Effectiveness of primary and secondary enforced seat belt laws

Rivara F P, Thompson D C, Cummings P

Authors' objectives
To determine the relative efficacy of primary and secondary enforced motor vehicle occupant restraint laws on the outcomes of restraint use, crash-related mortality, and crash-related injuries.

Searching
The Cochrane Collaboration search strategy (Murlow and Oxman, 1998 see Other Publications of Related Interest no. 1, Rivara et al., 1999 see other Publications of Related Interest no. 2) was used to search the following electronic databases: MEDLINE, EMBASE, National Technical Information Service (NTIS), PsycINFO, ERIC, CINAHL, Transportation Research Information Service (TRIS), and EI Compendex. The reference lists from each potentially eligible study were checked, and knowledgeable people in the field were contacted, for additional leads to published reports.

Study selection
Study designs of evaluations included in the review
Controlled studies that evaluated the impact of primary and secondary belt use laws on observed belt use, motor vehicle fatalities, and motor vehicle injuries. Ecological studies were the only type of study design found. In order to be included, a study had to meet each of the following criteria:

1. Include data on one of the objectively measured outcomes described below.
2. Include a comparison group.
3. Study a political jurisdiction in which either a primary or secondary law was enforced with a penalty.
4. Provide information on data collection methods.

Studies had to include a comparison of primary enforcement law to no law, secondary enforcement law to no law, or a primary law to a secondary law. Only studies where some detail was provided about data collection methods were included.

Specific interventions included in the review
Primary and secondary enforced motor vehicle occupant restraint laws.

Participants included in the review
Motor vehicle occupants of all ages, excluding studies that evaluated restraint laws that applied only to children. Occupants could be either drivers or passengers, although for purposes of simplicity and consistency results for drivers only are reported.

Outcomes assessed in the review
Observed seat belt use, incidence of motor vehicle occupant fatalities, or incidence of hospitalization for motor vehicle occupant injuries.

How were decisions on the relevance of primary studies made?
Each of the articles identified by the original literature search was assessed independently, using the inclusion criteria, by two of the authors.

Assessment of study quality
The methodological criteria for ecological studies were as follows:

1. Whether or not ascertainment of exposure was the same for all members of the population.
2. Whether or not ascertainment of outcome was objective and the same for all members of the population.
3. Whether or not ascertainment of potential confounders was the same for all members of the population.
4. Whether or not outcome assessors were blind to intervention status.
5. Whether or not the study measured variables most likely to confound the association of interest.

The authors do not state how the papers were assessed for validity, or how many of the authors performed the validity assessment.

Data extraction
Data were collected using a standard abstract reporting form. Only data immediately before and immediately after the law and only observations on drivers or front seat occupants were included.

Methods of synthesis
How were the studies combined?
The relative prevalence of being belted associated with the law, was calculated by comparing the number of drivers belted per 100 observed drivers after the law to the number of drivers belted per 100 observed drivers before the law. Prevalence differences were also calculated by subtracting results before the law was in effect from the results after the law. Confidence intervals were tight and therefore not reported. Relative prevalence and prevalence differences for fatal and serious injury were calculated when a law was in effect compared to other periods.

How were differences between studies investigated?
Not reported, however the authors did not attempt to generate a summary estimate of effect across studies using meta-analytic methods, presumably because an informal assessment of heterogeneity showed that the studies were too different to combine.

Results of the review
A total of 48 studies were included. There were 24 studies that contained information regarding observed seat belt use, 31 studies with information about deaths due to crashes, and 15 studies that examined the impact of seat belt laws on nonfatal injury incidence, pattern or severity.

When places or time periods with primary enforcement laws were compared to those without such laws, the relative prevalence of seat belt use ranged from 1.5 to 4.5; the prevalence differences ranged from 10 to 50 per 100 observed drivers. Secondary laws had smaller effects. Two studies evaluated a change in law from secondary to primary enforcement; this was associated with an increase in belt use 6 months later of 5.3 per 100 observed drivers in Louisiana and 18 per 100 drivers in California. Primary enforcement laws were associated with a relative risk of death in motor vehicle crashes of .54 to .97. The reduction in mortality associated with secondary enforcement laws was much more modest, with relative risks estimates of .81 to 1.025. Primary enforcement laws were associated with a relative risk of severe injuries of .20 to .89; the association of secondary enforcement laws with severe injuries was smaller.

Authors' conclusions
Primary enforcement laws are likely to be more effective than secondary laws. However, few studies are of good quality, and quantitative estimates of the relative effect of primary compared with secondary laws are limited.
CRD commentary
The databases searched seem complete and appropriate. The Cochrane Collaboration search strategy is reported elsewhere, therefore cannot be judged but is usually sound. The inclusion criteria seem well chosen and inclusion of studies was assessed by two independent reviewers.

The authors did not attempt to generate a summary estimate of effect across studies using meta-analytic methods, which seems appropriate. Instead they described the results of primary studies in a narrative way, and only pooled studies that had similar outcomes. However, differences between studies were not formally investigated.

The authors did not report the way methodological quality criteria were assessed and how data extraction was done. Nor did they report confidence intervals for relative risk estimates. The authors' conclusions are appropriately cautious, given the limitations listed above.

Implications of the review for practice and research
The authors state that the most credible type of study for this question is a mixed ecological design, in which one compares the intervention community after legislation to the same population before the law, and controls for secular trends by using one or more comparison communities that did not adopt a law over the same time period, and that this has not yet been done properly.

Furthermore the authors state that there is a clear need to conduct a rigorous study directly comparing the effect of primary laws and of secondary laws, as well as examining the change from secondary laws to primary.

Bibliographic details

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Other publications of related interest

Indexing Status
Subject indexing assigned by NLM

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Record Status
This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract
contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.