

Delayed compensatory cigarette consumption after a workplace smoking ban

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Abstract

Objectives—To evaluate the impact of workplace smoking bans on cigarette consumption among continuing smokers over a two-year period.

Design—Two cross-sectional surveys and a longitudinal sample of smokers questioned about their smoking behaviour six months and two years after implementation of a workplace smoking ban.

Subjects—Workers in 46 government offices in Australia. The cross-sectional survey six months after the ban included 3388 workers, whereas the survey two years after the ban included 3982 workers. The longitudinal cohort study included 107 workers who were identified as current smokers in both surveys.

Main outcome measures—Smokers were asked to report usual daily cigarette consumption on both workdays and leisure days one month before implementation of the ban, and six months, and two years afterwards.

Results—From six months to two years after the ban, the cross-sectional data showed an increase in cigarette consumption of 1.3 cigarettes per day. The longitudinal sample of smokers reported an increase in workday cigarette consumption of 1.7 cigarettes per day. A previous study of workers in the same worksites found a reduction in consumption of 5.2 cigarettes per day from before the ban to six months after. Over a two-year period we estimate that the net effect of the workplace smoking ban was to reduce cigarette consumption by about 3.5 cigarettes per day.

Conclusions—Reductions in cigarette consumption among smokers frequently seen after implementation of a worksite smoking ban may diminish over time. This effect is more likely to occur when the initial response to a smoking ban is a large reduction in cigarette consumption.

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Keywords: workplace smoking ban; compensatory smoking

Introduction

Restrictions and total bans on cigarette smoking in enclosed work environments are now widespread.^{1,2} They have been introduced to protect non-smokers because of the evidence about the negative health effects of passive smoking.³ Results of studies on the impact of workplace smoking bans on cigarette consumption

vary. A number have found sizeable reductions in overall daily smoking rates (of three or more cigarettes a day).^{4,7} Reductions of between three and four cigarettes, for the working part of the day only, have also been found by several investigators.⁸⁻¹² However, others have found small or non-significant effects (unpublished observations).¹³⁻¹⁶ Some studies have used community samples to compare smoking rates among groups of workers who are subject or not subject to bans. At least three of these studies have found sizeable effects.¹⁷⁻¹⁹

This diversity in the magnitude of the effect of workplace smoking bans on daily smoking rates suggests that some aspects of the bans' implementation process, of the workplace environment, of the smokers, or of some interaction among these may be mediating the impact of the ban. There is evidence, for example, that increased support for quitting can lead to increased reductions in daily consumption, as well as to increased cessation.²⁰ This would suggest that the impact of workplace smoking bans may change as a function of the climate in which the bans are implemented and the support provided for smokers to control their smoking behaviour.

There is the need to understand better the extent to which reductions in cigarette consumption following the introduction of workplace smoking bans are maintained over time. In one of our studies, using cross-sectional samples taken from the same workplaces, reductions in consumption found six months after a ban were maintained 12 months later.⁵ On the other hand, Beiner and associates⁸ found non-significant increases between six and 12 months after a ban of about one cigarette a day. There is not yet enough evidence to draw clear conclusions about the extent to which initial reductions in consumption due to workplace smoking bans are maintained.

Here, we report findings of our longitudinal descriptive study, using data from a prospective subsample of smokers, and cross-sectional samples surveyed six months and two years after a ban was formally implemented. Those workplaces were also surveyed before formal implementation of a total workplace smoking ban. We have previously reported on changes in smoking behaviour from that survey to six-month follow up.⁴

Methods

In early 1988, the Australian Public Service implemented a policy of total bans on smoking in all Commonwealth Government offices.

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Table 1 Percentages of smokers in the longitudinal and cross-sectional samples

	Six-month follow up n (%)	Two-year follow up n (%)
Longitudinal subsample (n = 568)		
Smokers	131 (23.1)	128 (22.5)
Smokers among females	56 (24.0)	62 (26.6)
Smokers among males	75 (22.4)	66 (9.7)
Cross-sectional samples		
Smokers	792 (23.4)	990 (24.9)
Smokers among females	(24.7)	(25.4)
Smokers among males	(21.9)	(23.9)
Total sample	3388	3982
Smoker subsample		
Number	765	952
Females among smokers	48%	50%
Mean (SD) age of smokers (years)	30.7 (8.1)	31.7 (9.1)

The introduction of the ban was announced about 18 months before it was to come into force, and was widely publicised; restrictions were phased in gradually before the total ban in some workplaces, and smoking cessation programmes or assistance to cut down on consumption were offered.

Workers from 46 worksites, ranging in size from 20 to more than 500 staff, completed self-administered survey forms one month before formal implementation of a total workplace smoking ban and again six months and two years after the ban was implemented. About 80% of distributed surveys were returned.⁴ Smokers provided estimates of the number of cigarettes they usually smoked on work and leisure days, and completed rating scales on a number of smoking-related attitudes, perceptions, and beliefs. The six-month and two-year samples (the focus of this paper) are described in table 1. Among these smokers, there was a longitudinal subsample of 107 whose data from both surveys could be matched, and who reported smoking at the time of both surveys. There were small amounts of missing data on most variables and the number of missing cases can be inferred from the statistics reported. Whereas the two-year survey attempted to recruit all workers equally, the six-month survey focused recruitment (although not exclusively) on those who provided identifying information about themselves in the survey before the ban, and which we have reported elsewhere.⁴ This is why the sample size is smaller.

Organisational restructuring at some of the work divisions surveyed between the two follow-up surveys also produced changes, and probably accounts for the increased proportion of women. A small number of those who completed the follow-up surveys and who reported that they were not subject to extensive bans were excluded from the samples reported. Earlier publications provide details of the methods and the items used in the six-month survey,⁴ and the two-year survey was very similar.²¹ The surveys took smokers about 10 minutes to complete.

Smokers were asked to report usual daily cigarette consumption on both workdays and leisure days. They were also asked for details of consumption for the previous workday, broken down into seven time periods. At the two-year follow up, smokers were also asked for a retro-

spective estimate of consumption before the ban on both workdays and leisure days. Other questions asked, of relevance to this paper, were a six-item scale on attitudes to smoking bans²²; a perception of the effects of the ban on work performance (six-month survey), whether they had made quit attempts in the past seven months (six-month survey) and in the past three years and, if so, when (two-year survey); perceived change in workday consumption (six-month survey); extent of wanting to quit; self-efficacy for quitting; intention to quit; reported unpleasantness if they were unable to smoke for an hour or more; age; and sex. Short forms of the advantages and disadvantages of smoking scales,²³ using an agree-disagree format, were also administered at the time of the two-year survey, as they had been in the survey before the ban.²⁴

STATISTICAL METHODS

The main analyses examined differences between continuous variables by analyses of variance. For most variables there was a small amount of missing data, which resulted in up to 5% of cases being missing in some analyses.

Results

PREVALENCE OF SMOKING

Table 1 shows that the proportion of smokers in the two cross-sectional follow-up surveys was quite stable, as was the proportion in the longitudinal subsample.

CHANGES IN DAILY CIGARETTE CONSUMPTION IN THE LONGITUDINAL SUBSAMPLE

Workplace smoking restrictions varied at the time of the initial survey.⁴ The reduction in workday consumption of 5.2 cigarettes per day from before the ban to six months after, which was previously reported for those not subject to restrictions before the ban,⁴ is based on a far larger sample than comparisons involving those who also completed the two-year follow-up survey.

The focus of the study we report here is on change from six months to two years after the ban. Reported workday and leisure-day smoking rates were compared (table 2) for those 107 smokers who reported being smokers at both the six-month and two-year surveys after the ban. A small number of cases had missing data on at least one of the consumption estimates. Only 38 of these had no or limited bans in place at the time of the baseline survey. We have therefore limited our focus to the six-months to two-year period when bans were in place. Based on reported usual consumption, there was an increase in workday consumption of 1.7 cigarettes a day over this period, but no statistically significant changes in leisure day smoking rates (see table 2). When diaries of the previous workday's consumption were used to assess change in workday consumption, an increase of 1.4 cigarettes a day was observed ($t = 2.73$, $df = 107$, $P < 0.01$).

Table 2 Average reported number of cigarettes smoked on workdays and leisure days in the longitudinal subsample six months and two years after the introduction of a total workplace smoking ban, for smokers ($n = 107$)

	Six-month follow up Mean (SD)	Two-year follow up Mean (SD)	Difference*	r	t	P
Diary-based estimates						
Workdays ($n = 105$)	15.2 (8.3)	16.6 (9.6)	1.4 (5.3)	-0.83	2.7	<0.01
Usual consumption						
Work days ($n = 104$)	15.2 (8.4)	16.9 (9.5)	1.7 (5.4)	0.83	3.3	<0.01
Leisure days	19.1 (10.5)	19.4 (10.6)	0.3 (5.8)	0.85	0.6	ns

*The difference may not be equivalent to the apparent difference, due to rounding errors.

CHANGES IN DAILY CIGARETTE CONSUMPTION IN THE CROSS-SECTIONAL SAMPLES

Table 3 shows data on usual reported cigarette consumption on both workdays and leisure days.

Consumption estimates rose by an average of 1.3 cigarettes a day from 13.1 at six months to 14.4 two years after the ban, among those respondents who reported working in the public service at the time the bans were introduced. The two-year consumption estimate for those who were in the public service before bans (14.4 cigarettes a day) was somewhat larger than that for new recruits (12.6 cigarettes a day). The estimate of change in workday cigarette consumption among all public servants is thus slightly less at 0.9 cigarettes a day (from 13.1 to 14.0). Using diary-based estimates of consumption on the last working day, the increase was smaller (0.4, from 13.6 to 14.0 overall).

CIGARETTE CONSUMPTION DURING SPECIFIC PERIODS OF WORKDAYS

To examine where compensatory smoking may have occurred, we analysed data from the longitudinal subsample for each of six periods of the day separately, excluding reports of consumption indoors, which had fallen close to zero. Cigarette consumption was significantly greater at two years than at six months for the period before work and for coffee breaks (table 4). Analyses of the cross-sectional samples showed the same pattern. It is notable that variability of consumption estimates increased for work breaks, lunch times and before work in both longitudinal and cross-sectional samples.

POSSIBLE CONTRIBUTORY FACTORS

We found no statistically significant differences in changes in cigarette consumption between women and men or any effects as a function of age. Increases in workday consumption from six months to two years were not correlated with either workday or leisure-day consumption at six months. To examine whether the compensatory smoking increase from six months to two years was related to the extent

Table 3 Average (SD) reported workday smoking rates among the cross-sectional samples, six months and two years after the ban

	Workdays			Leisure days		
	Mean	(SD)	n	Mean	(SD)	n
Six months	13.1	(8.8)	770	17.0	(10.5)	777
Two years						
Employed when ban introduced	14.4	(9.5)	725	17.7	(10.9)	716
New employees	12.6	(9.2)	190	16.8	(10.8)	182
All respondents	14.0	(9.5)	924	17.5	(10.8)	908

Table 4 Reported cigarette consumption for specific periods of workdays, at six months and two years following implementation of a total workplace smoking ban for the longitudinal subsample ($n=105$ cases with valid data)

Time period	Six months		Two years	
	Mean	(SD)	Mean	(SD)
Working outside	1.36	(2.2)	1.31	(2.2)
Coffee breaks	1.61*	(1.4)	2.14*	(1.8)
Lunch breaks	1.81	(1.3)	2.03	(1.7)
Before work	1.90*	(1.7)	2.19*	(2.0)
Hour after work	1.74	(1.3)	1.90	(1.6)
Rest of evening	6.51	(4.2)	6.90	(4.3)

* Significant differences between survey times, of at least $P < 0.05$.

of initial change in consumption, we used the difference between workday and leisure-day consumption at six months as an index of initial change (we assumed no differences in consumption as a function of workday before bans were introduced). This measure of initial change was unrelated to the extent of the compensatory increase.

We considered the hypothesis that reductions in consumption could be due to smokers cutting down their consumption as part of attempting to quit. We compared consumption changes from six months to two years after the ban, between those who reported they had tried to quit over this period, and those who had not, but found no difference. We also related consumption change to other variables associated with quitting, but found no relationship for wanting to quit, intention to quit, or self-efficacy, whether measured at the six-month follow up or at the two-year follow up.

Smokers' attitudes toward the ban²⁴ became significantly more positive between the six-month and two-year surveys (mean 19.2 (SD 0.41) vs 20.2 (SD 0.44); $P < 0.0001$ for the cross-sectional sample; and 19.2 vs 20.5; $P < 0.0001$ for the longitudinal subset). The change in consumption cannot be attributed to simple discontent with the ban. Controlling for six-month consumption levels, attitudes at six months were not related to consumption change, but attitudes at two years were significantly correlated with change (0.19, $P < 0.05$). More negative attitudes were associated with increases in consumption (more compensatory smoking).

We also used the longitudinal subsample to explore possible relationships between consumption change and reported unpleasantness if unable to smoke for an hour or two, reported effect of the ban on work performance, reported inconvenience from the ban (all measured at six months), and subsequent reports of going outside to smoke (at two

years). There was no relationship for reported unpleasantness or for reported inconvenience, either alone or after consumption levels were controlled for. We did find that smokers who reported that the ban had reduced their work performance at six months increased their consumption at two years more than did those who had not ($F = 19.6$, $df = 2, 105$, $P < 0.0001$). Smokers who reported going outside to smoke on most days at the two-year survey had increased their consumption more than those who did not (2.4 compared with 0.3 cigarettes a day increase; $t_{104} = 2.0$, $P < 0.05$).

Finally, we examined the advantages and disadvantages of smoking²² measured at two years. Here, we found a positive correlation between the advantages of smoking and increased compensation ($r = 0.23$), which was increased when consumption levels were controlled for ($r = 0.30$). There were no effects for the disadvantages of smoking. Given that the effect for the advantages of smoking could be one of the consumption change producing changes in the advantages, we explored the relationship between the advantages measured before the ban, and found essentially the same result ($r = 0.10$; not significant, rising to $r = 0.17$; $P < 0.05$ when six-month consumption was controlled).

Discussion

These findings suggest no change in smoking prevalence over the period from six months to two years after workplace smoking bans were implemented, and some increase in workday cigarette consumption. The lack of change in smoking prevalence contrasts with a drop in prevalence found in a cross-sectional 18-month follow-up survey of Telecom Australia workers,⁵ in which it was estimated that the observed changes in prevalence were about twice that which would be expected among members of similar occupational groups in Australia.^{4,5} Indeed, in the cross-sectional sample in this study, prevalence actually increased. This may be because we undersampled smokers at the six-month follow up. If this is true, then the drop in prevalence we reported to six months⁴ would have been an artefact. Our study had a longer time frame than the Telecom Australia study (two years as against 18 months) and a larger sample, so the failure to find evidence of increased cessation suggests that smoking prevalence reductions do not always occur, and may require policies which actively encourage cessation. Our impression from working with the two separate employer groups in each of these studies was that there was significantly more systematic effort directed at smoking control, and at health promotion generally, in Telecom than there was in the Australian public service, the setting of the study we have reported here. Policies in the public service worksites were equivalent because the bans had been implemented as part of a service-wide policy. Although we did observe some evidence of varying levels of implementation we were unable to quantify this. Additionally, in some

of the larger workplaces, implementation seemed to vary by section, area, or both.

The overall effect of the bans on workday cigarette consumption appears to have been reduced to between three and four cigarettes a day from the reduction of five cigarettes a day found six months after implementation. This suggests that reduced health risk among smokers subject to workplace smoking bans may actually be less than we have previously argued to be the case.⁴

The findings we report here are consistent with the increase being due to a range of factors. We suspect two are particularly important: increased smoking during the breaks in and around work; and the tendency to smoke more as one gets older, at least within the age range of most of those in this study. Based on the overall shift in the cross-sectional sample of 0.8 cigarettes a day, it suggests that for the longitudinal sample, consumption may have increased by about half a cigarette a day due to expected changes with aging. Some of this was also due to smoking more before work, perhaps to raise nicotine levels in anticipation of not being able to smoke until the first work break of the day. Of the remaining amount of compensatory smoking, some has been taken up by increased smoking during work breaks. Further, those who reported going outside to smoke more often were those who increased consumption more, suggesting the extra smoking during breaks was largely taking place outside. Given the increased variability of the consumption measures over time, it is likely that only a portion of smokers have moved to increased compensatory smoking, presumably those who go out frequently to smoke.

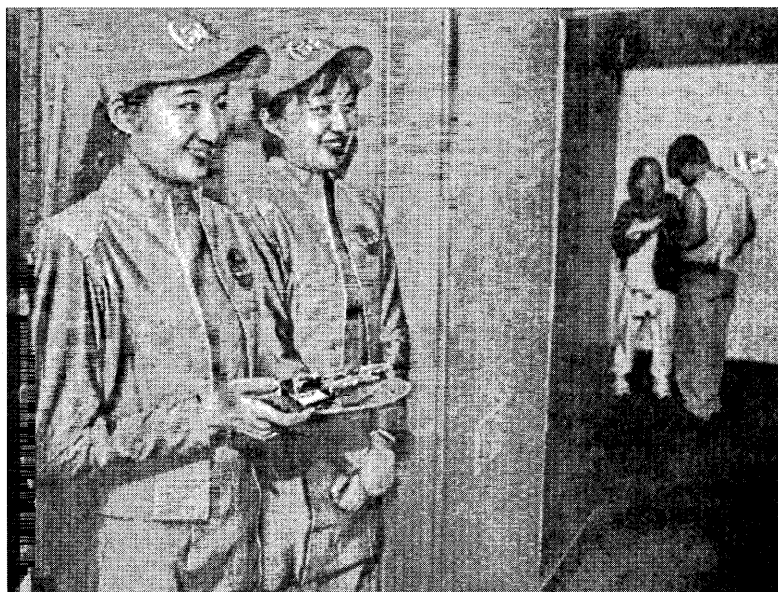
Our evidence suggests that the compensatory smoking we have observed is more likely to be a way of managing addiction to minimise effects on work and perhaps also subjective sense of wellbeing, rather than as an opportunity to avoid work for brief periods. Smokers concerned about the effects of the ban on their work performance at the six-month follow up increased their consumption more than those who were not concerned. Further, those higher in the advantages of smoking at two years (that is, those who see smoking having benefits for them) were more likely to increase their consumption. However, antagonism to the ban cannot be ruled out from having an effect, as negative attitudes did relate to increased consumption. However, the effect being stronger at two years than at six months is more consistent with the negative attitudes being a result of the problems caused, rather than being a motive for increased smoking. It is not clear why these changes have occurred over a period so long after the bans were introduced.

We would argue that forces may exist that have led these smokers to develop compensatory smoking patterns some months after being first subject to workplace smoking bans. With no opportunities to smoke while working, smokers may be forced to congregate in a limited number of available places (typically outside). As a result of this, smoking

may tend to become, over time, a more strongly socially cued behaviour. It is notable that we did not find compensatory smoking in another population we surveyed six and 18 months after the ban.⁵ As we have argued above, this population may have been better supported in their attempts to cope with the ban. Alternatively, given the lower initial decline in consumption we found there, they may simply have been quicker to develop the culture of smoking outside. That such compensatory smoking can occur demonstrates the power that cigarette smoking can exercise over the lives of regular users. It suggests that, if smokers are to gain maximum health benefits from workplace smoking bans, active strategies will be required to discourage compensatory smoking. To the extent that the effects are limited to a portion of smokers, it may be possible to identify them and to develop interventions to prevent or reverse such effects. This may require helping smokers to learn strategies to cope more effectively, without recourse to going outside the workplace to smoke.

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Women offer free cigarettes at the Nightman disco in Beijing, which BAT transforms into a "free-floating advertisement for its 555 brand" three nights a week. Source: Washington Post, 20 November 1996.