for included studies. Of those studies, both found traffic law enforcement has moderate effects on roadway safety as measured by accidents. The remaining studies were cross-sectional and had less stringent inclusion criteria, resulting in findings that alone would be less generalizable.

## 8.1 Definitions

Police interventions or traffic law enforcement are defined as measures designed to increase the perceived risk of being arrested or sanctioned among the general population and to maximize the detection and apprehension of road delinquents in order to prevent traffic accidents (Blais & Dupont 2005). These interventions take many forms and include enforcement of alcohol-impaired motorists, speeding motorists, seat-belt wearing and traffic signs or intersections (Rousseau & Blondiau 2013). Specific interventions include random-breath testing and sobriety checkpoints for alcohol-impaired drivers, red-light and automatic cameras that can capture violators without police being present, random road watch and general traffic enforcement and a combination of interventions into a mixed-methods approach (Blais & Dupont 2005). Another area of review concerns road safety campaigns, defined as a purposeful attempt to inform, persuade and motivate a population or subgroup to change its attitudes and/or behaviors to improve road safety using organized communications involving specific media channels within a given time period (Phillips et al 2011).

## 8.2 Causal mechanism

The concept of traffic law enforcement stems from the general theory of deterrence which suggests that people will be less likely to engage in undesirable behavior when there is a possibility of sanctions. Deterrence theory combines with rational choice theory in this context to suggest that in the arena of roadway safety, drivers will make informed, rational choices on their driving behavior based upon the celerity, certainty or severity of sanctions (Pearsall 2014, Makowski & Stratmann 2011). When examined in the context of reducing roadway accident injuries and fatalities, the causal chain would suggest that the deterrent effect of traffic sanctions would result in less risky driving behaviors and would thereby reduce the likelihood of severe accidents or injuries (Blais & Dupont 2005).

## 8.3 Main findings

*Police-based traffic law enforcement has an effect on reducing the number of accidents with injuries however this reduction is not observed with stationary, automatic interventions.  
(Level B)*

Based upon a comprehensive meta-analysis of studies examining roadway safety efforts in twelve developed countries, there is a strong correlation between a mixed-efforts approach to traffic law enforcement and a reduction in accidents with injuries. This research however, did not find those safety benefits to be present in the use of less invasive, less personal enforcement measures such as automatic cameras designed to capture red-light or speeding violations.

*As the number of traffic tickets issued increases, there is a corresponding decrease in the number of motor vehicle accidents and accident-related injuries.*

*(Level C)*

A period of data collection in Massachusetts provided an opportunity to obtain uniform data on traffic law enforcement activity in over 300 municipalities for a two-year period. This observational study shows that increased traffic enforcement and fine activity during a period of budgetary shortfalls had a corresponding decrease in the number of crash injuries and fatalities during the same time period.

*The deterrent effect of traffic law enforcement sanctions diminishes as the time from the sanction increases.*

*(Level C)*

This study provides results which are consistent with the literature on the theory of deterrence and suggests that drivers alter their behavior in the immediate time frame following the issuance of a sanction for a violation of roadway rules. This study showed that drivers were 35% less likely to be involved in a fatal motor vehicle crash within one month of being convicted of a traffic infraction. That deterrent effect reduced notably however as the time frame approached two to four months and was essentially eliminated after that time.

*A mixed-methods approach to roadway traffic enforcement is more effective than utilizing any single approach.*

*(Level B)*

The findings in this study were similar to that of the Makowski & Stratman (2011) research and supported the concept that a mixed-methods approach is more effective at obtaining compliance with roadway safety than any single approach. This would support the concept of police traffic enforcement and suggests that ongoing efforts in developed nations is grounded and appropriate. The research suggests however, that a single approach is less effective than a mixed-methods approach where multiple different avenues of enforcement are utilized and would appear to support the continuation of multiple avenues of enforcement.

*The implementation of random breath-testing shows is associated with decreases in roadway fatalities.*

*(Level B)*

This study was conducted by examining roadway safety data in the period of time following the enacting of new legislation in Australia that authorized random breath-testing in an effort to reduce accidents, injuries and fatalities associated with alcohol impaired driving. While this study primarily concerns an enforcement effort targeted towards alcohol-impaired driving, it

was included in this study based upon the transfer possibility for other types of traffic infractions. The RBT process was identified as being minimally invasive with respect to the amount of time required for the process but reductions in crashes, injuries and fatalities were observed.

*A change to a more immediate sanction for speeding and driving while intoxicated led to a decrease in fatal crashes, hospital admissions and EMS calls.  
(Level B).*

Research analyzed fatal traffic crashes, hospital admissions and EMS calls for the periods before and after the implementation of new enforcement measures based upon an immediate imposition of sanctions as opposed to deferred sanctions. Sanctions that included immediate license revocation or vehicle impoundment at the time of the violation were found to correlate with a 21% decrease in fatal crashes.

*When police traffic law enforcement is decreased, roadway accidents with injuries increase significantly.  
(Level C)*

This finding suggests that during periods of reduced traffic law enforcement, there is a corresponding reduction of the deterrent effect of that enforcement and violations of the road safety laws increase. As a result, there is a corresponding increase of traffic crashes, injuries and fatalities.

*Roadway safety campaigns can be moderately effective at reducing traffic accidents however there are distinct differences between the types of messages and their effects.  
(Level B)*

A mixed-methods approach to roadway safety should include safety campaigns that target drivers with messages designed to encourage compliance and deter bad behavior however, these efforts differ in their effectiveness based upon the specific type of campaign and only have moderate effects in isolation.

## **9.0 Conclusion**

A review of the scientific literature supports the assumption that traffic law enforcement is a necessary component of reducing roadway accidents, injuries and fatalities. While there are inherent weaknesses in studying behavior and ethical considerations that would prohibit certain measurement processes, all studies reviewed suggested that there is a correlation

between enforcement actions and the number of accidents, injuries and fatalities that result from traffic accidents.

## **10.0 Limitations**

Concessions were made in relation to the depth and breadth of the search process. As a result, some relevant studies may have been missed.

A second limitation concerns the critical appraisal of the studies included. This CAT did not conduct a comprehensive review of the psychometric properties of the tests, scales and questionnaires used.

A third limitation concerns the fact that the evidence on several moderators is often based on a limited number (sometimes only one) of studies. Although most of these studies were well controlled, or even randomized, no single study can be considered to be strong evidence – it is merely indicative.

Finally, this CAT focused primarily on the results of meta-analyses. As a consequence, relevant findings may have been missed.

Given these limitations, care must be taken not to present the findings presented in this CAT as conclusive.

## **11.0 Implications and recommendations**

From the findings outlined in the CAT, certain recommendations may be made with respect to the manner in which roadway safety initiatives are conducted.

First, the extent to which monetary fines impact the driving behaviors should be evaluated and compared with alternative sanctions. While alternative sanctions are outside the limited scope of this CAT, recent events that have highlighted the perceived legitimacy concerns about the monetization of traffic enforcement suggest that this is an area ripe for further exploration.

Second, further work should be done to review the extent to which the deterrent effect can be maximized through such options as sanctions phased in over time or other alternatives that combat the decay effect observed. As seen in the study by Redelmeir et al (2002), any intervention that can dramatically reduce traffic fatalities should be considered for the magnitude of the potential impact to society.

Third, we should consider attempts to maximize the effects of roadway safety initiatives through a combination of enforcement efforts, education and sanctions. While there is a strong base of evidence to support the concept that sanctions have an impact on the driving behavior

of motorists, further research should be considered to determine the most effective mix or efforts. As the roadway safety implications of traffic law enforcement are closely aligned with rational choice and deterrence theory, the most contemporary research findings in those disciplines should be examined and evaluated with respect to their impact upon roadway traffic safety efforts.

Fourth, the speed at which sanctions are imposed is an area that should be reviewed further. Recent studies in other fields suggest that the celerity, or swiftness of a sanction has more of a deterrent effect on a violator than the severity of the sanction, a finding which appears to be supported in the results of this CAT (Pearsall 2014). As a result, current sanctioning systems that rely on extended periods of time between the violation and the monetary fine should be reviewed.

Finally, the system of automated red-light and speed cameras should be reviewed further as the preliminary results from this CAT suggest they have little effect upon the driving behaviors of motorists and therefore do not contribute to the overall goal of reducing accidents, injuries and fatalities.

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