Safety and economic impacts of photo radar program

Chen G

Record Status
This is a critical abstract of an economic evaluation that meets the criteria for inclusion on NHS EED. Each abstract contains a brief summary of the methods, the results and conclusions followed by a detailed critical assessment on the reliability of the study and the conclusions drawn.

Health technology
The author investigated the use of a large-scale photo radar programme to reduce unsafe traffic speed in British Columbia (BC), in Canada. This programme was compared with the status quo (i.e. no programme). The BC photo radar programme was introduced in 1996 and funded by the Insurance Corporation of British Columbia (ICBC), a government-owned provincial crown corporation. It consisted of 30 mobile photo radar units deployed across the province, each unit including a cross-the-road Doppler radar, a camera with a flash and a laptop computer, all mounted in an unmarked mini van. The programme started with a 5-month warning phase, during which time the owners of the offending vehicles received warning letters rather than violation tickets. On August 1996, fines were imposed with the highest fines in school and construction zones. The BC photo radar programme was terminated in June 1997.

Type of intervention
Primary prevention.

Economic study type
Cost-benefit analysis.

Study population
The study population comprised motorists in BC, Canada.

Setting
The study setting was the community. The economic study was undertaken in Canada.

Dates to which data relate
The effectiveness data were derived from studies published between 2000 and 2002. The dates to which the resource use data related were not clear. The price year was 2001.

Source of effectiveness data
The effectiveness data were mainly derived from two studies (Chen et al. 2000 and 2002, see ‘Other Publications of Related Interest’ below for bibliographic details), both of which assessed the effectiveness of the BC photo radar programme.

Outcomes assessed in the review
The outcomes assessed from the literature were:

the reduction in fatal and injury collisions because of the radar programme;

the reduction in mean traffic speed due to the radar programme;
the occupancy rate of passenger vehicles;
the yearly total vehicle-distance of travel in BC;
the number of speed violation ticket disputes; and
the average time spent to attend a court hearing.

Study designs and other criteria for inclusion in the review
The author reported that a province-wide impact study (Chen et al. 2000) and a site-specific study (Chen et al. 2002) were used to assess the speed and safety effects of the photo radar programme. The province-wide impact study used time series analysis methods to assess the macro level effect of the programme across the whole jurisdiction and controlled for trend, seasonality and key traffic safety-related variables. The site-specific study used a comparison group design to control for trend, and potential traffic and collision migration to non-photo radar enforcement sections of the highways.

Sources searched to identify primary studies
Not reported.

Criteria used to ensure the validity of primary studies
Not reported.

Methods used to judge relevance and validity, and for extracting data
The validity of the primary studies does not appear to have been assessed.

Number of primary studies included
Approximately seven different sources were included in the review. Effectiveness data on the number of injuries and fatal collisions prevented were derived from three studies (Chen 2002; Chen et al. 2000 and 2002), all of which assessed the effectiveness of the BC photo radar programme. Data from this group of studies were also used to derive the mean reduction in traffic speed. Total vehicle distance of travel and occupancy rates were derived from governmental sources. The number of disputes and the time spent to attend a court hearing were derived from court reports.

Methods of combining primary studies
Not reported.

Investigation of differences between primary studies
The author did not investigate differences between the primary studies.

Results of the review
The BC photo radar programme prevented a total of 1,542 injuries and 70 fatal collisions annually.

The mean traffic speed reduction due to the programme was 2.4 km/hour, which represented a 3% reduction in speed.

The yearly total vehicle-distance of travel was 41.7 billion vehicle-km of travel for passenger cars and 4.3 billion vehicle-km of travel for trucks.

The occupancy rate for passenger vehicles was 1.4.
Fewer than 10% of tickets were disputed. The average time lost in disputing tickets was 3 hours.

**Measure of benefits used in the economic analysis**

All benefits (effects) were converted into monetary costs. Using the societal perspective, fatal collisions and injury collisions were valued at CAD 4.6 million and CAD 120,000 per collision, respectively, following advice from published Canadian studies. Using the ICBC perspective, fatal and injury collisions were valued at the ICBC average claim (CAD 50,000 and CAD 40,000, respectively). Time lost due to speed reduction was estimated by computing the difference in total travel times required to complete the yearly vehicle-km of travel at the speeds before and after the introduction of the programme. The unit value of travel time for passenger cars and trucks was based on guidelines from the BC Ministry of Transportation and Highways. Time lost in disputing photo radar tickets was estimated by multiplying the actual number of disputes by the estimated average time spent to attend a court hearing and by the average hourly wage of BC workers. Photo radar fines were excluded from ICBC benefits. The environmental effects were also excluded.

**Direct costs**

The direct costs included in the analysis were those of the government of BC. These included:

- the capital expenditure (start-up costs) such as planning, photo radar equipment purchasing, software development, signing, and programme education and publicity campaign;
- the police costs, as a stand-alone police force was created for the deployment and administration of the photo radar units;
- the photograph and violation tickets processing costs, including photograph processing, data management and analysis, and ticket generating and mailing expenses; and
- the incremental workload caused to the provincial court systems, which affected the prosecutor, support staff, justice of the peace, sheriffs, and court or registry clerks.

The quantities of resource used and the unit costs were reported separately. All capital costs were amortised over a 10-year period, corresponding to the estimated economic life of the equipment. The different costs of setting and running the radar programme were generally derived from the ICBC and BC government offices. A 6% discount rate was used, following the guidelines of the BC government. The total costs were reported. The price year was 2001.

**Statistical analysis of costs**

The costs were treated as point estimates (i.e. the data were deterministic).

**Indirect Costs**

The indirect costs included in the analysis were those associated with productivity losses due to reductions in speed and time disputing the programme tickets. As reported already, these indirect costs were included as benefits in this analysis.

**Currency**

Canadian dollars (CAD).

**Sensitivity analysis**

The author performed several one-way sensitivity analyses. They varied the discount rate (0 to 10%), the reduction in speed (2.0 to 2.8 km/hour), the reduction in injury and fatal collisions (1,154 to 1,929 and 54 to 87, respectively), and the injury/fatal collision valuation (by 10%).
**Estimated benefits used in the economic analysis**
The benefits of the photo-radar programme from a societal perspective were:

- Reduction in fatal and collision injuries, CAD 513,930,000;
- Time lost due to travel, -CAD 371,643,000; and
- Time lost due to ticket disputes, -CAD 1,041,000.

Therefore, the net benefit of the photo radar programme from a societal perspective was CAD 113,955,000.

The benefit of the photo radar programme from the ICBC perspective was the reduction in fatal and collision injuries (CAD 65,554,000).

Therefore, the benefit of the photo radar programme from an ICBC perspective was CAD 65,554,000, as the costs incurred due to lost time were not a loss to the ICBC.

**Cost results**
For both perspectives (i.e. the ICBC and societal perspectives), the costs of the photo radar programme were as follows:

- Capital, CAD 4,745,000;
- Process serving, CAD 1,557,000;
- Equipment maintenance, CAD 147,000;
- Ticket and photo processing, CAD 7,141,000;
- Police, CAD 11,746,000; and
- Court, CAD 1,954,000.

Therefore, the total costs of the programme were CAD 27,290,000.

**Synthesis of costs and benefits**
The costs and benefits were combined by subtracting the costs from the benefits. Therefore, the net benefit of the photo radar programme was CAD 113,955,000 from a societal perspective and CAD 38,264,000 from the ICBC perspective.

The results of the sensitivity analyses showed that, under all possible scenarios, the benefits of the photo radar programme outweighed the costs of the programme.

**Authors' conclusions**
Automated photo radar traffic safety enforcement could be an effective and efficient means to manage traffic speed, reduce collisions and injuries, and combat the huge resulting economic burden to society.

**CRD COMMENTARY - Selection of comparators**
A justification was given for using the no-programme alternative as a comparator. It represented the status quo. You should decide if the comparator used represents current practice in your own setting.

**Validity of estimate of measure of effectiveness**
The author derived the majority of effectiveness estimates from a group of studies that evaluated the impact of a traffic photo radar programme aimed at reducing dangerous driving. The author did not provide enough details of the trials used to derive effectiveness measures so as to be able to comment on their quality.

Validity of estimate of measure of benefit
The author converted all benefits into monetary terms. The methods used to convert effects into monetary benefits were appropriately reported. Further, for each effect the author reported its monetary valuation and the source used to derive the valuation estimate. The impact of the monetary valuation on the results was then appropriately explored in a series of one-way sensitivity analyses.

Validity of estimate of costs
Not all of the cost categories relevant to the societal perspective adopted were included in the analyses. For example, the author did not include the health care costs of treating victims of road crashes. The author reported that not all of the costs were included in the analysis. Revenues generated from photo radar fines were not reflected in the benefit calculation as they were a transfer from ticketed drivers to the government. The author did not include any environmental impact, as they deemed that the effect of the programme would be negligible. The author provided very detailed cost estimates, showed how these were calculated, and reported the costs separately for each category, all of which will enhance the generalisability of the author's results. The costs of the programme were mainly derived from governmental sources. The costs were varied in one-way sensitivity analyses and the ranges used were reported. Since the costs could be incurred over the future, all future costs were discounted at 6% per annum following Canadian guidelines. The price year was reported, which will ease any future inflation exercises.

Other issues
The author appropriately compared the results of the study with similar studies conducted in Norway and the UK that had also found photo radar programmes generated higher benefits than costs. The issue of generalisability to other settings was addressed in the sensitivity analysis. The author does not appear to have presented the results selectively and the conclusions reflected the scope of the analysis. The author reported no further limitations to their study.

Implications of the study
The author recommended that the application of a photo radar programme to reduce unsafe motoring speed should be planned and implemented with caution. In addition, every effort should be made to focus and to promote the programme on safety improvement grounds, in order not to alienate drivers who might see this programme as a source of government revenue.

Source of funding
None stated.

Bibliographic details

PubMedID
16266937

DOI
10.1080/15389580500253729

Other publications of related interest
Chen G, Meckle W, Wilson RJ. Speed and safety effect of photo radar enforcement on a highway corridor in British


Indexing Status
Subject indexing assigned by NLM

MeSH
Accidents, Traffic /economics /prevention & control; Automation; Canada; Cost-Benefit Analysis; Humans; Insurance Carriers /economics; Photography /economics; Policy Making; Radar; Safety /economics; Social Control, Formal /methods

AccessionNumber
22006000277

Date bibliographic record published
31/01/2007

Date abstract record published
31/01/2007