

Workplace smoking policies and their association with male employees' smoking behaviours: a cross-sectional survey in one company in China

JiaNing Gao,¹ PinPin Zheng,¹ JunLing Gao,¹ Simon Chapman,² Hua Fu¹

¹School of Public Health, Fudan University, Shanghai, PR China
²Sydney School of Public Health, University of Sydney, New South Wales, Australia

Correspondence to

Professor Hua Fu, School of Public Health, Fudan University, PO Box 248, 138 Yixueyuan Road, Shanghai 200032, PR China; hfu@fudan.edu.cn

Received 17 February 2010
 Accepted 27 October 2010
 Published Online First
 21 November 2010

ABSTRACT

Objectives The present work sought to evaluate different worksite smoking control policies and their associations with employees' smoking behaviours and attitudes among Chinese male workers.

Methods This was a cross-sectional survey with a self-administered standardised questionnaire, conducted among seven production workplaces of one multinational company in Shanghai in 2008. In total, 1043 male workers were involved. Current smoking prevalence, daily cigarette consumption, quitting intention and their potential association with workplace smoking control policies (smoke free or restricted smoking) were measured.

Results Current smoking prevalence in workplaces where smoke-free policies had been imposed for 3 years was 55.5%, about 18% lower than in workplaces that only restricted smoking. Smokers in smoke-free workplaces also smoked 3.4 cigarettes less per day, made more quit attempts, were more confident of successfully quitting and more willing to accept a company sponsored cessation programme. Those patterns declined or were not found among the workplaces where smoking control policies had been imposed for 10 years. Smoker quitting intentions were not associated with workplace smoking policies regardless of the duration of the policies imposed.

Conclusions A smoke-free workplace policy was found to have a significant association with lower smoking prevalence and daily cigarette consumption, but not with employee quitting intentions. Restrictive smoking policies had no impact on employee smoking behaviours. The impact of workplace smoking control policies may vary over time.

which is still believed to be in an early stage of the tobacco epidemic.⁶ The working population aged 30 to 50 years has the highest smoking prevalence.⁷ The proportions of relapsed quitters and former smokers are comparable in all occupational groups, with blue-collar workers having the lowest rate of quitting among various occupations. Workplaces are often described as an ideal setting to help smoking employees reduce cigarette consumption, increase their desire to quit and increase their likelihood of cessation by imposing policies prohibiting and restricting smoking in workplaces.⁸ Since the 1980s, the Chinese government has introduced a series of regulations to prohibit smoking in public settings such as public transport, theatres and hospitals. However, the implementation of these policies—and therefore their impact—has been far from satisfactory.⁹ Most workplace smoking control policies were inspired by safety and production concerns rather than to protect employees' health. This has resulted in a diversity of smoking policies imposed in workplaces over the country. Partially because of that, there have been few studies evaluating workplace smoking policies and their impact on employee smoking behaviours in China. Furthermore, most research on workplace smoking control policies has been focused on the protection of non-smokers, rather than on smokers who also benefit from the policies.

This study sought to investigate smoking prevalence and behaviours of Chinese workers whose workplaces had introduced types of smoking control policies for 3 or 10 years, to evaluate the relationship between these workplace smoking control policies and employees' smoking behaviours.

METHODS

A smoking-related survey was conducted in a multinational company in Shanghai as part of the company's health promotion campaign during December 2007 to July 2008. All seven production plants located in Shanghai were included in this survey. The workforces involved ranged from 49 to 613. Because of safety and production requirements, fully smoke free (n=3) or restrictive smoking policies (n=4) had been strictly implemented in all plants since their establishment. These policies had been equally and persistently implemented by all plants since their commencement. A 'smoke-free policy' was defined as smoking being prohibited everywhere at the workplace site. In such workplaces, smoking is only allowed outside the workplace fence. A 'restrictive smoking policy' means that smoking is only permitted in a designated indoor

As the most preventable cause of premature death and disability, cigarette smoking is one of the most important public health challenges worldwide.¹ After home, the workplace is where people spend most time and is thus the place where potential exposure to secondhand smoke (SHS) is greatest.² Smoke-free workplaces are important because of their value in protecting non-smoking employees from SHS and because creation of smoke-free environments is one of the most effective strategies for reducing tobacco consumption, increasing smokers' desire to quit and increasing their likelihood of cessation.^{3–5}

With a population of 1.3 billion, China is the world's largest producer and consumer of tobacco. As estimated in the China Tobacco Control Report 2007, there are more than 350 million smokers and about 540 million regular SHS smokers in China,



This paper is freely available online under the BMJ Journals unlocked scheme, see <http://tobaccocontrol.bmj.com/site/about/unlocked.xhtml>

smoking room on site. Of these seven plants, two worksites (one with a smoke-free policy, one with a restrictive smoking policy) had implemented their policies for 3 years, and the other five sites (two with smoke-free policies and three with restrictive smoking policies) had implemented their policies for about 10 years.

Before the survey, the purpose of the study was explained to the plant management and commitment obtained to support the study. To encourage worker participation, employees in all worksites were sent brochures and/or emails and exposed to posters promoting the survey. Each plant designated one survey coordinator who received a half-day training session. During March and May 2008, a self-administered questionnaire was distributed via the coordinators to all employees. Completion of the questionnaires was anonymous. Questions covered:

- ▶ Occupation: professionals and managers, laboratory workers and technicians, sales and marketing, production operators.
- ▶ Smoking status: ever smokers were defined as those who had smoked at least 100 lifetime cigarettes and current smokers were those who reporting smoking at the time of survey. Current smokers were further stratified as light (<10 cigarettes per day), moderate (10–19 cigarettes per day), heavy (20–29 cigarettes per day) and very heavy smokers (≥ 30 cigarettes per day).
- ▶ Intention to quit was categorised as no quitting intention in the next 6 months; intention to quit within 6 months; and intention to quit within 1 month. A quit attempt was defined as at least one period of 24 h of non-smoking in the past 12 months.

Other questions covered perceptions of smoking's impact on health, cessation benefits and attitudes to the smoking policies in their workplace.

The χ^2 test was used to examine associations between smoking control policies and several dependent smoking behavioural variables. The Mann–Whitney test was used for subgroups with sample sizes less than 5. To adjust for possible confounding factors, we performed multivariate analyses using multiple linear and multiple logistic regression models. The control variables included in the analyses were age, education, occupation, night shift work, intention to quit, number of quit attempts in the past year and the period of time smoking policies had been imposed in a worker's workplace. The dependent variables were daily cigarette consumption and quit intention. We categorised daily cigarette consumption as <10 cigarettes per day and ≥ 10 cigarettes per day; and quitting intention as no quitting intention in the next 6 months or having an intention to quit in the next 6 months. These analyses were performed with SPSS V.11.0 (SPSS, Chicago, Illinois, USA).

RESULTS

In total, 1132 questionnaires were distributed and 1070 responses were collected (response rate 94.5%). Non-responses were employees on extended sick leave or those who had been relocated to other workplaces in the company. After deleting records with missing values, 1043 (92%) records were available for analysis. The age of respondents ranged from 19–72 years, with the average age being 37 years old. Half the employees had 10–12 years of education, while 20% had an education of less than 10 years and 30% had at least college education. Two-thirds were production operators, professional/management and technical staff made up around 15% each and 7% were sales and marketing personnel. Since the number of female employees in these production plants was less than 10% and their smoking rate was quite low (<5%), they were excluded from the analysis in this study.

Table 1 shows current smoking prevalence and intention to quit by age, education, occupation and night shift workers with two types of smoking control policies in their workplaces. In workplaces that had implemented smoking policies for 3 years, employees from completely smoke-free workplaces had a smoking prevalence 24.3% lower than those with only restrictive smoking workplaces (55.5% vs 73.3%). However, there was no difference between employees working at sites that have had smoking policies in place for 10 years. Among occupational groups, production operators consistently had the highest smoking prevalence, regardless of the type of smoking policy at their workplaces and the period the policy had been imposed for ($p < 0.05$). For workplaces where smoking policies had been imposed for 10 years, professionals and laboratory technicians had the lowest smoking prevalence, while sales/marketing workers had a higher smoking prevalence (75.9%) than the production workers (68.6%). Trend analyses indicated that smoking prevalence decreased with higher education levels across all workplaces ($p < 0.01$), regardless of type of smoking policy. No such trend was found between smoking prevalence and age ($p > 0.05$). Night shift workers from plants with 3-year smoking control policies had a higher smoking prevalence (62.4% to 90.0%) than day shift workers (40.0% to 49.5%).

Table 2 shows patterns of smoking behaviours of employees in workplaces with different smoking restriction policies. Workplaces where a smoke-free policy had been imposed for 3 years had a greater proportion of light smokers, less heavy and very heavy smokers, a longer time until first cigarette after waking, a higher proportion of smokers having made quit attempts, more workers with quit intentions and more workers who were likely to accept the company cessation programme compared to smokers from restrictive smoking policy workplaces. However, other than the proportion of very heavy smokers and the time to first cigarette after waking, the patterns were not much different between the workplaces with different smoking policies in the

Table 1 Current smoking prevalence among employees by type of workplace smoking policy imposed for 3 or 10 years

	Policy in place for 3 years		Policy in place for 10 years	
	Restricted, % (n)	Smoke free, % (n)	Restricted, % (n)	Smoke free, % (n)
Age				
<30	77.4 (24)	45.8 (72)*	39.6 (144)	40.4 (47)
30–39	61.5 (13)	61.7 (133)	59.7 (139)	61.5 (65)
40–49	–	47.1 (17)	73.6 (208)	64.6 (48)
50+	100 (1)	60.0 (5)	62.0 (100)	80.0 (20)
Education				
≤ 9 years	–	–	64.6 (130)	78.3 (23)
10–12 years	87.5 (32)	61.5 (117)*	73.6 (277)	72.3 (83)
13–14 years	55.6 (9)	59.7 (62)†	50.0 (80)	46.2 (39)
≥ 15 years	–	35.4 (48)	26.0 (104)	28.6 (35)
Occupation				
Production operators	87.5 (32)	59.9 (157)*	68.6 (369)	71.7 (106)
Professionals	20.0 (5)	33.3 (18)†	34.6 (78)	36.4 (33)
Laboratory technicians	33.3 (6)	48.9 (47)†	36.0 (86)	41.2 (34)
Sales/marketing	100 (1)	60.0 (5)	75.9 (58)	57.1 (7)†
Night shift work				
Yes	90.0 (30)	62.4 (157)*	70.1 (321)	72.0 (75)
No	40.0 (15)	40.0 (70)	48.1 (270)	49.5 (105)
Total	73.3 (45)	55.5 (227)*	60.1 (591)	58.9 (180)

* $p < 0.01$.

†Using the Mann–Whitney test.

Table 2 Smoking behaviours among smokers by type of smoking policy in their workplace imposed for 3 or 10 years

	Policy in place for 3 years		Policy in place for 10 years	
	Restricted (N=33)%	Smoke free (N=126)%	Restricted (N=355)%	Smoke free (N=106)%
Cigarettes smoked daily				
Light	6.1	31.7*	21.1	30.2
Moderate	60.6	55.6	44.8	48.1
Heavy	33.3	12.7*	27.3	20.8
Very heavy	—	—	6.8	0.9*
Time to first cigarette after waking (min)				
<5	6.1	4.8	17.2	9.4*
6–30	57.6	33.3*	36.6	32.1
31–60	30.3	23.0	16.1	20.8
>60	6.0	38.9*	30.1	37.7
Quitting intention				
No intention in next 6 months	33.3	51.6	55.8	58.5
Intend quitting within 6 months	57.6	39.7	36.0	36.8
Intend quitting within 1 month	9.1	8.7	8.2	4.7
No. of quitting attempts in past 12 months				
0	33.3	14.3*	48.5	46.2
1	24.2	14.3	20.0	14.2
2	24.2	32.5	9.0	10.4
>2	18.2	38.9*	22.5	29.2
Self-confidence about quitting				
Will not succeed	6.1	9.5	10.1	10.4
May not succeed	18.2	12.7	16.3	11.3
Uncertain	45.5	20.6*	25.4	30.2
May succeed	24.2	39.7	28.7	36.8
Will succeed	6.0	17.5*	19.5	11.3
Willing to attend company cessation programme				
Yes	55.6	75.8	71.7	70.0
No	44.4	24.2*	28.3	30.0

* $p < 0.05$.

10-year policy group. The proportion of smokers who smoked their first cigarette within 5 min after waking up was the highest (17.2%) in 10-year restrictive smoking workplaces. This was nearly two times the proportion (9.4%) in the 10-year smoke-free workplaces and three times that of the workplaces with 3-year policies (4.8% to 6.1%). The workplaces with restrictive smoking policies had the highest numbers of very heavy smokers (6.8%) compared to all other groups (0% to 0.9%).

Although a majority (70%) of all smokers believed smoking had a moderate to severe impact on their health, nearly a quarter of employees thought smoking was either harmless or had only a mild impact on their health. Around 15% of smokers believed that quitting smoking even had a negative impact to their health. These findings were similar to the results of the 1996 China National Smoking Prevalence Survey and the results of previous research.^{10–11} However, around 90% of smokers were supportive of smoking policies in workplaces and public settings.

The results of multiple logistic and linear regression analyses on the relationship between daily cigarette consumption and quitting intention and potential confounders are shown in table 3. No significant association between age and daily cigarette consumption was found among workplaces with 3 years of smoking policy implementation. But smokers from workplaces with 10 years of restrictive smoking control policies who were aged more than 40 years consumed more cigarettes, 3–3.8 per day, than younger smokers. However, the smokers in the over 50

age group were twice as likely to intend to quit as smokers aged less than 30 years.

Education was not associated with daily cigarette consumption, or with quitting intention. The professional group from workplaces with 10 years of restrictive smoking policies smoked significantly less—2.5 cigarettes per day—than production operators ($p < 0.01$). The laboratory technicians from workplaces with smoking policies in place for 3 years had significantly stronger quitting intentions, while similar responses were also found in the sales and marketing groups from the workplaces that had smoking control policies in place for 10 years. For unknown reasons, smokers from workplaces that had had smoking policies for 10 years showed more significant quitting attempts over the past year and more confidence with regard to their quitting results. This was not found among the employees from the workplaces that had had smoking policies for 3 years. Smokers who were willing to participate in a company sponsored cessation programme were unsurprisingly 3–6 times more likely to intend to quit smoking than those uninterested in the company cessation programme ($p < 0.01$), no matter how long the smoking control policies had been imposed at their workplaces.

For workplaces with 3-year smoking policies, employees from completely smoke-free workplaces smoked significantly less (3.4 cigarettes per day) than smokers from workplaces with only restrictive smoking policies ($p < 0.01$). However, this impact was not seen between the workplaces where smoking policies had been in place for 10 years.

No significant association was found between workplace smoking control policies and smokers' quitting attitudes regardless of how long the smoking policies had been in place.

DISCUSSION

This is the first study in China to investigate smoking control policies in plants and their association with employee smoking behaviours, as well as their changes over time. The results show that workplace smoking control policies may have a strong association with smoking prevalence and daily cigarette consumption, but their association with smokers' quitting intentions is weak. This association seems more significant among workplaces that have had their policies in place for a shorter time.

Workplace smoke-free policy appeared to have a strong association with lower smoking prevalence, as well as reducing the number of cigarettes smoked. Smoke-free policies were also associated with a greater proportion of light smokers, fewer heavy smokers and a longer time until first cigarette after waking. The patterns of smoking prevalence and daily cigarette consumption in restrictive smoking workplaces were quite similar to that reported in the 2002 China national smoking survey, although the majority of workplaces in the national survey did not restrict onsite smoking at all.¹² Our results are also consistent with the findings of a Taiwanese study in which the smoking prevalence of male employees was significantly lower (29.5%) in workplaces with prohibitive smoking policies than those with either restrictive (42.7%) or unrestricted policies (44.5%).¹³

The pronounced effects of a completely smoke-free workplace on smoking prevalence and daily cigarette consumption may have decayed over time: the significant impact found in the workplaces where smoke-free policies had been imposed for 3 years was not found in workplaces where the policy had been implemented for 10 years. Smoking prevalences in workplaces where restrictive or smoke-free smoking policies had been

Table 3 Results of multiple logistic (ORs) and multiple linear (β weight) regression analyses of factors associated with smokers' daily cigarette consumption and quitting attitudes (N=620)

	Workplace with smoking policies implemented for 3 years		Workplace with smoking policies implemented for 10 years	
	Daily cigarette consumption, β weight (95% CI)	Quitting attitudes, OR (95% CI)	Daily cigarette consumption, β weight (95% CI)	Quitting attitudes, OR (95% CI)
Age				
<30	Reference	Reference	Reference	Reference
30–39	1.431 (–0.325 to 3.187)	0.411 (0.158 to 1.068)	1.051 (–0.783 to 2.884)	1.140 (0.577 to 2.253)
40–39	–2.830 (–6.467 to 0.806)	0.313 (0.040 to 2.457)	3.050 (1.261 to 4.840)†	1.416 (0.723 to 2.772)
50+	1.187 (–3.823 to 6.198)	2.290 (0.074 to 70.398)	3.866 (1.727 to 6.006)†	2.399 (1.072 to 5.367)*
Education				
≤9 years	Reference	Reference	Reference	Reference
10–12 years	–0.146 (–1.941 to 1.650)	0.613 (0.229 to 1.635)	0.934 (–0.540 to 2.409)	0.692 (0.395 to 1.212)
13–14 years	1.298 (–1.667 to 4.264)	0.425 (0.077 to 2.357)	0.127 (–2.140 to 2.395)	1.286 (0.552 to 3.000)
≥15 years	–	–	–1.165 (–4.199 to 1.870)	1.580 (0.506 to 4.939)
Occupation				
Production operators	Reference	Reference	Reference	Reference
Professionals	–1.672 (–5.840 to 2.497)	0.657 (0.067 to 6.493)	–2.551 (–4.954 to –0.147)*	0.687 (0.267 to 1.769)
Laboratory technicians	–0.348 (–2.605 to 1.909)	13.168 (2.506 to 69.187)†	–2.007 (–4.557 to 0.544)	0.571 (0.221 to 1.476)
Sales/marketing	–1.872 (–7.477 to 3.732)	1.908 (0.083 to 43.688)	–0.993 (–3.009 to 1.023)	3.159 (1.461 to 6.829)†
Night shift work				
No	Reference	Reference	Reference	Reference
Yes	1.634 (–0.545 to 3.812)	2.114 (0.593 to 7.519)	–0.832 (–2.201 to –0.538)	2.074 (1.212 to 3.546)†
First cigarette after waking up (min)				
<5	Reference	Reference	Reference	Reference
6–30	–1.825 (–5.596 to 1.945)	0.348 (0.043 to 2.831)	–3.776 (–5.577 to –1.976)†	1.800 (0.870 to 3.722)
31–60	–4.838 (–8.557 to –1.120)*	0.749 (0.093 to 6.018)	–5.589 (–7.710 to –3.468)†	1.632 (0.712 to 3.741)
>60	–7.266 (–10.921 to –3.612)†	0.730 (0.094 to 5.695)	–8.674 (–10.609 to –6.738)†	2.842 (1.312 to 6.158)†
No. of quitting attempts in the past 12 months				
0	Reference	Reference	Reference	Reference
1	2.579 (0.030 to 5.129)*	0.474 (0.122 to 1.840)	–0.470 (–2.081 to 1.142)	2.617 (1.438 to 4.762)†
2	1.764 (–0.430 to 3.959)	0.346 (0.103 to 1.163)	0.019 (–2.094 to 2.132)	4.041 (1.873 to 8.719)†
>2	1.281 (–0.977 to 3.539)	1.370 (0.384 to 4.883)	–1.272 (–2.804 to 0.259)	4.591 (2.607 to 8.086)†
Self-confidence about quitting				
Will not succeed	Reference	Reference	Reference	Reference
May not succeed	–0.295 (–3.549 to 2.959)	0.450 (0.073 to 2.771)	1.889 (–0.547 to 4.324)	2.870 (0.991 to 8.316)
Uncertain	–0.843 (–3.791 to 2.105)	1.852 (0.372 to 9.229)	1.533 (–0.666 to 3.732)	1.698 (0.632 to 4.563)
May succeed	–0.365 (–3.294 to 2.563)	0.841 (0.169 to 4.189)	0.525 (–1.707 to 2.757)	4.707 (1.774 to 12.487)†
Will succeed	–3.265 (–6.537 to 0.006)	2.264 (0.373 to 13.746)	–0.243 (–2.613 to 2.127)	5.697 (2.017 to 16.093)†
Acceptance to cessation programme in workplace				
No	Reference	Reference	Reference	Reference
Yes	–0.443 (–2.243 to 1.358)	6.369 (2.227 to 18.182)†	–0.018 (–1.335 to 1.299)	2.793 (1.655 to 4.717)†
Smoking policies in workplace				
Restrictive smoking	Reference	Reference	Reference	Reference
Smoke free	–3.384 (–5.529 to 1.240)†	0.433 (0.136 to 1.384)	–0.549 (–1.977 to 0.878)	0.924 (0.539 to 1.584)

* $p < 0.05$.
† $p < 0.01$.

imposed for 10 years were quite similar to each other (60.1% vs 58.9%), which was also similar to the 2002 national survey result of 57.4%.

Occupation is another factor associated with employee smoking behaviours. In our study, production operators had the highest smoking rate among all occupation groups. But salesmen and marketing employees, who are normally more educated than production operators, had very similar smoking rates to production operators. As emphasised in the 2009 China National Smoking Report, awareness of the health impacts of cigarette smoking among the Chinese population is still very low and this issue is further exacerbated by the implementation of largely ineffective health promotion campaigns.¹⁴ More importantly, cigarettes are still a common commercial product in China and smoking is perceived as an important component of social activity and a way of communicating.^{10 15 16} Mao *et al*, in their study on factors influencing smoking by Chinese adults, indicated

that in most Chinese social situations positive perceptions of smoking will be highly influential in increasing smoking rates and uptake.¹⁷ This may partially explain the highest smoking rate being in sales/marketing employees in our study. Because of their working roles, those group employees are exposed daily to such pro-smoking cultural influences and have more opportunities to smoke with their customers or clients. Their high smoking rates, therefore, could reflect a combination of lack of knowledge of health effects, permissive smoking in most public settings (even if smoking is not allowed in their workplaces) and positive social perceptions of smoking. However, education appears to impact on quitting behaviour. We found university educated smokers had a higher proportion who reported that they had made quitting attempts in the past 12 months compared with the lowest educated group (50.5% vs 26.5%, $p < 0.01$).

Although nearly half of smokers reported having no quitting intention in the coming 6 months, around 60% of current

smokers had tried to stop for at least a day in the preceding 12 months. This contrasts with smokers from Western countries with long-standing tobacco control policies, such as in the US where most smokers report wanting to quit.^{18 19} While smoke-free policies have been extensively implemented in workplaces in the West, even more importantly cigarette smoking is increasingly being denormalised, making smoking a socially unacceptable behaviour.²⁰ Unfortunately, this is far from being the case in China and serves to weaken the effects of workplace smoking restrictions.

We found no significant association between smoking control policies and employees' quitting intentions. Implementing workplace smoke-free policies for safety and production reasons, as opposed to employee health protection, could partially be relevant in explaining this. Smedslund *et al*, using meta-analytic procedures, compared 19 studies on the effectiveness of workplace cessation programmes and found smoking cessation interventions showed initial effectiveness, but the effect seemed to decrease over time and was not present beyond 12 months.²¹ The authors attributed this to the proportion of committed 'hardcore' smokers who may be less motivated to quit and more likely to be nicotine dependent. In our study, the workplaces where smoking policies had been imposed for 10 years had more heavy to very heavy smokers than the workplaces where smoking control policies had been imposed for 3 years. The smokers from these workplaces with policies in place for 10 years also made less quitting attempts (50%) in the last 12 months than smokers (80%) from workplaces where the relevant smoking restrictions had been implemented for 3 years.

After China ratified the WHO Framework Convention on Tobacco Control in 2005, a series of regulations were enacted by the Chinese government to strengthen tobacco control in public settings such as public transport, cinemas and hospitals, but very few workplaces were affected.¹⁴ Even in these public settings, the effects of tobacco control are still less than satisfactory. China is still considered to be in the early stages of the tobacco epidemic. The prevalence of smoking in Chinese men seems to have levelled off, but has not yet dropped. In 2005, as estimated, a total of 673 000 deaths were attributable to smoking in China.²² The adverse health effects of smoking cause a huge economic burden to the Chinese society, with an estimated cost of \$5 billion in 2000. Of this, \$1.7 billion or 3.1% of national healthcare expenditure, was spent on treating smoking-related diseases.²³ To reduce such a huge social and economic burden, effective and sustained tobacco control programmes are urgently needed to curb the tobacco epidemic in China. More stringent smoking control policy, therefore, needs to be emphasised in workplaces in China to move more smokers to consider quitting smoking.

The limitations of this study are those inherent in any cross-sectional research: no causal inferences can be drawn between workplace smoking control policies and employee smoking behaviours. It is possible that lower smoking rates were evident among employees whose workplaces imposed smoke-free policy before the policies were adopted. Small sample sizes in some subgroups could be another bias in this study, which may limit our data analyses. Another possible limitation in this study is that we relied on participant self-report of smoking behaviour. However, we can conceive of no reasons in the conduct of the survey as to why respondents should falsely report their smoking status. Since this survey was conducted in one multinational company in Shanghai, the findings may not reflect China at large.

What this paper adds

- ▶ Smoking restrictions are uncommon in Chinese workplaces, and where they have been adopted it is primarily due to safety and production concerns and not for the protection of employee health.
- ▶ As the majority of Chinese smokers are part of the working population, workplace smoking policies have the potential to positively impact smoking rates and attitudes. This is the first study to investigate types of smoking control policies in Chinese workplaces and their potential impact on employee smoking behaviours.
- ▶ The study results show a significant association between completely smoke-free workplaces and employee smoking prevalence and daily cigarette consumption, although these impacts diminished over time. These findings underline the need for more stringent smoking control policies to be enacted in all Chinese workplaces.

In conclusion, this study found a significant association between the stringency of workplace tobacco control policy and lower smoking prevalence and daily cigarette consumption, although these impacts varied over time. However, smokers' quitting intentions were not associated with workplace smoking policies. These results call for more stringent workplace smoking policies. Such initiatives should also be extended across China to other public places and the home.

Funding This work was partially funded by the Shanghai Health Bureau.

Competing interests None declared.

Provenance and peer review Not commissioned; externally peer reviewed.

REFERENCES

1. *WHO Framework Convention on Tobacco Control*. Geneva: World Health Organization, 2003.
2. **Marcus BH**, Emmons KM, Abrams DB, *et al*. Restrictive workplace smoking policies: impact on non-smokers' tobacco exposure. *J Public Health Policy* 1992;**13**:42–51.
3. **Glasgow RE**, Cummings KM, Hyland A. relationship of worksite smoking policy to changes in employee tobacco use: findings from COMMIT. *Tob Control* 1997;**6**(suppl 2):S44–8.
4. **Chapman S**, Borland R, Scollo M, *et al*. The impact of smoke-free workplaces on declining cigarette consumption in Australia and the United States. *Am J Public Health* 1999;**89**:1018–23.
5. **Bauer JE**, Hyland A, Li Q, *et al*. A longitude assessment of the impact of smoke-free worksite policies to tobacco use. *Am J Public Health* 2008;**98**:1024–9.
6. *China Tobacco Control Report*. Beijing: China Ministry of Health, 2007.
7. **Yang GH**, Ma JM, Liu N, *et al*. Smoking and passive smoking in Chinese, 2002. *Chinese J of Epidemiology* 2005;**26**:77–83 (in Chinese).
8. **Fichtenberg CM**, Glantz SA. Effect of smoke-free workplaces on smoking behaviors: systematic review. *BMJ* 2002;**325**:188–94.
9. **Yang GH**, Fang LX, Tan J, *et al*. Smoking in China: findings of the 1996 national prevalence survey. *JAMA* 1999;**282**:1247–53.
10. **Yang GH**, Ma JM, Chen AP, *et al*. Smoking cessation in China: findings from the 1996 national prevalence survey. *Tob Control* 2001;**10**:170–4.
11. **Zheng PP**, Zheng LX, Guo FX, *et al*. Two year follow-up and evaluation of group intervention on smoking cessation. *Journal of Hygiene Research* 2008;**37**:53–6.
12. **Yang GH**, Ma J, Liu N, *et al*. Smoking and passive smoking in China. *Zhonghua Liu Xing Bing Xue Za Zhi* 2002;**26**:77–83 (in Chinese).
13. **Hu SC**, Huang SY, Li D, *et al*. Workplace smoking policies in Taiwan and their association with employees' smoking behaviours. *European J Pub Health* 2005;**15**:270–5.
14. *China Tobacco Control Report*. Beijing: China Ministry of Health, 2009.
15. **Mao ZH**, Dewei H, Yang GH. New evaluation of the demand for cigarettes Chinese residents. *Chinese Health Economics* 2005;**24**:45–8 (in Chinese).

16. **Zheng PP**, Ye TT, Fu H, *et al.* Current situation of smoking prevalence in Changqiao district, Shanghai. *Environmental & Occupational Medicine* 2004;**21**:145–8 (in Chinese).
17. **Mao ZH**, Yang GH, Ma JM, *et al.* Adults' demand of cigarettes and its influencing factors in China. *Soft Science of Health* 2003;**17**:19–23 (in Chinese).
18. *The Health Consequences Of Smoking: A Report of the Surgeon General*. Atlanta, Ga: Centers for Disease Control and Prevention, 2004.
19. Cigarette smoking among adults and trends in smoking cessation-United States. *MMRW* 2009;**58**:1227–32.
20. **Chapman S**, Freeman B. Markers of the denormalisation of smoking and the tobacco industry. *Tob Control* 2008;**17**:25–31.
21. **Smedslund G**, Fisher KJ, Boles SM, *et al.* The effectiveness of workplace smoking cessation programmes: a meta-analysis of recent studies. *Tob Control* 2004;**13**:197–204.
22. **Gu DF**, Kelly TN, Wu XG, *et al.* Mortality attributable to smoking in China. *N Engl J Med* 2009;**360**:150–9.
23. **Sung HY**, Wang L, Jin S, *et al.* Economic burden of smoking in China, 2000. *Tob Control* 2006;**15**(suppl):i5–11.