

Mass media campaigns designed to support new pictorial health warnings on cigarette packets: evidence of a complementary relationship

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ABSTRACT

Background In Australia, introduction of pictorial health warnings on cigarette packets was supported by a televised media campaign highlighting illnesses featured in two of the warning labels—gangrene and mouth cancer.

Methods Two studies examined whether the warnings and the television advertisements complemented one another. Population telephone surveys of two cross-sections of adult smokers measured changes in top-of-mind awareness of smoking-related health effects from before (2005; n=587) to after the pack warnings were introduced (2006; n=583). A second study assessed cognitive and emotional responses and intentions to quit after smokers watched one of the campaign advertisements, comparing outcomes of those with and without prior pack warning exposure.

Results Between 2005 and 2006, the proportion of smokers aware that gangrene is caused by smoking increased by 11.2 percentage points (OR=23.47, p=0.000), and awareness of the link between smoking and mouth cancer increased by 6.6 percentage points (OR=2.00, p=0.006). In contrast, awareness of throat cancer decreased by 4.3 percentage points, and this illness was mentioned in the pack warnings but not the advertisements. In multivariate analyses, smokers who had prior exposure to the warnings were significantly more likely to report positive responses to the advertisements and stronger post-exposure quitting intentions.

Conclusions Television advertisements and pictorial health warnings on cigarette packets may operate in a complementary manner to positively influence awareness of the health consequences of smoking and motivation to quit. Jurisdictions implementing pictorial warnings should consider the benefits of supportive mass media campaigns to increase the depth, meaning and personal relevance of the warnings.

INTRODUCTION

Televised mass media campaigns can reduce smoking prevalence by curbing uptake and encouraging adult cessation.^{1–2} There is also increasing evidence that warning labels on cigarette packets improve awareness of the health effects of smoking,^{3–4} encourage adult smokers to quit^{4–8} and reduce adolescents' intentions to begin smoking,^{9–10} and that health warnings that contain a picture or image elicit more positive responses than do text-only warnings.^{3–5–7–11–15} In 2006 the Australian Government implemented legislation mandating that pictorial health warnings were to replace the

previous black and white text warnings on all cigarette packets imported and manufactured for retail sale in Australia.^{16–17} In the same year, a group of eight Australian anti-tobacco organisations produced and aired two new television advertisements that were explicitly linked to two of the pack warnings. These advertisements—*Amputation*¹⁸ and *Mouth Cancer Talks*¹⁹—expanded on the health information provided in the warnings, and sought to add depth, meaning and personal relevance to the pictorial warnings. Given that Australia was the first country to implement pictorial warnings in conjunction with a supportive mass media campaign, the aim of this paper is to examine whether the pack warnings and the television campaign may have operated in a complementary manner to enhance adult smokers' knowledge about the health effects of smoking and to increase their motivation to quit.

Australia's pictorial pack warnings occupy 30% of the front and 90% of the back of the pack. They combine graphic images depicting the health effects of smoking with detailed explanatory messages and the number for the quitline. The 14 different warnings are divided into two sets of seven (Series A and Series B), which are rotated annually with an intermediate transition period in which any may appear. Series A warnings were mandated to appear on all tobacco products imported and manufactured for retail sale in Australia from 1 March 2006, and the Series B warnings entered circulation at the beginning of the transition period on 1 November 2006.^{16–20–21}

Based on exploratory focus testing with smokers, which indicated that the images in two of the Series A warnings—'Smoking causes peripheral vascular disease' and 'Smoking causes mouth and throat cancer'—were particularly powerful, the complementary mass media campaign was specifically designed to increase the salience of these two warnings. The *Amputation*¹⁸ advertisement depicted a smoker about to have his gangrenous leg amputated. The final scene cut from an image of the surgeon in the advertisement to the image of the gangrenous foot on the pack warning, thereby explicitly linking the advertisement with the 'Smoking causes peripheral vascular disease' warning. *Mouth Cancer Talks*¹⁹ highlighted information from the 'Smoking causes mouth and throat cancer' pack warning. It began with a close-up of the image of mouth cancer on the pack, and then the camera zoomed out to reveal a woman with mouth cancer telling the viewer how smoking caused her cancer. This warning also featured in

a television advertisement aired in February and March 2006 by the Australian Government, which notified the public that images of the health effects of smoking, such as mouth cancer, would begin appearing on cigarette packets to make smokers more aware of the health impact of smoking.²² In addition, in February 2006 an advertisement was aired in the state of Victoria, Australia, which highlighted the link between smoking and emphysema. The *Bubblewrap*²³ advertisement depicted a piece of bubblewrap cut in the shape of two lungs and a trachea, which was slowly being popped by a lit cigarette. A voiceover explained that 'lungs are made up of millions of tiny air sacs...chemicals in tobacco smoke destroy them. It's called emphysema and it's irreversible'. While focusing on emphysema, this advertisement was not linked to the pack warning which highlighted the link between smoking and emphysema, and it had previously been aired in Victoria in 2005.

Two studies were conducted in Australia in 2005 and 2006 to evaluate the impact of the new pictorial warnings and the television advertisements. The first study uses data from an annual population telephone survey conducted in Victoria, Australia. Measuring knowledge about the health effects of smoking before and after the Series A warnings were introduced, these data allowed an examination of the impact of the warnings and the advertisements on knowledge about illnesses caused by smoking. The second study, which evaluated the *Amputation* and *Mouth Cancer Talks* advertisements, allowed us to explore whether exposure to the pack warnings influenced the effectiveness of the ads. We anticipated that those smokers who had been exposed to the warnings prior to watching the ads would be more likely to report positive cognitive and emotional advertisement responses and changes in their intentions to quit.

METHODS

Study 1: Population survey

Procedure and measures

Two telephone surveys of a cross-section of randomly sampled Victorian adults (18 years and older) were conducted in November and December of 2005 (n=2999) and 2006 (n=2996). Data were collected by a commissioned market research company through a series of eight-minute to 16-minute interviews (response rate 54% in 2005; 43% in 2006). To assess knowledge about the health effects of smoking, respondents were initially asked if they believed that there are any illnesses caused by smoking. Those who agreed that there are some smoking-caused illnesses were then asked 'Which illnesses do you think are caused by smoking?' Respondents were able to name as many or as few illnesses as they could think of. Illnesses identified through this spontaneous recall question indicate the health information that is likely to be most saliently available, or top-of-mind, to smokers when they are making decisions about their smoking behaviour.²⁴

Demographic and smoking status characteristics were also measured. Socioeconomic status (SES) was measured using the Australian Bureau of Statistics' Index of Socio-Economic Disadvantage, using census data of the postcode area in which respondents resided.²⁵ This index ranks postcode areas on a continuum of high disadvantage to low disadvantage, taking into consideration factors that influence the level of socioeconomic disadvantage in the area. Respondents were categorised into three groups based on this scale. The high disadvantage group comprises people who lived in areas with disadvantage scores in the bottom 40% of the distribution of Victorian postcode areas; the moderate disadvantage group comprises those

who lived in areas whose disadvantage score lies between 41% and 80% of the distribution; and the low disadvantage group comprises those who lived in areas whose disadvantage score was above 80% of the distribution. Respondents also reported their age (18–29, 30–49 or 50+ years), their highest level of education and the average number of cigarettes smoked daily (10 or fewer, 11–20 or more than 20). Intentions to quit were measured using two standard smoking stage-of-change questions assessing plans to quit smoking within the next six months and the next 30 days. In accordance with established guidelines,²⁶ respondents were assigned to either the precontemplation (not intending to quit within the next six months), contemplation (considering quitting within the next six months but not within the next 30 days) or preparation (intending to quit within the next 30 days) stage-of-change.

Statistical analysis

A series of logistic regression analyses assessed whether the proportion of smokers who spontaneously recalled each illness increased or decreased between 2005 and 2006. In each of these models (a separate model for each illness), the year of survey was entered as a predictor variable, along with demographic covariates, smoking status and stage-of-change.

Study 2: "Natural Exposure" advertising evaluation

Procedure and measures

The *Amputation* and *Mouth Cancer Talks* advertisements were evaluated using the "Natural Exposure" advertising research methodology, in which a convenience sample of adult smokers in the Australian states of Victoria, Queensland, South Australia and Tasmania were unexpectedly exposed to an advertisement in their home viewing environment while watching a television programme that they usually watch.²⁷ Samples were recruited to reflect the target population of mass media campaigns in Australia, which is the demographic subgroup with the highest smoking prevalence (18–44 year olds of lower SES), and two separate samples were used to evaluate the *Amputation* and *Mouth Cancer Talks* advertisements. Consistent with the launch of each campaign, the "Natural Exposure" evaluation of *Amputation* occurred in May 2006, while the *Mouth Cancer Talks* evaluation was conducted in July 2006. Both of the studies began with a pre-exposure survey during which eligible respondents were recruited to watch a television programme in which the advertisement was scheduled to appear. Respondents were then recontacted within three days of the scheduled viewing session, and their potential exposure to, recall of and responses to the advertisement was assessed during this post-exposure survey. A detailed description of this methodology has been published elsewhere.^{27–29}

Advertisement recall and exposure to pack warnings

Respondents recalled the advertisement in one of three ways: first they were asked which advertisements they recalled seeing during the programme (spontaneous recall); those who did not recall the advertisement were then prompted as to whether they had seen an advertisement about the dangers of smoking (aided recall); and finally, the advertisement was described in full and respondents were asked if they remembered seeing it (recognition). An audit of the rollout of pictorial warnings indicated that it took several months for saturation of the Series A warnings to occur.^{4 30} When *Amputation* was aired at the beginning of May 2006, less than one-third of the eight most popular cigarette brands carried the new pictorial warnings, and by the time *Mouth Cancer Talks* was aired at the end of July 2006, 80% of

packets carried the pictorial warnings.⁴ Therefore, it is likely that some smokers had not been exposed to the pack warnings when they first saw the complementary advertisements, and so respondents were also asked how often they had read or looked closely at the new pictorial health warnings within the past two months (never; rarely; sometimes; often; very often).

Advertising response and exposure context measures

Three items measured acceptance of the advertisement (understanding, believability and relevance), and four items measured initial cognitive and emotional responses ('ad made me...stop and think; feel uncomfortable; feel concerned about my smoking; feel motivated to quit'). The proportion of respondents who agreed (strongly or somewhat) with each item is reported. We also measured three subsequent responses to the advertisement: recurring thoughts and images about the ad; interpersonal discussion; and changes in intentions to quit. Intentions were measured during both the pre-exposure and post-exposure surveys using two standard stage-of-change questions (as described in Study 1). Respondents also reported the total number of hours spent watching television on an average weekday, whether they had seen the advertisement more than once and whether anyone else was present when they first saw it. Age, SES and cigarette consumption were measured as in Study 1.

Statistical analysis

Multivariate logistic regressions examined whether pack warning exposure was associated with the likelihood of experiencing each of the advertising responses, adjusting for which

advertisement was viewed; demographic characteristics; cigarette consumption; pre-exposure stage-of-change; multiple advertisement exposures; and type of recall. In our examination of the impact of pack warning exposure on quitting intentions, we predicted the likelihood that smokers at post-exposure were in each of the three stages-of-change using three separate logistic regression models that each adjusted for intentions at pre-exposure (and the other covariates).

RESULTS

Study 1: Population survey

Analytical sample

Data from each year were weighted by age and sex according to the Australian Bureau of Statistics' census data for the Victorian population in 2006,³¹ to adjust for an over-representation of women and older people in the survey samples. Respondents who indicated that they currently smoked daily, weekly or less than weekly³² comprised the analytical sample (n=587 in 2005; n=583 in 2006). Sample characteristics are presented in table 1.

Spontaneous recall of smoking-related illnesses

For each of nine smoking-related illnesses featured in the pictorial health warnings, table 2 presents the proportion of current smokers who spontaneously recalled the illness in 2005 and 2006. The 2005 survey, conducted in November and December of that year, indicates knowledge levels approximately three months before the pictorial warnings were introduced. The 2006 data demonstrate knowledge levels at a time when more than 90% of cigarette packets carried one of the

Table 1 Demographic characteristics of participants in the 2005 and 2006 Population surveys (Study 1) and the "Natural Exposure" advertising evaluation study (Study 2)

Sample characteristics	Study 1 population survey*		Study 2 "Natural Exposure" advertising evaluation†		
	2005 (n=587) (%)	2006 (n=583) (%)	Total sample (n=448) (%)	Exposed to pack warnings (n=279) (%)	Not exposed to pack warnings (n=169) (%)
Sex					
Male	53.8	54.0	36.2	34.4	39.1
Female	46.2	46.0	63.8	65.6	60.9
Age					
18–29 years	30.8	32.4	7.6	9.0	5.3
30–49 years	45.4	44.6	56.3	59.5	50.9
50+ years	23.8	23.0	36.2	31.5	43.8
Highest level of education					
Not finished secondary	32.2	29.6	NA	NA	NA
Finished secondary/some tertiary	42.0	41.8	NA	NA	NA
Finished tertiary	25.4	28.4	NA	NA	NA
Socioeconomic status					
High disadvantage	39.1	36.0	51.3	52.0	50.3
Moderate disadvantage	43.4	43.1	33.3	33.7	32.5
Low disadvantage	17.5	20.9	15.4	14.3	17.2
Daily cigarette consumption‡					
Low (≤10 cigs per day)	45.7	49.0	28.8	31.2	24.9
Medium (11–20 cigs per day)	30.0	26.3	47.8	49.1	45.6
High (≥21 cigs per day)	14.6	14.4	23.4	19.7	29.6
Stage-of-change					
Precontemplator	60.3	60.4	38.8	33.3	47.9
Contemplator	24.2	21.6	40.4	43.7	34.9
Preparer	15.5	18.0	20.8	22.9	17.2

*Weighted by age and sex according to census data for the Victorian population in 2006.

†In this study, respondents were recruited to reflect the target audience of anti-smoking campaigns in Australia, which is the demographic subgroup with the highest prevalence of smoking (18–44-year-olds who are of lower socioeconomic status).

‡In 2005, daily cigarette consumption data were missing for 57 (9.7%) respondents. In 2006, data were missing for 60 (10.3%) respondents.

Note. Because of rounding, percentages may not add up to 100. Data about respondents' highest level of education were not readily available for the "Natural Exposure" advertising evaluation study.

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Table 2 Changes in the proportion of current smokers who spontaneously recalled each of illnesses featured in the Series A and Series B pack warnings between 2005 and 2006

Smoking-related illness	Inclusion in previous text warnings	Pictorial pack warning launch date	Mass media campaign launch date	Level of spontaneous recall		Change in level of spontaneous recall		
				Nov/Dec 2005 (n=587) (%)	Nov/Dec 2006 (n=583) (%)	% Point changes	Adjusted OR* 95% CI	p Value
Series A warnings								
Emphysema	No	1 Mar 2006	26 February 2006	34.8	42.9	8.1	1.47 (1.12 to 1.96)	0.006
Gangrene	No	1 Mar 2006	7 May 2006	0.5	11.7	11.2	23.47 (6.49 to 84.93)	0.000
Mouth/oral cancer	No	1 Mar 2006	23 July 2006†	5.2	11.8	6.6	2.00 (1.22 to 3.27)	0.006
Throat cancer	No	1 Mar 2006	None†	14.9	10.6	-4.3	0.75 (0.50 to 1.14)	0.176
Series B warnings								
Lung cancer	Yes	1 Nov 2006	None	54.3	41.4	-12.9	0.57 (0.44 to 0.75)	0.000
Heart disease/attack	Yes	1 Nov 2006	None	34.3	29.6	-4.7	0.89 (0.67 to 1.19)	0.433
Stroke/vascular disease	No	1 Nov 2006	None	8.6	7.6	-1.0	0.88 (0.55 to 1.42)	0.594
Eye problems	No	1 Nov 2006	None	7.1	3.2	-3.9	0.38 (0.21 to 0.68)	0.001
Pregnancy complications	Yes	1 Nov 2006	None	0.5	0.3	-0.2	0.64 (0.07 to 6.22)	0.700

*In each logistic regression model, 2005 served as the reference value.

†The 'Smoking causes mouth and throat cancer' pack warning also appeared in an information television advertisement that was aired in February and March 2006, which notified the public that images of the health effects of smoking, such as mouth cancer, would soon begin appearing on cigarette packets.

Note. All logistic regression models adjusted for the covariates: education level; socioeconomic status; daily, weekly or less than weekly smoking; daily cigarette consumption; and stage-of-change. In additional analyses, all models were replicated limiting the sample to daily smokers only. However, as these restricted models were not substantially different, we have presented the results for all current smokers.

Series A warnings, and these warnings had been reasonably prevalent on packs for around four months.^{4 30} In contrast, Series B warnings appeared on less than 5% of packs at the time of the 2006 survey.³⁰ In the months prior to the 2006 survey, *Amputation* and *Mouth Cancer Talks* had been on air in Victoria with a total media weight of around 1200 gross rating points (GRPs) for the six months between May and October (see Wakefield *et al* for further information about GRPs),³³ and the *Bubblewrap* advertisement aired in February and March 2006 with a total weight of 244 GRPs. Table 2 also indicates whether each specific illness was mentioned in the text-only warnings that preceded the pictorial warnings,¹⁷ and it shows launch dates for the pictorial warnings and for any mass media campaigns featuring the illness.

As shown in table 2, between 2005 and 2006 there were significant increases in the proportion of smokers who demonstrated top-of-mind awareness of the link between smoking and emphysema, gangrene and mouth/oral cancer. In comparison, top-of-mind awareness of the illnesses featured in the Series B warnings tended to decrease.

Study 2: "Natural Exposure" advertising evaluation

Analytical sample

Of those current smokers recruited to evaluate *Amputation*, 62.4% watched the programme and at least some of the advertisement breaks and so were potentially exposed to the ad, and of those recruited to evaluate *Mouth Cancer Talks*, 71.8% were potentially exposed. χ^2 analyses examined differences in the characteristics of respondents who recalled the two advertisements, to determine if the two independent samples were similar enough to be combined. Consistent with the slow rollout of the new pictorial warnings,^{4 30} a greater proportion of respondents who watched *Mouth Cancer Talks* in late July reported exposure to the warnings compared with those who watched *Amputation* in early May (70.3% compared with 55.7%; χ^2 (1, n=448) = 10.1, p=0.002). However, as the two samples did not differ significantly in their demographic composition (sex p=0.327; age p=0.228; SES p=0.311), cigarette consumption (p=0.471), pre-exposure stage-of-change (p=0.316) or type of advertisement recall (p=0.523), they were deemed sufficiently similar to be combined for further analyses. Therefore, the

analytical sample comprised 448 current smokers (of 515 potentially exposed) who recalled one of the ads spontaneously (18.1%), in a semi-prompted manner (48.0%), or through recognition (33.9%). Of these 448 respondents, 18.3% (n=82) indicated that they had never seen the pictorial pack warnings, 19.4% (n=87) had seen them only rarely, 17.9% (n=80) sometimes, 16.7% (n=75) often and 27.7% (n=124) had seen them very often. Based on a preliminary examination of the way in which respondents in each exposure category responded to the advertisements, we separated respondents into those who had been exposed to the pack warnings at least sometimes (62.3%; n=279) and those who had been exposed rarely or never (37.7%; n=169). Characteristics of these two groups are presented in table 1, and a second set of χ^2 analyses tested for differences between smokers in each category (table 1). Notably, precontemplators were over-represented among those respondents who reported not being exposed to the warnings (47.9% not exposed, compared to 33.3% exposed; χ^2 (2, n=448) = 9.49, p=0.009). Influence of exposure to graphic health warnings on responses to anti-smoking television advertisements.

As demonstrated in table 3, compared with those who had not been exposed to the warnings in the 2 months prior to advertisement exposure, smokers who had been exposed were significantly more likely to report that they believed the ad and found it relevant; that the advertisement made them stop and think, feel concerned about their smoking, feel uncomfortable, feel motivated to try to quit and made them experience recurring thoughts and images about the advertisement. After adjusting for pre-exposure stage-of-change, those who had been exposed were significantly less likely to be in the precontemplation stage and significantly more likely to be in the preparation stage at post-exposure, indicating significant forward movement in intentions to quit (table 3).

DISCUSSION

Evidence from two studies indicate that pictorial health warnings on cigarette packets and the televised mass media campaigns that supported their introduction may have worked in a complementary manner, whereby the advertisements enhanced the impact of the warnings on knowledge about the health effects of smoking, and exposure to the warnings

Table 3 Responses to anti-smoking television advertisements among those who had and had not been exposed to pictorial health warnings on cigarette packets

	Exposed to pack warnings (n=279)	Not exposed to pack warnings (n=169)	Adjusted OR* 95% CI	p Value
Message acceptance	% Agreed	% Agreed		
Understood	95.0	89.9	1.92 (0.87 to 4.25)	0.109
Believed	77.1	63.3	1.96 (1.25 to 3.08)	0.003
Relevant	81.0	63.3	2.20 (1.39 to 3.48)	0.001
Initial cognitive and emotional responses	% Agreed	% Agreed		
Stop and think	74.6	48.5	2.90 (1.86 to 4.52)	<0.001
Concerned about smoking	73.8	49.1	2.58 (1.66 to 4.01)	<0.001
Feel uncomfortable	73.8	56.8	1.72 (1.11 to 2.67)	0.016
Motivated to try to quit	55.2	33.7	2.12 (1.34 to 3.34)	0.001
Subsequent ad impact	% Yes	% Yes		
Recurring thoughts and images	54.5	33.1	2.13 (1.38 to 3.30)	0.001
Interpersonal discussion†	41.6	31.4	1.50 (0.97 to 2.32)	0.066
Stage-of-change at post-exposure				
Precontemplation	30.1	47.3	0.56 (0.32 to 0.97)	0.039
Contemplation	38.7	35.5	0.93 (0.58 to 1.51)	0.780
Preparation	31.2	17.2	2.57 (1.31 to 5.05)	0.006

*All models adjusted for the covariates: which advertisement was viewed; sex; age; socioeconomic disadvantage; daily cigarette consumption; stage-of-change at pre-exposure; TV viewing frequency; multiple exposures to the advertisement; and type of recall.

†Model also adjusted for whether there were others present when the respondent was exposed to the advertisement.

enhanced the effectiveness of the advertisements at motivating smokers to quit. Similar evidence of a complementary relationship has been observed in adolescents.¹⁰ In their examination of the impact of the pictorial warnings on adolescents' health effects knowledge, White and colleagues found that although awareness of the link between smoking and gangrene and mouth cancer increased among all adolescents following introduction of the warnings, those who had been exposed to the *Amputation* or *Mouth Cancer Talks* advertisements were significantly more likely to demonstrate awareness of these health effects than were those who had not seen the advertisements.¹⁰ These findings further demonstrate that the positive effects of pictorial pack warnings on knowledge of tobacco-related health effects are enhanced when the warnings are supported by a complementary mass media campaign.

Assessing population-level awareness of health effects both before and after implementation of the warnings, the population survey data suggested that exposure to a relevant mass media campaign enhanced the effect of the Series A warnings in producing greater awareness of certain smoking-related illnesses. Between 2005 and 2006, the proportion of smokers aware that gangrene is a smoking-related illness increased by 11.2 percentage points to 12%, and awareness of the link between smoking and mouth cancer increased by 6.6 percentage points. In addition, the proportion of smokers aware that emphysema is caused by smoking increased by 8.1 percentage points to 43%. In contrast, although one of the Series A pack warnings was labelled 'Smoking causes mouth and throat cancer', an image of throat cancer was not included on the pack warning and the link between smoking and throat cancer was not highlighted in a television advertisement. Awareness of this association decreased between 2005 and 2006. These findings indicate that the supportive television advertisements enhanced the impact of the 'Smoking causes peripheral vascular disease' and 'Smoking causes mouth and throat cancer' pack warnings on awareness of the link between smoking and gangrene and smoking and mouth cancer. However, given the simultaneous increase in awareness of emphysema, it appears that the complementary effect may be attributable to the presence of any mass media campaign that highlights the disease, rather than one that is

directly linked to the pack warning. This finding allows for the possibility that previously developed campaigns that are relevant, but not explicitly linked to new pictorial warnings, may be just as effective, thereby presenting a viable option for reducing the costs associated with campaign development. However, these findings also point to the importance of the graphic images on the pack warnings in producing greater awareness, as a reference to throat cancer in the text component of the 'Smoking causes mouth and throat cancer' warning was not sufficient to increase knowledge of this illness.

A limitation of this population survey is that we did not measure each individual's exposure to the specific pack warnings or the advertisements, and so we cannot claim that increases in knowledge are definitely associated with exposure to the warnings and advertisements. However, given that at least 80% of cigarette packets carried the Series A warnings when the population survey began in November 2006,⁴ and the data from the "Natural Exposure" evaluation studies indicates that 87% of respondents recalled seeing the *Amputation* or *Mouth Cancer Talks* advertisements, we expect that the majority of smokers participating in the population survey would have had some exposure to the Series A warnings and television advertisements. It is possible however that the changes in spontaneous recall may underestimate the impact of the two interventions, given that these population recall figures include those who may not have been exposed, or may have been exposed only rarely to the pack warnings and/or mass media campaigns. It is also important to note that despite the improvements rendered by the introduction of the pictorial warnings and the media campaign, the absolute level of top-of-mind awareness of both gangrene and mouth cancer remained low in 2006. These findings thereby reinforce the importance of continued efforts to educate smokers about the many illnesses caused by tobacco consumption.

The "Natural Exposure" methodology used to evaluate *Amputation* and *Mouth Cancer Talks* provided a novel method for examining responses to advertisements watched under natural viewing conditions. This study suggested that exposure to the pack warnings enhanced the effectiveness of the television campaigns, as previous pack warning exposure enhanced the

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likelihood that smokers accepted the advertisement and experienced most of the cognitive and emotional responses and recurrent thoughts and images. After adjusting for pre-exposure stage-of-change, a greater number of smokers who had been exposed to the pack warnings had increased their intentions to quit, compared with those who had not been exposed.

One limitation of this methodology is that participants are recruited from a database of respondents who have agreed to participate in future research, such that our ability to generalise these findings to the broader community is limited. However, the sample was selected to be broadly representative of the target population of anti-smoking television advertisements in Australia, which is the demographic subgroup with the highest smoking prevalence. Another limitation is that the measure of exposure to the pictorial warnings relied on smokers' self-report of how frequently they had noticed the warnings in the past two months only, and it did not ask which specific warnings they had been exposed to. Therefore, we may not have captured the full extent of exposure to the warnings, and it is also difficult to determine whether the complementary effect of the warnings and the advertisements is the result of smokers being exposed to the same message from multiple sources, or whether exposure to any of the pack warnings created a heightened attention and response to all other messages about smoking-related health effects. Smokers who were interested in quitting were particularly likely to recall noticing the pack warnings, such that the warnings and advertisements may have already been particularly salient and relevant to these individuals. It is therefore possible that the association between reported pack warning exposure and responses to the advertisements may be unduly inflated, but any such effect is minimised by our adjustment for pre-exposure stage-of-change in all analyses.

Recognising the importance of measures that increase awareness about the harms caused by tobacco, the Framework Convention on Tobacco Control (FCTC)³⁴ advocates the use of comprehensive education programmes that inform the public about the health consequences of tobacco use. Signatory countries to the FCTC must implement health warnings on cigarette packets that are large, clear, visible and legible, covering at least 30% of the pack and preferably also including a picture, and it is advised that the introduction of new pack warnings be

accompanied by a broad and sustained education campaign.³⁵ By demonstrating the complementary effect of television advertisements that highlight the illnesses featured in the cigarette pack warnings, the present studies, together with the work of White and colleagues,¹⁰ provide some of the first evidence in support of this implementation strategy. This research also contributes to evidence supporting a multifaceted approach in tobacco control,^{36–39} by establishing that tobacco control policy initiatives and social marketing campaigns may work together to improve knowledge about health effects and intentions to quit.¹ Jurisdictions implementing pictorial warnings on cigarette packets should consider the benefits of a complementary mass media campaign that will help to add depth, meaning and personal relevance to the new pack warnings.

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What this paper adds

- Pictorial health warnings on cigarette packs and televised mass media campaigns are two strategies demonstrated to independently increase knowledge of smoking harms and motivate smoking cessation. In this study, we found that pictorial pack warnings were more effective at increasing disease-specific awareness of the health effects of smoking when information about the diseases was also highlighted in a complementary television advertisement, and the television advertisements were more effective at motivating smokers to quit when the viewer had previously been exposed to the pack warnings. By demonstrating that the pack warnings and mass media campaign operated in a complementary manner, these findings provide some of the first evidence to support the recommendation from the Framework Convention on Tobacco Control that an implementation strategy for health warnings on cigarette packets should include a concurrent and complementary mass media campaign.

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Mass media campaigns designed to support new pictorial health warnings on cigarette packets: evidence of a complementary relationship

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