

Support and correlates of support for banning smoking in cars with children: findings from the ITC Four Country Survey*

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Background: Since 2006, banning smoking in cars with children has become a rapidly growing tobacco control policy. However, to date, there have been few studies examining support and correlates of support for car smoking bans, and none of the existing studies have been international in nature. We conducted such a study among smokers in four countries. **Methods:** 6716 adult current smokers from the 2007 Wave of the International Tobacco Control Four Country Survey, a nationally representative, longitudinal cohort telephone survey of smokers in the USA, Canada, UK and Australia. Controlling for demographics, heaviness of smoking, smoking health knowledge/beliefs and quit intentions, we compared support and correlates of support for banning smoking in cars with children across the four countries. **Results:** The majority of smokers supported banning smoking in cars with children. Support was highest in Australia (83%), followed by the UK (75%) and Canada (74%); support was lower—but still high—in the USA (60%). Support was highest among smokers who: had stronger quit intentions, were lighter smokers, had lower education, had no children in the home, believed that cigarette smoke is dangerous to non-smokers and could cause asthma in children, and were concerned about modelling smoking to children. **Conclusions:** These findings indicate that a majority of smokers in the four countries support banning smoking in cars with children, and lend support to banning smoking in cars with children. Additionally, they suggest that support may be increased by educating smokers about the dangers of cigarette smoke exposure.

Keywords: children's health, secondhand smoke, smoke-free policies, smoking in cars, tobacco control

Introduction

Exposure to secondhand smoke (SHS) has been identified as a cause of premature death in non-smoking adults and children.¹ More specifically, childhood exposure to SHS has been linked to an increased risk for sudden infant death syndrome, acute respiratory infections, ear problems and more severe asthma, among other health problems.¹ Children may also be more vulnerable to SHS because they do not have the same abilities to protect themselves from environmental exposures as adults, take in more oxygen relative to their size than adults and because they are undergoing maturation/growth.²

Since 2006, banning smoking in cars with children has become a rapidly growing tobacco control policy, consistent with recent air quality monitoring studies showing that smoking in cars produces dangerous levels of cigarette smoke.^{3–8} The importance of banning smoking in cars with children to protect children from SHS was stressed in a report by the Tobacco Advisory Group of the Royal College of Physicians (UK), recommending that smoking in all cars and vehicles be banned as a measure to reduce the harms of SHS on children.⁹ One longitudinal study by Sly *et al.*¹⁰ also showed

that exposure to SHS in cars led to an increased risk for persistent wheeze in adolescents. As of January 2010, approximately 26 jurisdictions in the USA, Canada and Australia have implemented such a ban, with other jurisdictions, including the UK, considering taking action.¹¹

Research to date has focused on measuring the level of support for these laws. However, no studies have examined support and correlates of support in great detail among nationally representative samples of smokers, and none of the existing studies have been international in nature.^{12–21}

We analysed data from 6716 adult current smokers from the 2007 Wave of the International Tobacco Control (ITC-4) Four Country Survey, a longitudinal cohort survey of smokers in the USA, Canada, the UK and Australia.²² We measured support for banning smoking in cars with children and the degree to which support for bans was related to demographic characteristics, heaviness of smoking, smoking health knowledge/beliefs and intentions to quit smoking. We also examined whether predictors of support differed across the four countries.

We had two primary hypotheses. First, we predicted that support for banning smoking in cars with children would be higher in Australia than the other three countries due to Australia's long history of advocacy campaigns and positive

media coverage for bans.³ Investigation into support for bans in Australia began in 1995, with the world's first survey assessing support for bans, for which 63% of smokers in Sydney gave support.^{3,12}

Second, we predicted that within Australia, support would be higher in South Australia where a ban was in force 3 months before the start of this study (31 May 2007) than the rest of the Australian states where no laws existed. This hypothesis was based on the previous research that suggests that public support for smoke-free laws rises after laws are put into force.^{23,24} This was only examined in Australia, because South Australia was the only jurisdiction of sufficient size for comparability in the four countries that had a ban for the entire survey period. The only other jurisdictions with laws in force for the entire survey period were the states of Arkansas ($n=6$) and Louisiana ($n=9$) in the USA.

Our secondary hypotheses were related to predictors of support for banning smoking in cars with children. First, we predicted that support for bans would be higher among lighter smokers and those who had strong intentions to quit because these smokers would likely find bans less constraining. Second, following research showing the relation between support for smoke-free hospitality venues and the belief that exposure to cigarette smoke can cause lung cancer in non-smokers,²⁵ we predicted that smokers who believe that cigarette smoke is dangerous to non-smokers and is related to asthma in children would be more likely to support bans. It is acknowledged that the scientific literature does not currently support a causal link between SHS exposure and asthma in children. However, the literature does support the notion that exposure to SHS can trigger asthmatic attacks among children with asthma, and increase their risk for severe asthma.¹ Third, because a previous study by Gillespie *et al.*¹⁴ showed that 'setting a good example for children' was one reason why smokers avoided smoking around children, we predicted that smokers who were concerned that smoking around children may lead children to start smoking would be more likely to support bans. Finally, because females in the European Union have been shown to be more likely to support smoke-free public places than males, and less likely to smoke in cars with non-smokers, we hypothesized that females in this four-country study would be more likely, compared with males, to support banning smoking in cars with children.^{26,27} We did not expect to find any differences in predictors of support across countries.

Methods

Respondents

All current smokers (6716) from the 2007 Wave of the ITC-4 were included. The ITC-4 is a nationally representative, random-digit dial, longitudinal cohort survey of adult (≥ 18 years) smokers that began in 2002. Further details on survey methodology can be found in Thompson *et al.*²⁸ Surveying for the 2007 Wave conducted between September 2007 and February 2008, with a response rate of 23.3% and a cooperation rate of 77%. Response rates were calculated using American Association for Public Opinion Research (AAPOR) RR4 2.30. Cooperation rates were calculated using AAPOR COOP4. A current smoker was defined as someone who had smoked at least 100 cigarettes in their lifetime, was currently smoking, and was not in the process of quitting. The final unweighted sample sizes were 1684 smokers from the USA, 1682 from Canada, 1590 from the UK and 1760 from Australia. Characteristics of respondents can be found in column 1 of table 1. Frequencies shown in tables are weighted.

Measures

Support for banning smoking in cars with children

We asked: 'Would you support a law that banned smoking in cars when children are in them?' Response options were 'yes' or 'no'. We asked about support for a law with 'children' in a general sense, rather than with children of a defined age because asking about a specific age would have limited the generality of our findings. For example, if we had asked about support for banning smoking in cars with children ≤ 5 years of age, it would be difficult to use the data to help policy makers pass laws to protect older children. Moreover, our goal was to assess support for the concept of banning smoking in cars with children, rather than to take a stance on the age ranges that might be adopted by governments.

Demographics

Data on respondents' sex, age, race/ethnicity, income and education were collected. Respondents' ethnicity was measured using the procedures from each country's census. In the USA, Canada and the UK, we defined majority as white, and minority as non-white. In Australia, we defined minority as language other than English spoken in the home.

For respondents in the USA, Canada and Australia, annual household income was categorized as: low = under \$30 000, moderate = \$30 000–\$59 999 and high = \$60 000 or higher. For respondents in the UK, income was categorized as: low = less than £30 000, moderate = £30 000–£44 999 and high = £45 000 or higher. Respondents who refused to give their income were put into a 'no answer' category.

We categorized education into three categories: low = high school or less, medium = technical, trade school or community college (some or completed), or some university, and high = at least a university degree. We also asked respondents if any children under the age of 18 lived in their household.

Heaviness of Smoking Index

Heaviness of Smoking Index (HSI)²⁹ is a 7-category variable that measures nicotine dependence. HSI was created by summing: cigarettes per day (0 = 0–10, 1 = 11–20, 2 = 21–30, 3 = ≥ 31), and minutes to first cigarette after waking (0 = 5 or less, 1 = 6–30, 2 = 31–60, 3 = ≥ 61).

Smoking health knowledge/beliefs

We measured smoking health knowledge/beliefs for three key relevant topics. See table 1 for response options and coding. To measure knowledge that SHS causes asthma in children, we asked, 'based on what you know or believe, does smoking cause asthma in children from SHS smoke?' To measure if smokers are concerned about modelling smoking to children, we asked, 'you worry that your smoking will influence the children around you to start or continue smoking.' To measure knowledge that SHS is dangerous to non-smokers, we asked 'is cigarette smoke is dangerous to non-smokers.'

Intentions to quit

We asked respondents if they had plans to quit smoking in the next 30 days, the next 6 months, sometime beyond 6 months or if they had no plans at all to quit.

Statistical analysis and missing data

SAS 9.1 was used to conduct all statistical analyses. The SAS PROC SURVEY LOGISTIC procedure was used to conduct all logistic regression analyses. All variables were classified as

Table 1 Predictors of support for a law to ban smoking in cars with children among smokers in the USA, Australia, Canada and the UK (N=6232)^{a,b}

Variable	n (%)	Support (%)	OR (95% CI)	P-value
Country				
USA	1427 (23)	59	1.00 (ref.)	ref.
Canada	1622 (26)	74	1.93 (1.57–2.36)	<0.0001
UK	1608 (26)	75	2.51 (2.02–3.12)	<0.0001
Australia	1575 (25)	82	3.66 (2.93–4.58)	<0.0001
Sex				
Female	2921 (47)	75	1.00 (ref.)	ref.
Male	3311 (53)	71	0.89 (0.77–1.04)	0.14
Age (years)				
18–24	770 (12)	80	1.00 (ref.)	ref.
25–39	2075 (33)	75	0.84 (0.60–1.18)	0.31
40–54	2167 (35)	70	0.88 (0.63–1.21)	0.42
≥55	1220 (20)	70	1.05 (0.74–1.50)	0.77
Ethnicity				
White	5523 (89)	72	1.00 (ref.)	ref.
Non-white	709 (11)	77	1.42 (1.10–1.83)	0.007
Education				
Low	3130 (50)	74	1.00 (ref.)	ref.
Moderate	2018 (32)	72	0.84 (0.71–0.99)	0.05
High	1084 (18)	71	0.79 (0.64–0.98)	0.03
Income				
Low	1623 (27)	71	1.00 (ref.)	ref.
Moderate	2076 (33)	74	1.09 (0.90–1.33)	0.37
High	2132 (34)	74	1.05 (0.85–1.28)	0.68
No answer	401 (6)	69	0.83 (0.62–1.13)	0.24
Children under 18 in home^c				
Yes	2532 (41)	73	1.00 (ref.)	ref.
No	3700 (59)	73	1.24 (1.04–1.48)	0.02
Intentions to quit				
Not planning to quit	1779 (29)	63	1.00 (ref.)	ref.
Beyond 6 months	2335 (37)	74	1.28 (1.05–1.54)	0.01
In the next 6 months	1352 (22)	78	1.41 (1.14–1.74)	0.001
In the next 30 days	691 (11)	82	1.80 (1.36–2.38)	<0.0001
Do not know	75 (1)	80	1.80 (0.95–3.42)	0.08
Heaviness of Smoking Index				
6—high dependence	761 (12)	59	1.00 (ref.)	ref.
5	718 (12)	63	0.91 (0.63–1.51)	0.97
4	1190 (19)	66	1.14 (0.76–1.71)	0.51
3	1721 (28)	73	1.37 (0.93–2.03)	0.11
2	1141 (18)	78	1.76 (1.17–2.66)	0.007
1	513 (8)	78	1.75 (1.12–2.72)	0.01
0—low dependence	188 (3)	81	1.90 (1.22–2.97)	0.005
Believe cigarette smoke is dangerous to non-smokers				
Strongly disagree, disagree or neither agree or disagree	1096 (18)	48	1.00 (ref.)	ref.
Strongly agree or agree	5065 (81)	78	2.57 (2.13–3.11)	<0.0001
Do not know	71 (1)	68	2.01 (1.09–3.71)	0.02
Knowledge that exposure to cigarette smoke is related to asthma in children				
No	971 (15)	51	1.00 (ref.)	ref.
Yes	4913 (79)	78	2.01 (1.65–2.47)	<0.0001
Do not know	348 (6)	68	1.60 (1.14–2.23)	0.006
Concern for modelling smoking to children				
Strongly disagree, disagree or neither agree nor disagree	2144 (35)	62	1.00 (ref.)	ref.
Strongly agree or agree	4002 (64)	79	1.81 (1.53–2.12)	<0.0001
Do not know	88 (1)	74	1.27 (0.73–2.16)	0.37

a: First category listed is the reference

b: All sample sizes and frequencies are weighted

c: Although the percentage levels of support for those with and without children did not differ, the adjusted analysis showed that those without children were more likely to support bans than those with children

OR, Odds ratio; 95% CI, 95% confidence interval

categorical. The SAS PROC SURVEYFREQ procedure was used to calculate weighted frequency data. All analyses were adjusted for demographic characteristics, HSI, smoking health knowledge/beliefs and quit intentions. In cases where the distribution of categorical variables was examined, we used the Rao–Scott modified χ^2 -test.

All analyses and frequency lists use data weighted on age, sex and region (sample sizes listed in text are unweighted). For analytic purposes, the weights were rescaled to sum to national sample sizes. Interactions were tested in logistic regression using the method described by Jaccard.³⁰ Respondents with missing data or who offered refusals

or 'don't know' responses were excluded from the analyses; this resulted in the deletion of 171 cases. However, in cases where number of 'don't know' responses reached a significant level, and/or the response 'don't know' had theoretical significance (health knowledge), don't know responses were retained.

Of the 171 cases of missing data, 90 were deleted because respondents gave a non-applicable response when asked if they would support banning smoking in cars with children.

Results

Support for banning smoking in cars with children

In the overall sample ($N=6716$), support was highest among smokers in Australia (83%), followed by smokers in the UK (75%) and Canada (74%); support was lower—but still high—among smokers in the USA (60%). All between-country comparisons were statistically significant at the $P=0.05$ level when adjusted for demographics, HSI, smoking health knowledge/beliefs and quit intentions.

Comparing support across Australian states

Support ranged from 94% in South Australia to 78% in Queensland. Results are presented in table 2. To examine if support was significantly higher in South Australia (the only Australian state that had a law in place at the time of the survey) than the rest of Australia, we ran a logistic regression analysis adjusting for demographics, HSI, smoking health knowledge/beliefs and quit intentions. Smokers in South Australia were significantly more likely to support bans than smokers from Queensland, New South Wales and Victoria.

We then ran a second analysis to compare support in South Australia to support in all other states combined. This analysis found that smokers in South Australia were 3.19 times more likely to support bans than respondents from all other states ($P=0.01$; 95% CI = 1.30–7.85).

Predictors of support across the four countries

Smokers from the states of South Australia and Tasmania in Australia, and the states of Arkansas, Louisiana and California in the USA were excluded ($n=499$) from this analysis, because they enacted laws banning smoking in cars with children before, or during the surveying period. We excluded them because we wanted to examine predictors of support in jurisdictions with no bans at the time of the survey. Adjusting for demographics, HSI, smoking health knowledge/beliefs and quit intentions, we found that smokers who were most likely to support bans: lived in Australia, were from a minority

group, had lower education, had no children <18 years of age in the home, had stronger intentions to quit, were lighter smokers, believed cigarette smoke was dangerous to non-smokers, believed that cigarette smoke could cause asthma in children and had a concern for modelling smoking to children. Results are presented in table 1. Country support percentages listed in table 1 differ from percentages listed elsewhere because they exclude respondents who lived in jurisdictions that had laws banning smoking in cars with children.

Differences in support for respondents with and without children

Because we unexpectedly found that respondents without children in the home were more likely to support bans in the adjusted logistic regression analysis (see above), we examined support for bans by age of oldest child in the home. Data for two respondents was deleted due to missing data on children's ages. Using the Rao–Scott χ^2 -test, we found that support for bans was significantly higher among respondents with younger compared with older children, 83% (5 years or younger, $n=602$) vs. 70% (6–17 years, $n=1928$), $\chi^2(1, N=2530)=22.46$, $P<0.0001$, significantly higher among respondents with younger (83%) compared with respondents with no children (73%), $\chi^2(1, N=4302)=17.68$, $P<0.0001$, and not different between respondents with older (70%) compared with respondents with no children (73%), $\chi^2(1, N=5628)=2.09$, $P=0.15$.

Sex and ethnicity differences in predictors of support

Although females were not generally more likely to support bans ($P=0.14$), we found a significant sex by country interaction ($P=0.01$), and a significant sex by ethnicity interaction ($P=0.05$). In the UK, females (80%) were significantly more likely than males (70%) to support bans, OR = 1.62 ($P=0.002$, 95% CI = 1.20–2.18). Sex as a predictor of support did not significantly differ across the other three countries at the $P=0.05$ level for each of the comparisons. Percentage levels of support for males vs. females were: Australia (83% vs. 81%), Canada (73% vs. 75%) and the US (57% vs. 61%). For ethnicity, we found that minority males (75%) were significantly more likely to support bans than majority males (70%), OR = 1.71 ($P=0.002$, 95% CI = 1.22–2.40), whereas minority females (77%) were just as likely to support bans as majority females, (78%), OR = 1.05 ($P=0.80$).

Country differences in predictors of support

With the exception of the sex difference mentioned above, no significant differences were found in predictors of support across the four countries. The country by concern for modelling smoking interaction did show significance, $P=0.005$. However, we were unable to examine the interaction because of the low number of respondents ($n=88$) in the 'don't know' category. To address this issue, we excluded the respondents who replied 'don't know' on the modelling concern question, and discovered that the interaction without these respondents was not significant, $P=0.65$.

Discussion

The majority of current adult smokers in the USA, Canada, the UK and Australia support banning smoking in cars with children. Consistent with our first hypothesis, support was highest in Australia—over 80% supported such a ban. Studies examining data from the 2002 ITC-4 Survey similarly

Table 2 Support for a law to ban smoking in cars with children among smokers in Australia ($N=1745$)^{a,b}

Australian state	n (%)	Support (%)	OR (95% CI)	P-value
South Australia	124 (7)	94	1.00 (ref.)	ref.
Western Australia	164 (9)	88	0.49 (0.17–1.37)	0.17
Tasmania	46 (3)	87	0.56 (0.14–1.73)	0.39
Victoria	425 (24)	84	0.35 (0.14–0.89)	0.03
New South Wales	548 (31)	82	0.30 (0.12–0.76)	0.01
Australian Capital Territory	29 (2)	82	0.25 (0.05–1.26)	0.10
Northern Territory	27 (2)	81	0.34 (0.06–1.81)	0.21
Queensland	382 (22)	78	0.25 (0.10–0.63)	0.004
Overall	1745 (100)	83		

a: First category listed is the reference

b: All sample sizes and frequencies are weighted

found that being from Australia predicted support for smoke-free policies, and having a smoke-free home.^{25,31}

Consistent with our second hypothesis, we found that support for bans was significantly higher in South Australia (the only Australian state that had a ban) than the rest of Australia. This conceptually replicates the findings of previous studies showing that after smoke-free legislation is introduced, support for smoke-free legislation is likely to rise.^{23,24}

When we examined our hypotheses related to predictors of support, we found that smokers who had stronger intentions to quit smoking and who were lighter smokers were most likely to support banning smoking in cars with children. These findings are not surprising as lighter smokers with intentions to quit are likely to find the laws less constraining, and possibly helpful in quitting. A 2002 study using Wave 1 of the ITC-4 Survey similarly found that lighter smokers were more likely to have smoke-free homes.³¹

As predicted, we found that smokers who were concerned about modelling smoking to children were more likely to support bans. Also as predicted, smokers who believed that cigarette smoke was dangerous to non-smokers, and could cause asthma in children were more likely to support bans. These findings reinforce the importance of educating the public about the dangers of cigarette smoke exposure. Although we expected to find that females would be more likely to support bans than males across the four countries, we found that it was only in the UK that females were more supportive of bans than males.

We found unexpected differences in support by ethnicity, education and by whether or not respondents had a child in their home in the adjusted analysis. Ethnic differences in support among males may be due to the fact that certain minority group members have been found to be more likely to implement car and home smoking bans than majority group members.^{17,32} It was unclear why smokers with lower education were more likely to support bans, one possible reason could be differences in car ownership. Although we found higher support among respondents with no children in the home in the adjusted analysis, we found that when we examined support among respondents by age of children in the home that support was higher among respondents with younger compared with no children/older children, and, that support was not significantly different between respondents with older compared with no children. These findings showing the highest levels of support for banning smoking in cars with children among respondents with younger children are consistent with previous findings using the ITC-4 sample that show that respondents with young children are more likely to have smoke-free homes.³¹

Limitations

These analyses were conducted on cross-sectional data, and thus we cannot conclude that it is the case that support for banning smoking in cars with children rises after laws are put into force. However, ITC studies using longitudinal data have shown that support for smoke-free legislation goes up after laws are put into place.^{23,24} There are also likely other important predictors of support for bans that we were unable to explore, for example, car ownership, duration of car trips and support for government intervention in general.

Future directions and research

Future studies should evaluate if bans on smoking in cars with children reduce reports of smoking in cars with children, children's biological exposure to cigarette smoke and smoking in cars with non-smokers. Information is also

needed for policymakers on how bans are being implemented and enforced, and what tactics may be most effective to ensure compliance.

Conclusion

Overall, this study shows that the majority of smokers in the four countries approve of banning smoking in cars with children. These results lend support to the introduction of such bans to protect children from the dangers of cigarette smoke exposure in cars.

The majority of provinces and states in Canada and Australia have now passed laws banning smoking in cars with children. The high level of support for banning smoking in cars with children in the UK (similar to the level of support in Canada at the time of surveying), suggests that bans could be successfully passed in the UK as they have in Canada.

Furthermore, as jurisdictions implement bans they may consider promoting the reasons for banning smoking in cars with children to smokers who are the least likely to support them. Finally, as research on support and correlates of support for banning smoking in cars with children does not exist outside of the four countries studied here, these findings may help other jurisdictions move forward as they consider implementing bans.

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Conflicts of interest: None declared.

Key points

- This is the first international study to examine and compare levels of support and correlates of support for laws to ban smoking in cars with children.
- Support for banning smoking cars with children is highest in Australia (83%), followed by the UK (75%) and Canada (74%); support is lower—but still high—in the USA (60%).
- Correlates of support were universal across the four countries, with the exception of sex in the UK.
- These findings will be of interest to policymakers internationally as laws to ban smoking in cars with children are becoming an increasingly popular form of smoke-free legislation.

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