Long-Term Effectiveness of Mass Media Led Antismoking Campaigns in Australia

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Abstract: A community antismoking campaign began in Sydney, Australia in 1983, and in Melbourne in 1984. These campaigns purchased prime-time television advertising spots to set the community agenda. An intense effort was made to ensure that antismoking activities were maximized at the school, organizational, and community level. Smoking prevalences in both cities from 1981 were fitted with a statistical model to identify any underlying trend, to assess any immediate impact, and to assess the longer term effect of continuing to conduct such campaigns, i.e. to identify any change in the underlying trend. During the years before the antismoking

campaigns, there was no observable trend in smoking prevalence in either city. At the beginning of the campaigns, there was an immediate drop of more than two percentage points in male and female smoking prevalence in both cities. Thereafter, a decline of about 1.5 percentage points per year was observed among males. No post campaign trend was observed in smoking prevalence for women in either city. These data support conducting coordinated community campaigns to reduce current smoking prevalence. (Am J Public Health 1990; 80:565–569.)

Introduction

Smoking prevalence in Australia did not decline much from 1974 to 1983 according to age standardized comparisons,[1,2] in contrast to the pattern seen in other Western developed countries.[3] For this reason, a number of individual states in Australia introduced a coordinated campaign approach to promoting change in health behavior, as pioneered in cardiovascular disease by the Stanford Three Community Project[4] and the North Karelia Project.[5]

In 1983 in Sydney and in 1984 in Melbourne, the State Health Departments established anti-smoking steering committees composed of personnel from the health departments, the major voluntary organizations, health professional societies, and university public health departments. Television commercials were developed to motivate smokers to quit smoking and to set the agenda for professionals whom the campaign team hoped to involve in promoting nonsmoking, given the evidence of the effectiveness of medical advice.[6-8] The effectiveness of school education programs[9] also made establishing such programs a high priority within the community. Although the campaign committees in both cities shared campaign materials and ideas, the actual activities undertaken within each city were dictated by the perceived local needs and opportunities.

A detailed evaluation was undertaken of the first year of the campaign in Sydney using Melbourne, which did not have a campaign that year, as a reference community.[10,11] More than 80 percent of the population of Sydney remembered the television commercials. After these commercials were aired, use of services such as a telephone quit line and enrollment in cessation classes increased. The campaign was also associated with higher levels of intention to quit in Sydney, a variable that had previously been shown to be associated with actual quitting.[12] Changes in smoking prevalence during the first campaign year were assessed by self-reported smoking behavior (after validation with salivary cotinine[13]) from

both cross-sectional and longitudinal surveys. No decrease was seen in the reference city, Melbourne. The pooled estimate of the difference in smoking prevalence attributable to the campaign was 2.8 percent (95% confidence interval = 0.5, 5.1).[11]

Since 1984, the campaigns have continued in both Melbourne and Sydney, spearheaded each year by commercials shown on prime time television for six to eight weeks during the winter months. In this paper, we assess the long-term effect of this approach to reducing the prevalence of smoking. We used data from both cities to determine whether these key intermediate goals were achieved:

- High public awareness of the campaign during each campaign year;
- A strengthening of the stand of health professionals, particularly physicians, against smoking;
- An increased proportion of the smoking population who both believed that smoking was harming their own health and also were being influenced by their social network to quit smoking.

The effectiveness of the campaign was assessed by using self-reported smoking data from 1981 to 1987 for each city.

Methods

General Design

This project has a before and after design in each of two intervention cities with a temporal lag of 12 months between the onset of the intervention in the second city. Prevalence data were obtained for several years before the onset of the intervention, as well as for the duration of the campaign. In 1983 and 1986, more detailed questions about health beliefs, intentions, and social influences were asked in each city. Small random surveys were undertaken approximately two months after the completion of each component of the television campaign to assess recall of commercials.

Mass Media Used in Campaigns

Television—In both Sydney and Melbourne, television advertising made up about two-thirds of the media budget for the campaigns. Typically, commercial spots were purchased during prime or fringe time for approximately four weeks out of eight at the start of the campaign year. Approximately 40 spots per week were shown during a schedule designed to ensure at least 50 percent market penetration in the Sydney

and Melbourne metropolitan areas during each year of the campaign.

Production of commercials followed research on messages that were likely to be effective among the target audience. These commercials were designed to use strong visual images of the health consequences of smoking. Further, they sought an emotive response among the audience to ensure attention and to maximize the likelihood that viewers would reassess the hazards of smoking and then possibly quit in the near future (for description, see Appendix).[12,15] All of the commercials ended with a "Quit line" telephone number that people could call 24 hours a day to hear a recorded informative and encouraging message about quitting smoking.

Other Mass Media—A concerted effort was made to coordinate all mass media advertising around a central theme that was dictated by the message in the major television commercial being run at the time. For billboard advertising, a simple message from the television commercial was displayed at numerous sites, especially those near mass transit locations. Advertising in newspapers included the normal large advertisement and, in Sydney, a section was purchased for journalistic coverage of smoking-related events and issues. Antismoking skits by major personalities complemented the normal quit smoking commercials on the radio. In addition, the campaign generated many news releases and events that resulted in substantial news coverage in all the mass media.

Physician's Offices

In both cities, there was active collaboration with the Australian Medical Association to develop and distribute printed resources that physicians could use to encourage and help their patients quit smoking. In Melbourne, a special training videotape about smoking was produced and shown widely to family physicians. In Sydney, a special training program was available to family physicians to enable them to more effectively counsel their patients to stop smoking.[16]

Schools

In Sydney, two school programs were developed: a comprehensive kindergarten through 12th grade curriculum and a grade-specific peer or teacher led curriculum. By 1986, 80 percent of all schools in Sydney had at least one person who was trained by the campaign team in conducting the program of choice for that school. Sixty-four percent (88 percent of the 73 percent who responded) of these schools reported using these materials during the 1986 academic year. Further, the campaign team sponsored theatre performances, rock concerts, and sports activities with antismoking themes.

In Melbourne, kindergarten through 12th grade curriculum resources on smoking were made available to all schools, and project workers encouraged and helped teachers to use these resources. By 1986, in sample surveys of school children in both Sydney and Melbourne, more than 70 percent of 12–15-year-olds reported receiving at least minimal health education about smoking during the year.[17]

Other Community Activities

Each year, the campaigns either organized smoking cessation clinics or informed the population in each city about the availability of clinics. Training programs were available for health educators who might be appointed to local government or other affiliated positions. In addition,

quit smoking display stands were regularly erected and staffed in shopping malls and at public fairs.

Assessing Smoking Prevalence

Between 1981 and 1987, 68,136 males and 70,634 females aged 16 years and over from the suburbs of metropolitan Sydney and Melbourne were interviewed in their homes as part of an ongoing weekly survey. Sampling procedures, reported in detail elsewhere,[11] involved selecting a household starting point at random from the electoral roll (in Australia, it is compulsory for citizens over 17 years of age to be registered on the electoral roll). Field interviewers proceeded to move from house to house in a clockwise direction until they obtained a cluster of 10 interviews from separate households. Within the household, the youngest person aged 16 years and over of a selected sex was interviewed. The resulting sample has been shown to be representative of the population on major sociodemographic variables.[11]

A smoker was defined as anyone who responded positively to questions on whether he or she smoked factory-made cigarettes, roll-your-own cigarettes, cigars, or a pipe. In two separate subsamples, self-reported smoking was validated with biochemical analysis of saliva for the presence of cotinine.[13]

Measuring Campaign Exposure

For each year of the campaign, recall of the television commercials was assessed on separate random samples of the population of at least 1,000 persons in the three months following the completion of the television phase of the campaign. Shortly after the completion of each annual television campaign, a subsample of persons in Sydney were shown a set of six still photographs taken from the commercials. They were first asked whether they had seen the commercial and, if they responded yes, what the message was (care was taken that no "giveaway" words or cigarettes appeared in the photographs). In Melbourne, the respondents were asked whether they had seen any television commercials against smoking, recently. The interviewer then probed all positive responses and recorded details of the message recalled.

Assessing Predictors of Quitting

In 1983 and 1986, additional random samples of the population of Sydney and Melbourne were surveyed. The Sydney survey included 271 smokers in 1983 and 557 smokers in 1986. The Melbourne sample included 217 smokers in 1983 and 550 smokers in 1986. Smoking respondents were asked to agree or disagree with a set of statements previously shown to be scales representing health beliefs and social influences.[12] The items in the health belief scale were "Smoking cigarettes doesn't greatly affect my health," "The problems with smoking only affect heavy smokers," and "I'd rather enjoy life as a smoker than live a little longer without cigarettes."

The items in the social influence scale were "I find that my smoking annoys people around me who don't smoke," "What I dislike about smoking is the smell that it leaves on clothes", "All the physicians that I know are strongly against smoking," "My close friends would prefer that I didn't smoke," and "I find that people are talking a lot more about smoking and the problems of giving up." Internal consistency reliability (Cronbach's alpha) on these scales have been

previously reported at 0.57 on the health benefit scale and 0.56 on the social influence scale.[12]

Statistical Analysis of Prevalence

For the purpose of analysis, data were grouped into intervals of six months for each city and were adjusted for age and sex to the estimated population of Sydney in 1986 using direct standardization. Salonen, et al,[18] have suggested using multiple linear regression models to evaluate the effectiveness of community-based intervention programs by testing for interaction effects between the type of community (intervention or reference) and the timing of the onset of the intervention effect. In this study, which lacked a nonintervention community, the following simplified form of the suggested model was fitted to each of the data sets.

$$P = \beta_0 + \beta_1 \, C + \beta_2 \, T + \beta_3 \, CT + \beta_4 \, S + \text{error}$$

where P represents the prevalence of smoking,

C is a binary indicator variable representing whether the data are from the precampaign (C = 0) or the postcampaign (C = 1) period,
T is the trend variable for time,
S is a binary indicator of season with a value of 1 for the first six months and −1 for the second six months of each year.

Using this model, β_0 is an estimate of the expected prevalence at the start of the campaign (T = 0) given the underlying trend in the precampaign period. β_1 is an estimate of the immediate effect of the intervention (as such an effect was demonstrated in a previous paper[15]). β_2 estimates the underlying trend in prevalence over the whole time period, and β_3 estimates the change in this underlying trend associated with the commencement of the campaigns. The coefficient β_4 provides an estimate of the effect of seasonal variation on the data. For each analysis, a model which included all the explanatory variables described above (full model) was fitted. A parsimonious model (adjusted for seasonal effect) was then developed by using backward elimination to remove variables, other than S, with the chosen level of significance set at 0.05. This reduced model identifies the pattern of change in prevalence in relation to the timing of the campaigns. A series of curvilinear (polynomial) models were also fitted to the data. Quadratic and cubic models were compared with the linear parsimonious models described above to assess whether the more complex models fit the data better.

Results

Population Knowledge of the Campaign

We assessed awareness about the antismoking campaign by asking people in each city what they recalled about the most public aspect of the campaign, the television commercials (Table 1). For all the major commercials in these campaigns, there was little difference between the recall of the commercial and identification of an appropriate antismoking message. In both cities, more than two-thirds of the community knew that an antismoking campaign existed in the years that such campaigns were conducted.

Action by Physicians

During the campaign, physicians' roles were assessed by asking respondents how strongly the physicians were against smoking; these data were then divided by age and sex for each city in 1983 and 1986 (Figure 1). Before the campaign, only 15 percent of males and females smokers over age 40 in
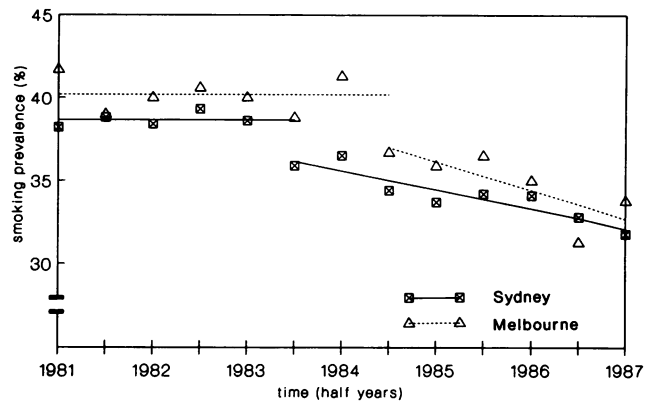

FIGURE 1—Age-Standardized Smoking Prevalence for Males in Sydney and Melbourne, 1981 to 1987

Sydney thought their physicians were strongly against smoking. By 1986, this had increased dramatically to 47 percent for males and 50 percent for females. In those under the age of 40 in Sydney, this proportion increased from 36 percent to 48 percent in males and from 28 percent to 46 percent in females. In Melbourne males, this proportion increased from 35 percent to 41 percent in those under 40 years and from 28 percent to 35 percent in those over 40. In Melbourne females, this proportion increased from 27 percent to 47 percent in those under 40 years and from 33 percent to 37 percent in those over 40 years.

The Health Belief/Social Influence Variable

A previous study[12] had demonstrated that only a combination of personal beliefs about smoking and the environmental influences to quit was associated with an increased likelihood to quit. This proportion reporting both social influence and health beliefs was low in those over the age of 40 years in Sydney in 1983 (males, 10 percent; females, 12 percent). By 1986, this proportion had increased to 29 percent in males and 27 percent in females. In those under 40 in Sydney, males increased from 34 percent to 53 percent and females increased from 30 percent to 44 percent. In those over 40 years in Melbourne, males increased from 21 percent to 29 percent and females increased from 22 percent to 32 percent. In those under 40 years in Melbourne, males increased from 30 percent to 43 percent and females increased from 31 percent to 48 percent.

Smoking Prevalence

We considered both the full and parsimonious statistical models fitted to the age-standardized data for men and

TABLE 1—Percentage of Males and Females Who Recalled Television Advertising in Sydney and Melbourne

Year	% Males	% Females	N
Sydney (aided by picture prompt)			
1983	84	84	2,970
1984	72	80	1,046
1985*	79	76	996
1986	92	94	457
Melbourne (unaided)			
1984	70	67	886
1985	73	68	1,818
1986	68	67	1,830

*Only 14-to-19 year-olds.

women separately for each city. For men, these models fit the data very well, explaining 96 percent of the variation in Sydney and 91 percent in Melbourne. For females, the best models did not fit quite so well, explaining 72 percent of the variation in the Sydney sample and 79 percent in the Melbourne sample. However, the most parsimonious model for the Melbourne women sample was not consistent with the other models. A consistent model fitted almost as well and explained 68 percent of the variation.

Figures 1 and 2 are graphical representations of the trends identified in the parsimonious models in conjunction with the observed data. For this presentation, the consistent model was chosen for Melbourne women.

Thus, the best estimate of smoking prevalence among Sydney men (Table 2) indicated that prevalence did not change in the three years before the campaign (June 1983) and was 38.7 percent ($\hat{\beta}_0$ in the parsimonious model). From 1981 to 1987, there was no significant underlying trend in smoking prevalence other than that associated with the campaign. The introduction of the campaign coincided with an estimated immediate drop in smoking prevalence of 2.5 percentage points in that six-month period. Continuation of the campaign was associated with a further drop of 1.12 percentage points per year (2 · $\hat{\beta}_3$). These estimates are consistent with those provided by the full model.

For women, smoking prevalence had again been constant during the years before the campaign and was 31.6 percent in Sydney and 29.8 percent in Melbourne. In Sydney, there was an immediate drop of 2.6 percentage points associated with the introduction of the campaign but smoking prevalence did not significantly decline in the later years of the campaign. Again, this estimate is consistent with that from the saturated model.

Men in Melbourne responded similarly to those in Sydney. As Table 3 shows, the expected prevalence of smoking at the beginning of the campaign (June 1984) was 40.1 percent ($\hat{\beta}_0$). Again, there was no underlying trend. With the start of the campaign, there was an immediate drop of 2.9 percentage points. A further decline of 1.9 percentage points per year occurred in conjunction with the continued campaign. Once again these estimates are consistent with those from the full model.

In Melbourne, two models fitted the data and, as indicated earlier, model 2 is the preferred model. Smoking prevalence prior to the campaign was 30.9 percent. The immediate effect of the campaign was a 2.5 percentage point
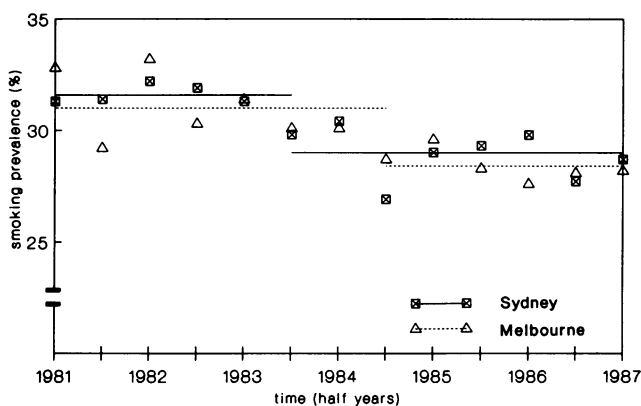
TABLE 2—Statistical Models for Smoking Among Males and Females in Sydney

		Full Model Estimate (SE)	Parsimonious Model Estimate (SE)
Sydney Males	$\hat{\beta}_0$	39.06 (0.67)	38.67 (0.28)
	$\hat{\beta}_1$	−2.91 (0.79)	−2.52 (0.49)
	$\hat{\beta}_2$	0.13 (0.20)	
	$\hat{\beta}_3$	−0.69 (0.22)	−0.56 (0.10)
	$\hat{\beta}_4$	−0.04 (0.18)	−0.04 (0.17)
		(R^2 = 0.96, 8df)	(R^2 = 0.96, 9df)
Females	$\hat{\beta}_0$	031.69 (1.02)	31.56 (0.42)
	$\hat{\beta}_1$	−2.11 (1.20)	−2.61 (0.54)
	$\hat{\beta}_2$	0.05 (0.31)	
	$\hat{\beta}_3$	−0.23 (0.34)	
	$\hat{\beta}_4$	0.38 (0.27)	0.32 (0.26)
		(R^2 = 0.77, 8df)	(R^2 = 0.72, 10df)

drop in smoking prevalence, again with no subsequent decline associated with the continued campaign. However, in this instance, the estimate from the full model is very different, highlighting the uncertainty that exists as to the true underlying model.

Comparison with other Models

The goodness of fit of these parsimonious linear models was compared with quadratic and cubic models. In each case, the best-fit linear model was a superior fit to either of the alternative models, except for Melbourne women, again emphasizing the problems in interpreting this set of data.

Discussion

This study suggests that smoking prevalence in the two major Australian capital cities did not decline prior to the campaign, as previously observed for the period 1974 to 1980 for Australia as a whole.[1-3] The mass media led antismoking campaigns coincided with a marked drop in smoking prevalence during the six-month period immediately following the start of the campaign for all persons in Sydney and for men in Melbourne (the effect on Melbourne women is less clear). The estimated size of this immediate effect was 2.6 percentage points in Sydney. A larger 2.9 percent effect of the antismoking campaign was seen among Melbourne men 12 months later. If we accept the model that suggests that women in Sydney and Melbourne reacted similarly to the antismoking campaign, the campaign immediately reduced smoking prevalence in Melbourne by 2.5 percent, an amount

FIGURE 2—Age-Standardized Smoking Prevalence for Females in Sydney and Melbourne, 1981 to 1987

TABLE 3—Statistical Models for Smoking Among Males and Females in Melbourne

		Full Model Estimate (SE)	Parsimonious Model Estimate (SE)	
Melbourne Males	$\hat{\beta}_0$	39.89 (1.00)	40.12 (0.42)	
	$\hat{\beta}_1$	−2.64 (1.33)	−2.87 (0.93)	
	$\hat{\beta}_2$	−0.06 (0.22)		
	$\hat{\beta}_3$	−0.89 (0.36)	−0.95 (0.27)	
	$\hat{\beta}_4$	0.58 (0.34)	0.57 (0.32)	
		(R^2 = 0.91, 8df)	(R^2 = 0.91, 9df)	
			Model 1	Model 2
Females	$\hat{\beta}_0$	29.77 (0.83)	29.40 (0.26)	30.93 (0.41)
	$\hat{\beta}_1$	−0.53 (1.10)		−2.52 (0.61)
	$\hat{\beta}_2$	−0.29 (0.19)	−0.37 (0.07)	
	$\hat{\beta}_3$	−0.04 (0.30)		
	$\hat{\beta}_4$	0.64 (0.28)	0.65 (0.25)	0.56 (0.30)
		(R^2 = 0.80, 8df)	(R^2 = 0.79, 10df)	(R^2 = 0.68)

similar to the estimates of the effect obtained in both men and women for Sydney one year earlier. In the alternative model, women in Melbourne were the only group who recorded a decreasing prevalence of smoking during the precampaign period. Given that there was no downward trend in smoking prevalence throughout the 1970s,[1-3] this model must be considered less plausible.

For men in both cities, continued antismoking campaigns were associated with an average continued decrease in smoking prevalence of approximately 1.5 percent per year. The situation for women is less clear, but suggests that the continued campaigns in Sydney and Melbourne were not associated with any further decrease in smoking prevalence among women.

This analysis of changes in community smoking prevalence does not consider the effect that such campaigns may have on uptake of smoking. In any given year, the influence of new smokers between the ages of 16 and 20 years (the teen years included in this data set) on the overall prevalence will be small. Before we can conclude how effective these campaigns really are, changes in the uptake of smoking among teenagers need to be explored. However, even with the effect on uptake of smoking being unresolved, this study supports conducting coordinated mass media antismoking campaigns (using purchased television time) as an effective way to reduce smoking prevalence in the community. Whether conducting campaigns for up to four consecutive years is cost-effective will be the topic of a subsequent paper.

APPENDIX

TV Commercials by City and Year

Commercial	Year 1983	1984	1985	1986
"Sponge"[a]	S	S, M	M	
"I've had enough"[b]	S	S, M	M	
"Mrs. Holden"[c]		S		
"Yul Brynner"[d]				S, M
"Heartbeat"[e]			M	M
"Stairs"[f]				M
"Mirrors"[g]			S	
"Tough Guy"[h]			S	
"Mates"[i]			S	

S = Sydney, M = Melbourne.
[a] an analogy between a sponge and a lung soaking up tar.
[b] smoking histories of three people outlining reason for quitting included ashtray on a girl's face and modeling of calling the Quitline.
[c] a laryngectomy patient (with subtitles) outlining her smoking related problems with communications.
[d] a posthumous exhortation "Whatever you do, don't smoke."
[e] cardiograph used to outline smoking effects on circulation."
[f] mirror distortion to reduce fears of weight gain and stress with quitting.
[g] linked smoking to shortening a young girl's life.
[h] teens, visiting cancer patient, review smoking-related disease.
[i] outlined social problems teens might face if they smoke.

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