Published in final edited form as:

Asia Pac J Public Health. 2015 March ; 27(2): NP606–NP615. doi:10.1177/1010539513483826.

Smoking Intensity among Male Factory Workers in Kunming, China

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Abstract

Introduction—This study investigated the intensity of cigarette consumption and its correlates among male factory workers in China, who has benefitted little from recent public health efforts to reduce smoking rates.

Methods—Data was collected from men working in factories of Kunming city, Yunnan, China, who are current daily smokers (N = 490). A multinomial logistic regression was conducted to examine the factors in association with smoking intensity in light, moderate, and heavy level.

Results—Light smoking correlated with social smoking, smoking the first cigarette later in the day, self-reported health condition, and quit intention. Heavy smoking was associated with purchase of lower priced cigarettes, difficulty refraining from smoking, and pre-hypertensive blood pressure.

Conclusion—Analyses of the ways specific demographic groups consume cigarettes in smoking prevalent regions can help guide tobacco-control strategies. Findings support that the selection of tobacco-control strategies may take smoking intensity and its correlates of the targeted population into consideration.

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Declaration of Interests:
None Declared.

Keywords

smoking intensity; pro-tobacco environment; tobacco control in China

INTRODUCTION

Urbanization and industrialization of the labor force have been cardinal features of China's sociological transformation during the last two decades.¹ As China has become “the factory of the world,” more and more Chinese have moved into urban blue-collar jobs. The smoking epidemic among these workers – particularly among men – is of a major public health concern with significant economical and health burdens that requires urgent and effective tobacco-control efforts.

In China, the world's largest consuming and producing country of cigarettes, smoking prevalence has declined in the past 15 years, even as it has remained highly gendered. Among males, national smoking rates have dropped from 63% in 1996, to 57.4% in 2002, and 54% in 2010.² Smoking prevalence among females in China has also declined and remains low: with a 3.8% national female smoking rate in 1996, 2.6% in 2002, and 2.1% in 2010.

A notable demographic exception in these recent public health victories across China has been male blue-collar workers. From 2002 to 2010, whereas smoking prevalence among men in many occupations remained constant or declined, smoking among male blue-collar workers increased (from 57% in 2002 to 67% in 2010).² Similar to the United States and other countries in Europe³, China's highest smoking rate has been found in men of blue-collar jobs (67%) when compared to men in other occupations, such as farming (61%), government service (54%), healthcare (41%), and education (38%).²

To gain insights in developing tobacco-control strategies for China's blue-collar workers, this study focuses on male current smokers employed in factories of Kunming, the capital city of Southwest China's Yunnan province.

Yunnan province is a region where male smoking prevalence hovers between 76-80%, among the highest in China.⁴⁻⁶ Among medical professionals in Yunnan, over half are current smokers in 2009. In Kunming city, over half of the male adults were current smokers as of 2008.⁷ This exceptionally high smoking prevalence among males in Kunming, Yunnan is not surprising in light of the region's pro-tobacco environment.

Yunnan, also known as China's “tobacco kingdom,” is one of the largest tobacco consuming and producing provinces in the country, with more than 50% of its tax revenue coming from the tobacco business.⁸ Nearly the entire population in Yunnan relies on tobacco production, at one level or another, not simply tobacco farmers, cigarette manufacture workers, or retailers. Three of the most popular brands in China today are Yunnan's Yuxi, Yunyan, Hongtashan.⁹ In 2011, the Hongyunhonghe Group sold over 1 billion Yunyan cigarettes in Kunming city alone.¹⁰

In contemporary China, cigarette prices vary significantly, ranging from 1.5 yuan/pack (or approximately 0.24 USD) to 150 yuan/pack (or 22.42 USD) with quite a significant numbers of brands with ≤ 4 yuan (or 0.75 USD) per pack.¹¹ Given the availability and variability of local brands, cigarettes are not only accessible and affordable, but also easily used as social status proxies.

The combination of various socioeconomic factors such as tobacco-producing, affordability of cigarettes, and the transition from farming to blue-collar work make Yunnan a particularly challenging region for effective tobacco control. To enhance understanding of blue-collar smoking in China, this study describes smoking intensity among male factory workers in Yunnan's provincial capital Kunming city and examines the sociodemographic and psychological correlates in association with smoking intensities. These findings will provide valuable insights for the formulation of new tobacco-control interventions well suited to a growing population, that is blue-collar men within China, at high risk of smoking exposure.

METHODS

Sample and data collection

Data were collected in a baseline assessment of smoking behaviors. The respondents were recruited from four Kunming enterprises: electrical machinery, metallurgical, automobile, and constructional factories. Ethical approval was sought and granted from Stanford's Non-Medical Institutional Review Board.

550 participants completed the baseline assessment. All were male, over 18 years of age, smoked at least 1 cigarette daily, and were working in one of the four factory settings at the time of the assessment.

A total of 60 respondents who were employed on time-limited positions were excluded from the study to ensure greater work-week uniformity and increase representativeness of the study sample of the workforce population. We compared the 60 excluded respondents with the 490 respondents included in the analyses in terms of smoking behaviors and demographic characteristics. These excluded smokers were not statistically different in smoking intensity compared to the included smokers.

Measure

Smoking intensity—Participants were asked to report the number of cigarettes they smoked in the past 24 hours. Based on their responses, we categorized the study sample into three levels of smoking intensities: light (< 10 cigarettes daily), moderate (between 10 to 20 cigarettes daily), and heavy (> 20 cigarettes daily). These definitions are consistent with previous studies conducted outside of China.¹²⁻¹⁵

Background characteristics—As part of a self-report questionnaire, these sociodemographic variables were assessed: age, education (less than high school, high school, college, and graduate education), family yearly income (coded based on the sample's median: $< 25,000$ yuan vs 25,000 yuan or higher), and marital status (married vs others).

Participants were asked to identify their occupation from a list of positions. Two variables were created based on participant's occupation: work class (managerial vs non-managerial), and working type (blue vs white collar).

Smoking history and behaviors—We assessed years of smoking by asking respondents “How old were you when you started smoking regularly?” Participants were asked to indicate the price of the cigarettes that they smoke in Yuan per pack (coded into < 4 yuan vs. > 4 yuan). They were asked to indicate the number of cigarettes they smoked in the past 7 days when they were alone with no one else around. Participants were classified as “social smokers” if < 10% of their total smoked cigarettes in the past 7 days were smoked alone and not with other people (which implies > 90% of their total smoked cigarettes were smoked with people). Other smoking behaviors related to levels of nicotine dependence were assessed by asking respondents “Do you inhale when you smoke?” and by using 5 items from the Fagerstrom Test of Nicotine Dependence¹⁶ assessing time to first cigarette; difficulty refraining from smoking; cigarette hate most to give up; smoked more during the first hours after waking; and smoked when being so ill in bed most day. For previous quit attempts and intent to quit information, respondents were asked how many times they quit smoking for at least 24 hours during the past year as well as whether or not they were seriously contemplating quitting smoking. Those contemplating quitting within the next 30 days, 60 days, 6 months, or 24 months we classified as having a quit intention.

Physical and mental health status—Four variables were included to measure respondents' health conditions: perceived general health status, concurrent health issues, blood pressure, and self-reported depression symptoms. Perceived general health was assessed asking respondents “How would you describe your health?” (coded as excellent/good vs. fair/poor). They were also ask to indicate which health issues they were experiencing at the time of the survey. The number of concurrent health issues was coded in three categories: none, 1, and 2 or more. Research staff measured respondents' blood pressure on site at the time of the survey; those with blood pressure over 120/80 mmHg were classified as having blood pressure in the pre-hypertensive range.¹⁷ Self-reported depression symptoms was assessed by asking respondents to indicate the frequency of experiencing each of the three symptoms in the past 7 days: (1) having trouble shaking off sad feelings, (2) feeling depressed, and (3) feeling sad, using a 5-point scale: 1(0 days in the past 7 days); 2 (1 day); 3 (2 - 3 days); 4 (4-5 days); and 5 (6-7 days). A total score, ranges from 3 to 15, was computed by summing up all three items. The internal consistency of the 3 depression items as measured by Cronbach's alpha was 0.86 for this sample.

DATA ANALYSIS

Data were analyzed using STATA version 11. We calculated summary statistics and standard errors for each variable in terms of the three levels of smoking intensity (light, moderate, and heavy). To examine the bivariate associations of each variable with smoking intensity, Chi-square tests were used for categorical variables and ANOVA was used for continuous variables. Multinomial logistic regression was then conducted to examine factors associated with the 3 groups of smokers who smoked in light, moderate, and heavy levels. The model included preselected *a priori* covariates (age, education, family income, working

class, blue/white collars, marital status, time to first cigarette, number of concurrent health issues, and depression scores) found in the literature to be associated with smoking intensity in Chinese populations and other variables that attained a p-value ≤ 0.20 in the bivariate comparisons.²²

RESULTS

Sample characteristics

Table 1 presents characteristics of the overall sample (N = 490) and by smoking intensity levels: light, moderate, and heavy. A majority of the respondents was married (81%) with ages ranged from 20 to 70 (36% <35, 36% 35 – 44, 7% 45-54, 21% 55+; mean = 43, SD = 10.83), two-thirds had at least a high school education (36% high school graduates and 22% college graduates), over three-quarters working in blue-collar positions (79%), and over half (59%) earning family income < 25,000 yuan per year, well below the national urban annual salary average of 29,229 yuan of 2008²³.

The daily cigarette consumption of the sample ranged from 1 to 60 (mean = 17.89, SD = 8.49). A majority (69%) of the respondents smoked between 10 and 20 cigarettes daily, 13% smoked under 10 cigarettes, and 18% smoked above 20 cigarettes. The average age started smoking regularly was 21 (SD = 5.14) (16% started before age of 18, 48% 18 -21, 27% 22 - 34, 9% 35+). A majority of the respondents (90%) spent >4 yuan/pack of cigarettes smoked. About 12% indicated they were predominantly social smokers smoking >90% of their cigarettes with others. Over half of respondents (54%) had their first cigarette of the day within 30 minutes of awakening, FTND score computed including cigarettes daily consumption of the study sample was 3.26 (2.04), 44% were considered dependent based on FTND score 4 or greater¹⁶. The FTND scores for light, moderate and heavy intensity groups were 1.00 (SD=1.19), 3.05 (SD=1.60), 5.67 (SD=1.65), respectively. Only one in four respondents reported a quit attempt in the previous year; 38% indicated intention to quit smoking (19% indicated ready to quit within 30 days, 10% within 60 days, 20% within 6 months, 51% within 24 months).

Many in the study sample (60%) perceived their health as either fair or poor; 63% indicated having at least one health issue (one illness = 31% and two or more illnesses = 32%). Half (52%) reported experiencing no depression symptoms measured. And researchers, using cuff and stethoscope, determined that most (72%) had normal blood pressure.

Characteristics by smoking intensity levels

Bivariate analyses indicated smoking intensities were significantly associated ($p < 0.05$) with education, cigarette price, social smoking, onset age of regular smoking, each of the smoking behaviors assessed (FTND items and smoking inhalation), quit attempts in the previous year, quit intention, and blood pressure (Table 1).

Correlates of smoking intensity levels: Multivariate results

Table 2 presents results from the multinomial logistic regression model depicting odds ratio estimates of factors significantly associated with smoking intensity levels. Both “light” and

“heavy” smoking intensity groups were modeled jointly using “moderate” as the referent group. The multivariate analyses indicated that smoking intensity was not associated with sociodemographics or depression, but were associated with cigarette price, social smoking, smoking inhalation, time to first cigarette, difficulty refraining from smoking, quit intention and two measures of health status (self-reported health issues and pre-hypertensive blood pressure).

Specifically, when compared to both moderate and heavy smokers (estimates using heavy smoking as a referent were not shown in Table 2), light smokers were more likely to smoke cigarettes in social situations, allow more time to pass after waking each morning before lighting first cigarette of the day, and express intentions to quit smoking. Light smokers were also more likely refrain from inhaling smoke and report a health issue than moderate smokers. When compared to both moderate and light smokers (estimates using light smoker as a referent were not shown in Table), heavy smokers were more likely to smoke lower priced cigarettes. Heavy smokers found it more difficult to refrain from smoking and were more likely to have blood pressure in pre-hypertensive range than moderate smokers (Table 2).

DISCUSSION

In comparison to a recent survey in six Chinese cities, which found that 27% of male smokers indicated that they are moving toward quitting (18% preparing to quit in next month, 9% in the midst of a quit attempt),²⁰ the rates of quit intention in our studied sample are relatively low (38% indicated an intention to quit within the next 24 months) due to the environment supportive of cigarette manufacturing. Even so, one third of the studied smokers and over half of light smokers present their quit intentions which provide encouraging evidence for future tobacco-control intervention, even in the most tobacco friendly areas.

Men in contemporary China, often swap and then smoke cigarettes for instrumental purposes.²⁵ Offering/receiving cigarettes and consuming them in each other's presence are ways for men to pay respect, build trust, and cement friendship.²⁵ Many Chinese men find it difficult to avoid group smoking, because refusing to partake in cigarette exchange may be seen as a social slight and may result in lost connections and damaged relationships with others. In our study sample, light smokers are more likely to intend to quit smoking than other smokers and they tend to smoke most of their cigarettes in social situations. This result may reflect that, despite their desire to quit smoking, light smokers may find it difficult to resist consuming cigarettes because they are susceptible to the social and ethical suasion of cigarette exchange practices. It may further suggest that to promote successful smoking cessation outcomes among this group of light smokers, greater effort needs to be made to denormalize social smoking customs and not simply expand but also enforce smoke-free legislation.³⁰

Where as in our study light smokers are especially responsive to how many people in their immediate social setting are smoking, heavy smokers might be more sensitive to how much cigarettes cost. Heavy smokers tend to consume low priced cigarettes more than light or

moderate smokers, irrespective of the other sociodemographic factors we studied. In early 2012, a public disagreement broke out in China between the Ministers of Health and Industry and Information Technology over the merits of raising cigarette taxes.³¹ Our findings would favor the support of the stance taken by the Minister of Health that low-priced modestly-taxed cigarettes in China are a significant health danger and require elimination.

Our study confirms that heavy smokers are more dependent on nicotine than others, as they are more likely to have their first cigarette within 30 minutes after awakening. Previous studies found that a home smokefree environment which disallows smoking inside the home disrupt the established smoking pattern by delaying smoker's first cigarette after awakening, making a smoker forgo his/her cigarette after meal, and breaking cue of smoking, and this smoking disruption significantly decreased cigarette consumption as well as increased likelihood of quit and stay quit.³² By means of promoting a home smokefree environment may not only substantially reduces secondhand smoke exposure but discourages smoking behaviors. Regarding to smokers' health conditions, interestingly, light smokers are more likely to self identify having one illness while heavy smokers are more likely to be diagnosed having blood pressure in pre-hypertensive range on site than other smokers. The disparity in health perception by smoking intensity such that light smokers have a better idea about their own health status than heavy smokers while heavy smokers are more likely to be diagnosed with illness may reflect their different attitudes and knowledge toward their health conditions. Because illness is one main reasons for Chinese males to quit and reduced smoking, raising the awareness of their own health status and their current illness caused by cigarette smoking would increase their quit intention.

This study has limitations. The results drawn from male smokers who worked in the four factory settings in Kunming China cannot be generalized to the overall male smoker population in China. However, focusing on this population with potential high risk of cigarette smoking in one of the largest tobacco producing areas in China sheds some lights on the understanding the tobacco use as well as its correlates among Chinese male.

CONCLUSION

This study describes characteristics and smoking behaviors among male factory workers in Kunming Yunnan, one of the largest tobacco producing and consuming provinces within China with an exceptionally high male smoking prevalence and pro-tobacco attitudes.

Overall, the exceptionally high male smoking prevalence (nearly 80%) in the studied area as well as the low quit intention among current smokers (2 in 3 male factory smokers had no intention to quit smoking in our studied sample) indicate that there is an urgency of tobacco-control efforts in cigarette producing regions of China. In addition, our findings that 63% self identified having at least one illness, and 28% have blood pressure in pre-hypertensive range imply the dramatic public health burden from tobacco use imposed in this tobacco producing area. The findings of the different sets of correlates of smoking intensity of light and heavy levels suggest that tobacco-control programs should target light and heavy smokers differently. For light smokers, the programs should focus on making cessation

assistance available, denormalization of cigarette smoking as a way to socialize, and using health status to promote cigarette quitting. For heavy smokers, the programs should focus on prohibiting the production and sale of inexpensive cigarettes, creating a home smokefree environment, as well as increasing their awareness of health status for intervention to increase their quit intention. Our findings offer insights to a potential new direction of formulating tobacco-control interventions by a targeted approach taking smoking intensity and characteristics of the population of focus into consideration.

Acknowledgments

Funding:

This research was supported in part by NIH grants: 5R25CA113710, P50DA009253, 5K23DA000468, K07CA093605.

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Table 1

Participant Characteristics by Light, Moderate, and Heavy-Intensities of Smoking

	All (N=490)		By Smoking Intensity		* p-value
		Light (<10 CPD ^a) (n=63) 13%	Moderate (10-20 CPD) (n=339) 69%	Heavy (>20 CPD) (n=88) 18%	
Sociodemographics					
Age (Mean ± SD)	43.00 ± 10.83	42.06 ± 11.99	42.36 ± 10.69	46.14 ± 10.02	0.30
Education					0.01
<High school	31%	21%	31%	40%	
High school graduates	36%	29%	37%	36%	
College	22%	29%	22%	19%	
Beyond college	11%	22%	10%	5%	
Annual family annual income >25,000 yuan	41%	38%	42%	40%	0.80
Job position - Manager	27%	33%	24%	30%	0.27
Working class					0.24
White collar	21%	25%	12%	15%	
Blue collar	79%	75%	78%	85%	
Marital Status					0.52
Married	81%	76%	82%	81%	
Not married	19%	24%	18%	19%	
Cigarette purchasing and Smoking behaviors					
Price per cigarette pack					<0.01
<=4 yuan	10%	8%	8%	23%	
> 4 yuan	90%	92%	92%	77%	
Smoked predominantly socially (>90% of cigarettes smoked with others)	12%	24%	11%	7%	<0.01
Age started smoking regularly (Mean ± SD)	21 ± 5.14	23 ± 6.10	21 ± 5.16	20 ± 3.91	<0.01
Not inhale when smoking	31%	46%	29%	25%	0.01
Time to first cigarette after waking ^b					<0.01
Within 30 minutes	54%	16%	55%	75%	
Between 31-60 minutes	24%	19%	26%	17%	
After 60 minutes	22%	65%	18%	8%	
Hard to refrain from smoking where forbidden ^b	30%	19%	26%	56%	<0.01
Hate to give up morning cigarette ^b	20%	16%	17%	34%	<0.01
Smoke when being sick ^b	26%	8%	24%	47%	<0.01
Smoke more during first 2 hours of the day ^b	22%	5%	20%	41%	<0.01
Nicotine Dependence score ^c	3.26 ± 2.04	1.00 ± 1.19	3.05 ± 1.60	5.67 ± 1.65	0.01
Previous quit attempts and intent to quit					
Had a 24-hour quit attempt within past year	25%	38%	24%	17%	0.01

	All (N=490)	By Smoking Intensity			* p-value
		Light (<10 CPD ^a) (n=63) 13%	Moderate (10-20 CPD) (n=339) 69%	Heavy (>20 CPD) (n=88) 18%	
Indicated intention to quit	38%	51%	38%	27%	0.01
General and mental health conditions					
Perceived general health					0.87
excellent / good	40%	43%	39%	39%	
Fair / poor	60%	57%	61%	61%	
Number of Concurrent health issues					0.23
None	38%	33%	40%	30%	
One illness	31%	38%	28%	35%	
Two or more illnesses	32%	29%	32%	35%	
Blood pressure in pre-hypertensive range	28%	24%	24%	44%	<0.01
Depression scores (Mean ± SD)	4.84 ± 2.61	4.78 ± 2.73	4.85 ± 2.57	4.85 ± 2.71	0.70

Notes

* comparisons across 3 smoking intensity groups

^a CPD= cigarettes per day

^b Items from Fagerstrom Test of Nicotine Dependence (FTND)

^c To avoid collinearity with the dependent variable, this paper used the nicotine dependence score which is the sum of the five items from FTND, excluding smoking intensity.

Table 2
Multinomial Logistic Regression Model of Selected Correlates associated with Smoking Intensities (N=489)

	Light (< 10 cigarettes daily) v.s. Moderate ^a		Heavy (> 20 cigarettes daily) v.s. Moderate ^a	
	OR(95%CI)	P	OR(95%CI)	P
Smoking behaviors				
Cigarette price				
High or Median (>4 yuan) (referent)	1		1	
Low (<=4 yuan)	0.69(0.18, 2.62)	0.59	3.23(1.45, 7.16)	<0.01
Smoked most cigarettes (> 90%) socially	2.74 (1.44, 6.55)	0.02	0.40(0.14, 1.14)	0.09
Inhale when smoking				
No	2.09(1.03, 4.23)	0.04	1.23(0.63, 2.37)	0.54
Yes (referent)	1		1	
Time to first cigarette after waking				
After 60 minutes	17.65(6.82, 45.66)	<0.01	0.66(0.25, 1.69)	0.39
Between 31-60 minutes	2.95(1.10, 7.88)	0.03	0.89(0.43, 1.84)	0.76
Within 30 minutes (referent)	1		1	
Difficult to refrain from smoking where forbidden				
Yes	2.30(0.95, 5.60)	0.07	2.63(1.45, 4.75)	<0.01
No (referent)	1		1	
Quit attempts and intention				
Had a 24-hour quit attempt within past year				
Yes	1.54(0.60, 3.99)	0.37	0.90(0.45, 1.82)	0.79
No (referent)	1		1	
Indicated intention to quit				
Yes	2.10(1.04, 4.22)	0.04	0.63(0.34, 1.16)	0.14
No (referent)	1		1	
Health Condition				
Number of self identified medical conditions				
One illness	2.31(1.07, 5.00)	0.03	1.44(0.75, 2.78)	0.27
Two or more illnesses	1.14(0.47, 2.74)	0.78	0.91(0.45, 1.83)	0.79
None (referent)	1		1	

Light (< 10 cigarettes daily) v.s. Moderate ^a				Heavy (> 20 cigarettes daily) v.s. Moderate ^a			
	OR(95%CI)	P			OR(95%CI)	P	
Measured blood pressure in pre-hypertensive range							
Yes	1.06(0.48, 2.37)	0.88			2.22(1.25, 3.96)	0.01	
No (referent)	1				1		

Note: All models were controlled for sociodemographics (age, education, family income, working class, working type, marital status), age first smoked regularly, other items from the Fagerstrom Test of Nicotine Dependence (hate to give up morning cigarette, smoke more during first hours after waking), and depression scores.

^a“light” and “heavy” smoking intensity groups were modeled jointly in the multinomial logistic regression model using “moderate” as the referent group.