

Effects of Workplace Smoking Bans on Cigarette Consumption

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Abstract: A sample of staff working in the Australian Public Service (n = 2113) were surveyed two to four weeks before a mandated total ban on workplace smoking was introduced, and again five to six months later. Among the 391 smokers on whom complete

data were available, the workplace smoking bans were associated with reduced rates of smoking, particularly among heavier smokers where the reduction in consumption was over 25 percent. (*Am J Public Health* 1990; 80:178-180.)

Introduction

The evidence for effects of workplace bans on smoking cessation is mixed¹⁻⁵; the reduction in prevalence may be no greater than the spontaneous rate of smoking cessation. Three studies which investigated consumption in continuing smokers, however, found evidence of reductions.^{1,3,5}

We examined the impact on smoking behavior of the introduction of a workplace smoking ban in the Australian Public Service, Australia's largest employer group, with over 170,000 employees. The introduction of the ban was announced over a year before its implementation deadline and was followed by publicity, pre-deadline phasing in of restrictions at some worksites, and availability of programs to help smokers stop smoking or to control their consumption. This paper reports evidence of changes in smoking behavior in a longitudinal sample of smokers from work settings with varying levels of restrictions on smoking prior to the mandated ban.

Method

A total of 2,113 employees of the Australian Public Service (from six Departments spread across three cities and 44 locations) was surveyed two to four weeks before the deadline for implementation of the ban, and again five to six months after its introduction. There were 4,215 respondents to the initial survey (a 79 percent return rate). However, 26.3 percent did not include their names on the initial questionnaire and another 11.5 percent had left the public service or were on extended leave, leaving 2,623 whom we attempted to recontact. A total of 2,169 matched surveys were returned (a return rate of 83 percent). However, 56 of these were not usable, leaving the final sample of 2,113.

Preliminary analyses revealed that those who completed both surveys were less likely at the pre-test to have been smokers (22.7 percent) compared to 27.6 percent for those who completed the initial survey only. There were slightly more males in the final sample (55 percent) compared to the initial sample (51 percent), but there was no difference in mean age or in overall daily cigarette consumption.

To explore the effects of the ban on workday cigarette consumption, only the 391 smokers who reported being smokers at both surveys were considered. Excluded from this group were 39 occasional smokers who reported in the

initial survey that they did not smoke on workdays and five who did not provide consumption estimates.

The initial questionnaire, completed two to four weeks before the deadline for the introduction of the ban, dealt with smoking status, the extent of current restrictions in their workplace, and the manner in which any existing restrictions were brought about. Smokers were asked to estimate the number of cigarettes they usually smoked on both work and non-work days, and to recall the number of cigarettes they smoked in the previous 24 hours, divided into seven time periods (before work, while working indoors, while working outdoors, during coffee breaks, at lunch time, in the hour immediately after work, and in the rest of the evening). They were also asked about their attitudes to smoking and to smoking bans, but these data are reported elsewhere.⁶ A similar questionnaire was administered at follow-up five to six months later.

Results

Of the matched sample of 2113, 492 (or 23.3 percent) were current smokers at the time of the initial survey and 471 (or 22.3 percent) were smoking at follow-up, a reduction of 21 smokers. Fifty-seven smokers at the time of the initial survey were not smoking at follow-up, and 36 previous non-smokers reported smoking. This 1 percent reduction in prevalence over the six month period is about the estimated yearly reduction in prevalence of smoking for Australians.⁷ Of those who stopped, 58 percent had done so more than four months before completing the follow-up questionnaire, i.e., closely following the introduction of the ban.

To study the effects of pre-deadline restrictions on consumption, restrictions were divided into those where the person could smoke at their work station (43 percent of respondents), and those where they should not (57 percent). As can be seen from Table 1, the pre-deadline daily consumption difference between those who reported that smoking at their work station was not permitted and those where it was permitted was 4.5 cigarettes per day. Table 1 also shows that the mean reduction in smoking following the ban was 5.2 cigarettes where there had been no pre-deadline work station restrictions, and 1.9 cigarettes where there were such restrictions. This smaller reduction in the latter group should be seen in the light of their lower pre-deadline consumption.

To further explore the consumption reduction in respondents for whom there had been no restrictions prior to the mandated ban, levels of reported usual workday consumption before the ban were divided into three categories (light, moderate, and heavy) and the change from reported pre-ban workday consumption to post-ban consumption organized by usual pre-ban consumption (Figure 1). While light smokers did not change consumption, moderate smokers reduced by an average of 5.8 cigarettes per day (29.1 percent) and heavy smokers reduced by 7.9 cigarettes (26.6 percent).

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TABLE 1—Mean Daily Cigarette Consumption before and Six Months after the Workplace Smoking Ban was Introduced, According to Restrictions Previously Imposed

Time of Survey	Pre-ban Smoking Restrictions		Difference (between subjects effect)
	Banned at Work Station (n = 221)	Not Banned at Work Station (n = 170)	
Before ban	16.01	20.54	4.53 (2.45, 6.61)
After ban	14.16	15.36	1.20 (-0.55, 2.95)
Before-after difference (within subjects effect)	1.85 (1.00, 2.70)	5.18 (3.94, 6.42)	

NB: 95% confidence intervals in parentheses.

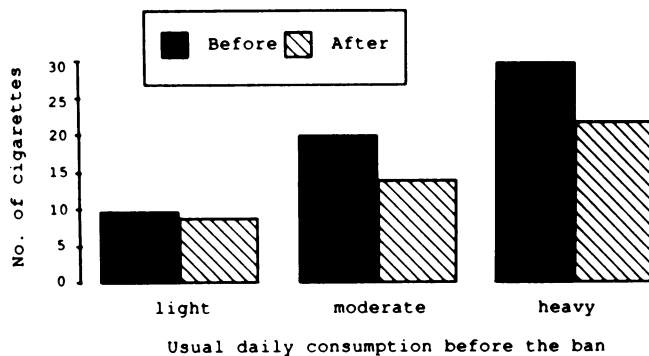


FIGURE 1—Mean Cigarettes Smoked per Day before and after the Ban among Previously Light, Moderate and Heavy Smokers
 Light = 1–14 cigarettes/day
 Moderate = 15–24 cigarettes/day
 Heavy = 25 or more cigarettes/day

As can be seen from Table 2, smokers reduced their average cigarette consumption while working inside by 7.0 cigarettes per day. This was partly compensated for by average increases of 0.7 of a cigarette smoked outside during working hours, and of less than half a cigarette both before work and in the hour after work. The pattern of change was generally consistent for the three smoker categories, except that heavy smokers tended to smoke more outside while working, and the light smokers showed evidence of compensation in the “rest of the evening.”

Discussion

Although some smokers may have used the ban’s onset and/or the increased availability of smoking cessation re-

sources as stimuli to stop, overall prevalence in the sample changed very little; it is not clear that this resulted in increased rates of smoking cessation compared with normal community rates. The introduction of the workplace smoking ban was associated with reduced levels of cigarette consumption, however. Small increases in rates of smoking outside of the work environment did not compensate for the enforced reduction. Comparison of smoking behavior under two prior levels of restriction on smoking corroborate the evidence that workplace smoking bans are associated with reduced overall levels of smoking, as do data, not reported here,* which showed similar drops in consumption among a small sample who completed 24-hour smoking diaries both before and after the ban.

Relatively little compensatory smoking occurred, and there is no evidence of greater compensation in heavier smokers, who are presumably the most addicted. The fact that smokers did not smoke more at coffee and lunch breaks suggests that the inconvenience of leaving the workplace to smoke was a sufficient obstacle to increased consumption. However, because we did not assess blood nicotine or cotinine levels directly, and did not ask for reports of puff topography, it is not possible for us to show that compensatory changes in puff topography did not occur. Smokers could have increased puff frequency, depth of inhalation, or amount smoked as compensatory mechanisms. However, the environmental restraints imposed by a workplace smoking ban do not favor compensation by changed smoking topography because they reduce opportunities to space cigarettes throughout the day, and compensatory smoking patterns

*Available on request to author.

TABLE 2—Mean Changes in Cigarette Consumption by Usual Smoking Level Reported in the Initial Survey for Those Who Could Smoke at the Work Stations at that Time, Broken Down by Time of Day

	Pre-testing smoking level			
	Light n = 48	Moderate n = 62	Heavy n = 60	Total n = 170
Before work	0.17 (-0.11, 0.45)	0.31 (0.07, 0.55)	0.80 (0.38, 1.22)	0.44 (0.25, 0.63)
Coffee breaks	-0.04 (-0.44, 0.36)	-0.16 (-0.60, 0.28)	0.07 (-0.42, 0.56)	0.05 (-0.20, 0.30)
Working inside	-2.83 (-3.60, -2.07)	-6.42 (-7.58, -5.26)	-10.97 (-12.79, -9.15)	-7.01 (-7.93, -6.09)
Working outside	0.46 (0.10, 0.82)	0.24 (-0.33, 0.81)	1.37 (0.50, 2.24)	0.70 (0.32, 1.08)
Lunch	0.38 (0.08, 0.67)	-0.13 (-0.37, 0.11)	0.13 (-0.33, 0.60)	0.11 (-0.09, 0.31)
Hour after work	0.46 (0.15, 0.77)	0.31 (0.01, 0.61)	0.55 (0.21, 0.89)	0.44 (0.62, 0.26)
Rest of evening	0.48 (-0.46, 1.42)	0.05 (-0.84, 0.93)	0.13 (-1.18, 1.44)	0.20 (-0.41, 0.81)
Total	0.94 (-2.51, 0.63)	-5.81 (-7.32, -4.30)	-7.9 (-10.62, -5.21)	-5.18 (-6.41, -3.95)

NB: 95% confidence intervals in parentheses.

would result in increased exposure, primarily in the evening when most cigarettes are already reported to be consumed. Nevertheless, if there were compensatory changes, then inferences about the benefits of the reduced consumption would be weakened.

Heavy smokers appear to benefit most from a workplace ban. As heavy smokers typically find smoking cessation most difficult,⁸ workplace smoking bans may provide a means by which they can reduce their consumption to less dangerous levels. Although controlled smoking has not been shown to be a generally sustainable strategy under normal conditions,⁹ the imposition of environmental restrictions may make long-term controlled smoking more viable in itself, and a useful way station for those who would eventually like to stop smoking completely.

To estimate the impact the ban may have on overall cigarette consumption, we extrapolated our results to the entire Australian Public Service. We estimate that 24.7 percent of 170,000 public servants or about 42,000 are smokers. Taking the estimate of reduced consumption of 5.2 cigarettes a day from the main sample in Table 1, and assuming 240 work days per year, the resultant reduction in cigarette consumption is about 52 million cigarettes. At the current cost of about 10 cents (Australian) for a cigarette, this represents a loss of \$5.2 million a year in retail tobacco sales to staff of the Australian Public Service alone. The public health benefits of these restrictions seem clear, but it is also evident what is motivating the tobacco companies to oppose them.

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NICHD Funds Two Research Centers on Learning Disabilities

The National Institute of Child Health and Human Development (NICHD) has announced the establishment of the first two US research centers to combine the biomedical and behavioral sciences to focus specifically on learning disabilities. One of the new centers, headed by Dr. Bennett Shaywitz, will be at Yale University in New Haven, CT; the other, headed by Dr. Martha Bridge Denckla, will be located at Johns Hopkins University in Baltimore, MD. Support for the two centers totals approximately \$1.5 million, with \$550,000 going to Yale, and almost \$1 million to Johns Hopkins.

The centers were established in response to the recommendations of the Interagency Committee on Learning Disabilities (ICLD), which was established by the Health Research Extension Act of 1985 to review proposals for research programs and facilities related to learning disabilities in children. The US Department of Education (1987) reports that 4.73 percent of all school-aged children (representing almost 1.9 million children) receive special education services for learning disabilities.

The Yale Center will include three projects: attention and conduct disorders in children and their interrelationships; attentional aspects of cognition; and a study of the distribution, types, and stability of reading, arithmetic and attention problems in a representative sample of children selected at age five and followed for two years.

The Johns Hopkins Center proposes a multidisciplinary program; through the convergence of biomedicine and education, investigators hope to discover how and why children develop learning disabilities. The program will include neurologists, psychiatrists, geneticists, statisticians, psychologists, special educators, and communication specialists.

The investigators plan to use molecular genetics technology and magnetic resonance imaging (MRI) to study the origins of learning disorders. The research will focus on the psychological processes related to brain development as well as the effects of educational intervention. To gain a better understanding of Attention-Deficit-Hyperactivity-Disorder, investigators will study the visual, spatial and motor deficits in families with a history of known genetic defects. Methodological approaches will include neuropsychological analysis and MRI correlates of intervention-resistant reading disabilities.