

# Smoke-free cars legislation: it works but New Zealand should still rigorously evaluate its upcoming law

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## ABSTRACT

In this viewpoint we briefly review the evidence for smoke-free car legislation. We find that this legislation has been consistently associated with reduced secondhand exposure in cars with children/youth in all nine jurisdictions studied. Despite this, there are various aspects of this intervention that warrant further study—especially determining its impact on reducing tobacco-related ethnic inequalities. So we argue that the New Zealand Ministry of Health should invest in a thorough evaluation of this important upcoming public health intervention. This could both help the country in further refining the design of the law (if necessary) and would also be a valuable contribution to advancing the knowledge base for international tobacco control.

A systematic review has reported that smoking in cars leads to extremely high exposure to secondhand smoke (SHS), “even in the presence of air-conditioning or increased airflow from open windows”.<sup>1</sup> Many jurisdictions have responded to this hazard by legislating against smoking in cars (particularly in Canada, Australia and the US). However, the latest Cochrane systematic review on the impact of smoke-free legislation does not specifically consider the impact of such laws on youth exposure to SHS in cars.<sup>2</sup> We therefore aimed to examine the relevant literature to determine the impact of such legislation and to help policymakers decide if further evaluation is worthwhile around the planned smoke-free cars legislation for New Zealand.

### Methods for the literature review

Searches of the peer-reviewed literature were conducted using PubMed and Google Scholar on 9 February 2020 using a range of

search terms (eg, smoke AND cars/vehicles AND ban/law). In these searches we aimed to identify studies where the impact of a smoke-free car law was estimated from survey data on smoking in cars containing children/youth. The bibliographies of these identified studies were also searched for additional relevant studies.

### Results of the literature review

From publications identified by the searches (n=136 in PubMed; the first n=100 items in Google Scholar), we identified five relevant peer-reviewed studies. These studies covered nine different jurisdictions with smoke-free car laws (England, California and seven Canadian provinces) (Table 1). In all these jurisdictions there was evidence of declines in youth exposure to SHS after implementing the law, and in jurisdictions where it was assessed these declines persisted in all the subsequent survey waves.

**Table 1:** Studies identified in the peer-reviewed journal literature on the impact of smoke-free cars legislation on smoking in cars containing children/youth.

Setting (publication year)	Summary of impact	Comments
Canadian provinces (2013) <sup>3</sup>	Reduction in youth SHS exposure (using two different analytical methods) of 26% and 39% for one dataset; and 10% and 12% for another dataset.	This study used a quasi-experimental design (before and after law implementation and with control provinces). It used two different analytical methods and also two different survey datasets—though both with self-reporting. There were up to seven provinces in the intervention group depending on the analytical method.
Canadian provinces (2015) <sup>4</sup>	Lower odds of exposure to SHS in children (aged 11–14 years) of between 0.45 and 0.98 (first wave post-implementation) and between 0.51 to 0.91 in subsequent survey waves	This study of smoke-free car laws in seven Canadian provinces used repeated cross-sectional surveys (involving self-reporting) with a quasi-experimental design. The results for exposure to SHS in cars for the first survey wave post-law (compared to the control provinces) were: Ontario with odds ratio [OR] = 0.45; Newfoundland (OR = 0.53); Nova Scotia (0.59); Saskatchewan (0.68); Prince Edward Island (0.73); British Columbia (0.96); and Manitoba (0.98). There were also lower odds in all subsequent survey waves (n=8 results).
California (2018) <sup>5</sup>	Large post-implementation reductions in SHS exposure (12% annually) in middle and high school students	This study involved a before and after design with comparison with the rest of the US (of which only 5% of the population was covered by such smoke-free car laws). It reported that the proportion of Californian students self-reporting exposure to smoking in cars in the last seven days declined <1% annually from 2001 through 2005, but declined 12% annually from 2007 to 2011 (ie, after the law in 2007). There was a 37% reduction in the odds of exposure to smoking in cars in 2011 compared with 2001 (OR = 0.63; 95%CI: 0.57–0.70). The national trends (for the US) did not show comparable declines after 2006.
England (2019) <sup>6</sup>	A 23% reduction in SHS exposure for children aged 8–15 years	This study involved interrupted time series logistic or ordinal regression analyses using national survey data, albeit also relying on self-reporting. Compared to pre-legislation, the odds ratio of self-reported exposure to smoking in cars post legislation was 0.77 (95%CI: 0.51–1.17; p=0.222). Exposure in the pre-legislation period (2011–14) was 9.4–12.8%, and post-legislation (2016–17) was 5.0–5.8%. Of note is that we consider that this study (along with the second Canadian one above <sup>4</sup> ), seemed to pay excessive attention to arbitrary indicators of statistical significance—as opposed to commenting on the overall pattern of the results and how they compare to previous studies. That is we agree with the arguments in Amrhein et al <sup>7</sup> which explain the problem of dismissing results as “non-significant” despite them being similar to the findings in other studies.
England (2020) <sup>8</sup>	A 72% relative reduction or a -4.1% absolute reduction in SHS exposure in children aged 13–15 years	This study used logistic regression within a difference-in-differences framework with survey data for three different years for the two jurisdictions of England and Scotland. It found that “among children aged 13–15 years, self-reported levels of regular exposure to smoke in cars for Scotland were 3.4% in 2012, 2.2% in 2014 and 1.3% in 2016 and for England 6.3%, 5.9% and 1.6%.” The ban in England was associated with a -4.1% (95%CI: -4.9% to -3.3%) absolute reduction (72% relative reduction) in exposure to tobacco smoke among children.

### Putting the evidence in context

The findings of this review indicate that smoke-free car legislation was consistently associated with reduced SHS exposure in cars with children/youth in all nine jurisdictions studied. This finding is consistent with other types of evidence, eg, a study in Quebec where smoking in cars with children was lower among smokers who mistakenly believed Quebec had such a law.<sup>9</sup> Similarly, it is consistent with spill-over benefits of reduced smoking/SHS exposure in cars from other smoke-free legislation for public places (eg, in England,<sup>10</sup> in the three other UK jurisdictions,<sup>11</sup> Canada<sup>12</sup> and the US for adopting smoke-free car rules<sup>13</sup>). It is also consistent with international evidence from a Cochrane systematic review on smoke-free legislation being effective in many other settings,<sup>2</sup> and with what is known about the effectiveness of public health laws in general from a major systematic review.<sup>14</sup>

### What evaluation of the upcoming law should New Zealand do?

From a health protection perspective, there appears to be enough real-world evidence for policy-makers to introduce smoke-free car legislation. However, there are still major knowledge gaps. For example, there is a need to evaluate the equity impacts of such laws (eg, the relative size of Māori vs non-Māori benefits in the New Zealand context) and to evaluate the impact of any laws that prohibit vaping in cars. It also seems desirable to determine the value of co-interventions to enhance the law, such as mass media campaigns around the SHS hazard. Finally, evaluation of the impact by level of enforcement, would also provide useful information, as has been argued by others.<sup>15</sup>

New Zealand, with its upcoming law to prohibit smoking in cars with youth (<18 years), is well positioned to do this work. This is because past New Zealand research has refined methods for on-street observing smoking in cars (in these studies:<sup>16-18</sup>) and has an ongoing national annual survey of around 30,000 14-15-year-old school students (Year 10 survey) which collects relevant data (eg, as in a study<sup>19</sup> which considered inequalities by ethnicity and school-based socioeconomic position). Indeed, this survey of school students has been running annually since 1999 and so

it could provide enough time points for a time-series analysis. There are also data from a cohort of adults about self-reported smoking in cars with children from the New Zealand arm of the International Tobacco Control (ITC) Survey, which will allow for repeat cross-sectional, and possibly within-cohort analyses. It is conceivable that a time-series analysis of smoking prevalence among adults in their 20s and 30s (ie, those who are most likely to have young children) from the New Zealand Health Survey might show a differential impact relative to other age-groups. But this is probably unlikely given the law is more likely to result in a change of where smoking occurs (ie, not in vehicles) as opposed to quitting.

Evaluation work using biomarkers (cotinine and nicotine levels) would be more expensive but is also probably justified to verify changes in self-reported exposures and to assess whether total exposure to SHS for children from all sources has decreased (ie, a reduction in SHS exposure from inside vehicles has not been replaced by more smoking in the home, albeit a remote possibility given available international data from other smoke-free laws). The “Growing up in New Zealand” longitudinal study<sup>20</sup> could potentially adopt biomarker assessment of SHS exposure in children in conjunction with other routine assessments.

Such research should ideally be commissioned by the government agency which developed the law: the Ministry of Health. It could be tendered for by relevant university based researchers, consultancies doing research or non-governmental agencies (eg, the organisation ASH runs the Year 10 Survey). Such an approach was taken by the Ministry when it commissioned evaluation work<sup>21</sup> of the new smoke-free environments law implemented in 2004 (covering smoke-free bars and restaurants), including an additional evaluation of the impacts on Māori health.<sup>22</sup> The Ministry has also recently commissioned evaluation work on tobacco taxes.<sup>23</sup> Unfortunately however, the Ministry has failed to evaluate other recent major national tobacco control policy interventions, including: the initial introduction of pictorial health warnings, the point-of-sale display ban for tobacco and (most recently) standardised packs with enhanced pictorial health warnings.

The results from evaluating the new smoke-free cars law would be potentially very useful for New Zealand in refining the design of the law or adjusting the level

of media promotion or enforcement. It would also make a valuable contribution to advancing the knowledge base for international tobacco control.

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**Competing interests:**

Nil.

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