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The impact of graphic cigarette warning labels and smoke-free law on health awareness and thoughts of quitting in Taiwan

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Abstract

The present study evaluated the impact of Taiwan's graphic cigarette warning labels and smoke-free law on awareness of the health hazards of smoking and thoughts of quitting smoking. National representative samples of 1074 and 1094 people, respectively, were conducted successfully by telephone in July 2008 (pre-law) and March 2009 (post-law). Results reveal that the prevalence of thinking about the health hazards of smoking among smokers increased from 50.6% pre-law to 79.6% post-law, while the prevalence among non-smokers increased from 68.8 to 94.1% during the same period. The prevalence rates of smokers who reported thinking of quitting rose from 30.2% pre-law to 51.7% post-law. Multivariate analyses results indicated that the implementation of graphic warning labels and the smoke-free law significantly increased the odds of awareness about the health hazards of smoking [odds ratio (OR) = 6.39, 95% confidence interval (CI) = 4.84–8.44] and thoughts of quitting smoking (OR = 2.39, 95% CI = 1.48–3.87). In conclusion, the implementation of a smoke-free law in combination with graphic cigarette warning labels has been effective in increasing thoughts about the health hazards of smoking and quitting smoking.

Introduction

The World Health Organization (WHO) has predicted that tobacco use may kill a billion people by the end of this century. More than three quarters of tobacco-attributable deaths will be in low- and middle-income countries [1]. To curb the tobacco epidemic, the WHO Framework Convention on Tobacco Control (FCTC), the first international treaty devoted to public health, went into force in 2005. As of June 2010, the FCTC had been signed by 171 parties. About 150 countries that have ratified the treaty are required to implement effective tobacco control policies following the FCTC recommendations. Guidelines for implementing smoke-free policies (Article 8 of FCTC) and pictorial health warnings (Article 11) were adopted at the second and third WHO FCTC Conferences of the Parties in 2007 and 2008, respectively. A growing number of countries such as France, Italy, Ireland, Scotland, Spain, England and Uruguay have introduced comprehensive smoke-free policies [2, 3]. In addition, over the past decade, more than 30 countries such as Canada, Brazil, Australia and Singapore have introduced graphic cigarette warning labels to raise public awareness of the health hazards of smoking and to motivate smokers to quit.

Graphic cigarette warning labels serve as an effective population-based strategy to inform smokers and non-smokers about the health hazards of smoking, to increase quit attempts and to reduce

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smoking initiation [1, 4–6]. Canada was the first country to introduce graphic warnings in 2001. Warning labels provided health information and served as an important strategy for the comprehensive tobacco control program in Canada. Cross-country studies [7, 8] showed that Canadian graphic warning labels were most effective in informing smokers about the health hazards of smoking compared with smaller text-only warnings in the United States, United Kingdom and Mexico. In addition, this study [9] found that larger graphic warnings stimulated more cognitive responses, such as thinking of the health hazards of smoking and motivating thoughts of quitting smoking. Moreover, thoughts of quitting was found to be the key mechanism by which warnings stimulate quitting intentions and help smokers feel that they are capable of success [10]. In Asia, a study in Thailand indicated that smokers reported greater levels of awareness and thoughts of health hazards and quitting after the introduction of graphic warning labels [4].

Studies from developed countries such as Finland [11], the Netherlands [12], Scotland [13] and Spain [14] have shown a considerable reduction in workplace and restaurant secondhand smoke (SHS) exposure and in respiratory symptoms among hospitality workers [15] after implementation of a smoke-free law. In addition, previous studies have indicated that implementing smoking ban policies and promoting smoke-free environments had a positive impact on motivating smokers to quit [16–18]. For example, one study found that hospitalization in a smoke-free environment was associated with increases in patients' thoughts of quitting, which had beneficial effects on subsequent reduction in the number of cigarettes smoked and later attempts at quitting [19]. Comprehensive smoke-free policies were more likely to increase the social unacceptability of smoking and to promote smoking cessation [3]. Despite several studies showing the positive impact of smoke-free policies and graphic warnings, there is a need to examine the impact of the FCTC policies in countries other than the high-income western countries that provide most of the evidence base for these policies. The present study aimed to examine the impact of implementing FCTC policies in Taiwan.

Taiwan has about 4 million smokers. In 2008, the smoking prevalence was 22%. The smoking prevalence for men (39%) was higher than women (5%). Cigarette smoking in Taiwan has resulted in an estimated 18 000 deaths annually [20]. To reduce the tobacco burden, the Taiwan Tobacco Hazards Prevention Amendment Act was passed in July 2007 and took effect in January 2009. The 2009 amended law strengthened existing legislation by introducing a range of tobacco control measures including extending smoke-free areas to almost all enclosed workplaces and public places, adding graphic health warnings to cigarette packages and totally banning tobacco advertisement, promotion and sponsorship as the FCTC has recommended.

The amended law extends smoke-free areas to all enclosed workplaces and most public places. The old law banned smoking in libraries, classrooms, performance halls, indoor gymnasiums, public transportation vehicles, medical care institutions, banks and post offices, while smoking was permitted in designated smoking areas in schools, government offices, hotels, department stores and restaurants. The amended act completely bans smoking in workplaces, restaurants, bars, hotels, shopping malls, campuses, medical institutions, stations, government agencies, banks, post offices and public transportation vehicles. Semi-outdoor restaurants and bars that are only open after 9 p.m., and are intended exclusively for persons beyond 18 years of age, were excluded from the smoking ban. To ensure widespread awareness of, and compliance with, the amended act, several communication strategies including media campaigns and community education programs were implemented between August 2008 and January 2009. The media campaigns used television, radio, newspapers, magazines, the web, bus advertisements and billboards to reach an estimated 23 million Taiwan residents. The main media message was 'Smoking will be prohibited in all indoor workplaces and public places beginning 11 January 2009. Violators will be fined up to New Taiwan dollar (NT$) 10 000'.

In addition, all tobacco products sold in Taiwan have been mandated to contain one of six graphic warning labels since January 2009. The old text-only

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warnings included six messages on the hazards of smoking such as lung cancer, heart disease, emphysema and low-birth weight babies, along with the benefits of quitting smoking in 12-point font to cover 25% of the front of the packages. The new warnings consisted of a written warning and a vivid color image covering at least 35% of the pack surface, front and back, with additional information including a quitline number (0800636363). To develop effective warnings, graphic health warning images from other countries such as Canada, Brazil and Thailand were collected. Experts from medicine, media and tobacco control fields were invited to design the graphic warnings images and texts. In addition, content pretests and public hearings were conducted to understand the public's reactions to health warnings. Finally, six graphic warnings were selected and revised to reduce ambiguity and misunderstandings. The new warnings included one of six pictures depicting tobacco-related pathology and the hazards of smoking and SHS, such as images of lung cancer, heart diseases, oral diseases and sexual dysfunction. Taiwan's graphic health warning images can be reached at the following website: http://www.e-quit.org/boxworning/taiwan.html.

Taiwan enacted a tobacco health surcharge in 2002. Several tobacco control measures were implemented, such as smoke-free campaigns and smoking cessation outpatient services. Despite studies showing the benefits of financing smoking cessation outpatient services to help smokers quit [21], cigarette consumption remained high in Taiwan. The 2009 Taiwan Tobacco Hazards Prevention Amendment Act is a milestone for Taiwan tobacco control. However, few studies evaluated tobacco control policies in Taiwan. The impact of the combination of graphic warnings and a smoke-free law on the awareness of health risks and smoking cessation remains unclear. As part of the evaluation of the new act, we analyzed data from two waves of surveys to estimate changes in the general awareness of the health hazards of smoking and thoughts of quitting smoking before and after the implementation of the graphic cigarette warnings and the smoke-free law. The research hypothesis stated that thoughts about health hazards and quitting smoking will significantly increase after the implementation of the graphic cigarette warnings and the smoke-free law in Taiwan.

Methods

Participants and procedure

The present study used national population-based data from two waves of research in July 2008 and March 2009 to assess the impact of the 2009 Taiwan Tobacco Hazards Prevention Amendment Act. The surveys were national cross-sectional random-digit-dialed telephone surveys that used a computer-assisted telephone interview system to collect public opinion on smoke-free legislation, graphic cigarette warnings and SHS exposure in a representative sample of the non-institutionalized population (aged 15 years and older) in Taiwan. Telephone numbers were drawn from 23 counties in Taiwan. Phone numbers were proportionally selected and called by random digit sampling. Household participants were randomly selected. The household telephone coverage rate in Taiwan has been around 98% since 2000. The response rates were 51.0 and 52.0%, respectively, for the pre- and post-law surveys and the cooperation rates were 64.7 and 72.0%, respectively. For the pre- and post-law surveys, representative samples of 1074 and 1094 people, respectively, were interviewed successfully by telephone.

Measures

A comprehensive review of previous empirical studies guided the development of the questionnaires. The dependent variables in this study included thoughts about the health hazards of smoking and thoughts about quitting smoking. Thoughts about health hazards were measured in the pre-law survey with the question 'Do you think that the health warnings on cigarette packages are likely to make you think about the health hazards of smoking and secondhand smoke?' and in the post-law survey with the question 'Do you think that the

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Tobacco Hazards Prevention Amendment Act implementation is likely to make you think about the health hazards of smoking and secondhand smoke?' Thoughts about quitting due to the new act was measured in the pre-law survey with the question 'Do you think that the health warnings on cigarette packages are likely to prompt you to think about quitting smoking?' and in the post-law survey with the question 'Do you think that the Tobacco Hazards Prevention Amendment Act implementation is likely to prompt you to think about quitting smoking?' Thoughts about quitting due to warnings were measured in the pre-law survey with the question 'Do you think that the health warnings on cigarette packages are likely to prompt you to think about quitting smoking?' and in the post-law survey with the question 'Do you think that the graphic health warnings are likely to prompt you to think about quitting smoking?' In addition, perceptions of general smokers' quitting motivation was measured in the pre-law survey with the question 'Do you think that the health warnings on cigarette packages are likely to prompt general smokers to think about quitting smoking?' and in the post-law survey with the question 'Do you think that the Tobacco Hazards Prevention Amendment Act implementation is likely to prompt general smokers to think about quitting smoking?' Responses were rated on a four-point Likert scale (very likely, likely, not likely and not very likely). Respondents who reported that they are not likely or not very likely to think about the health hazards of smoking and quitting were categorized as the reference group in the logistic regression model.

The independent variables included the survey time (pre-law and post-law), socioeconomic and demographic characteristics, smoking status and SHS exposure. The first wave of surveys conducted in July 2008, which was 6 months before the amended act, was categorized as the reference group in the logistic regression model. The second wave of surveys was conducted in March 2009, which was 3 months after the implementation of graphic health warnings and the smoke-free law. Respondents' socioeconomic and demographic characteristics obtained in this study included gender (male versus female), age (15–39, 40–59 and 60+ years), educational attainment (elementary and middle, high school and college and higher), employment (yes versus no) and monthly income (NT$ <20 000, 20 000–49 999, ⩾50 000 and unknown). Respondents' smoking status was categorized as current smoker versus non-smoker.

To measure SHS exposure, individuals were asked if anyone had smoked in front of them at their workplace, household or in public places during the past week (yes versus no). In addition, individuals were asked whether they felt that smoking increased, lessened or was about the same in their workplace, household or in public places after the new act. The question of 'public place' SHS exposure was not anchored to regulated places, thus individuals were further asked which public place they often encounter anyone smoking in front of them during the past week. To measure notice of the cigarette warning labels, individuals were asked whether they noticed health warnings on cigarette packages during the past month (yes versus no). In addition, during the second wave of the surveys, individuals were asked whether they felt unpleasant due to graphic warnings (strongly pleasant, pleasant, unpleasant and strongly unpleasant) and whether they will give quit advice due to graphic warnings (very likely, likely, not likely and not very likely). Also, individuals were asked whether they were satisfied with smoke-free environments after the new act. Responses were rated on a four-point Likert scale (strongly satisfied, satisfied, dissatisfied and strongly dissatisfied).

Analyses

SAS software (version 9.1) was used to analyze the data sets. To assess the prevalence of public awareness of the health hazards of smoking and SHS and thoughts of quitting in the two waves of the surveys, estimates were weighted to each respondent's probability of being selected and the age-, sex-, area- and education-specific populations of the 2007 Taiwan census. Chi-square tests were used to compare the changes of thoughts about health hazards, thoughts about quitting and SHS exposure in the pre- and post-law surveys. Only significant

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changes pre-law to post-law (at $P < 0.05$) are reported in the Results section. Univariate and multivariate logistic regression analyses were used to estimate the change in the odds of thoughts about health hazards and quitting in the two waves of the surveys across socioeconomic and demographic correlates (gender, age, education and income), smoking status and SHS exposure. In addition, the analytic sample includes only smokers for the second model with quitting as the dependent variable.

Results

Characteristics of participants

Table I lists the weighted percentages for the socioeconomic and demographic characteristics of both smokers and non-smokers for the pre- and post-law surveys. Total respondents were mainly aged 15–39 years with college-level, or higher, educations and monthly incomes of less than NT$20 000. Chi-square tests for the entire sample showed that there was no significant difference in gender, age, education and monthly income among respondents to the pre- and post-law surveys (Table I).

Reactions to health warnings and the smoke-free law

Table II indicates that the prevalence of noticing health warnings and of thinking about health hazards and quitting significantly increased after the new act was implemented in Taiwan. For example, the weighted percentage of noticing health warnings increased from 38.3% pre-law to 47.5% post-law, while the prevalence of thinking about the health hazards of smoking increased from 65.8 to 92.0%. By smoking status, the prevalence of thoughts about health hazards among smokers increased from 50.6% pre-law to 79.6% post-law, while the prevalence among non-smokers increased from 68.8 to 94.1% during the same period.

The prevalence of perceptions of general smokers' quitting motivation increased from 24.4% pre-law to

Table I. *Socioeconomic and demographic characteristics of participants*

	Non-smokers		Smokers		Total		χ^2 test
	Pre	Post	Pre	Post	Pre	Post	
	Weighted percentage (%)						*P* value
Gender							
Female	57.2	56.7	10.8	7.0	50.4	49.6	0.24
Male	42.8	43.3	89.2	93.0	49.6	50.4	
Age (years)							
15–39	45.0	45.5	46.2	45.0	45.1	45.4	0.75
40–59	35.2	35.2	40.4	38.6	35.9	35.7	
60+	19.9	19.3	13.4	16.5	18.9	18.9	
Education							
Elementary and middle	30.1	29.4	30.0	33.1	30.1	29.9	0.84
High school	32.5	31.6	41.4	40.0	33.8	32.8	
College and higher	37.5	39.1	28.6	26.9	36.2	37.3	
Monthly income							
NT$<20 000	50.4	48.0	28.2	29.8	47.1	45.8	0.15
NT$20 000–49 999	34.7	37.8	47.0	45.0	36.7	38.8	
NT$≥50 000	11.5	9.4	23.5	19.2	13.0	10.5	
Unknown	3.3	4.8	1.3	6.0	3.1	4.9	

Using Taiwan year 2007 census as sample weights. Pre-law (July 2008): $N = 1074$, non-smokers $n = 925$ and smokers $n = 149$. Post-law (March 2009): $N = 1094$, non-smokers $n = 943$ and smokers $n = 151$. Chi-square (χ^2) tests for the total sample comparing data of the pre- and post-law surveys.

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Table II. *Reactions to the amended act among smokers and non-smokers*

	Non-smokers		Smokers		Total		χ^2 test
	Pre	Post	Pre	Post	Pre	Post	
	Weighted percentage (%)						*P* value
Reactions to warnings and new act							
Notice cigarette warning label	31.0	40.2	81.7	91.0	38.3	47.5	<0.001
Thoughts about health hazards*	68.8	94.1	50.6	79.6	65.8	92.0	<0.001
Perceptions of general smokers' quitting motivation*	24.2	68.6	25.3	60.8	24.4	67.4	<0.001
Thoughts about quitting due to new act*			30.2	51.7			<0.001
Thoughts about quitting due to warnings			30.2	42.5			<0.001
Feel unpleasant due to warnings		57.5		62.0		58.7	
Thoughts about giving quit advice		75.6		35.1		64.3	
SHS exposure							
Workplace SHS exposure	25.4	6.3	46.7	13.1	28.5	7.3	<0.001
Household SHS exposure	30.9	16.9	71.3	47.5	36.8	21.3	<0.001
Public place SHS exposure	54.9	46.8	65.2	52.6	56.4	47.6	<0.001
Feel less smoking in workplace		63.4		50.4		61.0	
Feel less smoking at home		50.5		38.5		48.6	
Feel less smoking in public place		78.5		74.5		77.9	
Satisfied with smoke-free act		94.0		78.7		91.9	

Pre-law (July 2008): total $N = 1074$, non-smokers $n = 925$ and smokers $n = 149$. Post-law (March 2009): total $N = 1094$, non-smokers $n = 943$ and smokers $n = 151$. Chi-square (χ^2) tests for the total sample comparing data of the pre- and post-law surveys, except for 'thoughts about quitting' for smokers only. Asterisk indicates that the measurements of these items for the pre- and post-law surveys were different. Please see the Methods section for the individual questions.

67.4% post-law. Similarly, for smokers, the prevalence of thoughts about quitting due to warnings increased from 30.2% pre-law to 42.5% post-law, while the prevalence of thoughts about quitting due to the new act was 51.7%. In addition, 58.7% of respondents reported that the new graphic warnings made them feel unpleasant; while 64.3% reported that the graphic warnings had led them to think about giving quit advice to their family and friends. The workplace SHS exposure prevalence decreased markedly from 28.5% pre-law to 7.3% post-law, while household SHS exposure prevalence decreased from 36.8% pre-law to 21.3% post-law. Overall, 91.9% reported being satisfied with smoke-free environments after the implementation of the new act.

Thoughts about health hazards/quitting by socioeconomic and demographic characteristics and by SHS exposure

The results indicated an overall increase in the prevalence of thoughts about health hazards and quitting for groups from different socioeconomic and demographic characteristics and differing SHS exposure after the new act became effective. By gender, the prevalence of thoughts about health hazards among females increased from 68.3% pre-law to 95.1% post-law, while the prevalence among males increased from 63.5 to 89.0% (Table III). Similarly, the prevalence of thoughts about quitting due to the new act among female smokers increased from 18.0% pre-law to 47.5% post-law, while the prevalence among male smokers increased from 31.6 to 52% (Table IV). Similarly, for smokers who reported not being exposed to household SHS, the prevalence of thoughts about quitting increased from 21.1% pre-law to 56.9% post-law, while the rates among smokers not exposed to workplace SHS increased from 27.7 to 52.2%.

Factors related to thoughts about health hazards

Univariate logistic regression results indicated that the following factors could be used independently

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Table III. *Factors associated with thoughts about heath hazards*

	Weighted percentage		Unadjusted		Adjusted	
	Pre	Post	OR	95% CI	OR	95% CI
Survey time						
Pre-law	65.8		1		1	
Post-law		92.0	6.00	4.59–7.85	6.39	4.84–8.44
Gender						
Female	68.3	95.1	1		1	
Male	63.5	89.0	0.69	0.55–0.87	0.86	0.65–1.13
Age (years)						
15–39	59.2	90.1	1		1	
40–59	64.9	93.5	1.31	1.03–1.68	1.24	0.93–1.65
60+	88.4	94.4	3.60	2.34–5.53	2.69	1.64–4.41
Education						
Elementary and middle	82.0	93.4	1		1	
High school	64.6	91.3	0.49	0.35–0.68	0.68	0.47–1.00
College and higher	55.3	91.7	0.40	0.29–0.55	0.49	0.33–0.73
Monthly income						
NT$<20 000	73.3	93.3	1		1	
NT$20 000–49 999	58.9	91.1	0.62	0.48–0.80	0.87	0.65–1.17
NT$⩾50 000	59.7	91.6	0.56	0.40–0.80	0.98	0.63–1.51
Unknown	71.1	89.0	0.93	0.49–1.76	0.79	0.39–1.59
Smoking status						
Non-smoker	68.8	94.1	1		1	
Current smoker	50.6	79.6	0.39	0.30–0.52	0.38	0.27–0.54
Workplace SHS exposure						
No	58.8	93.5	1			
Yes	65.7	94.1	0.63	0.41–0.97		
Household SHS exposure						
No	66.3	93.2	1			
Yes	65.2	87.8	0.61	0.48–0.77		
Notice warning label						
No	68.7	93.8	1			
Yes	62.1	90.2	0.81	0.64–1.01		
Feel unpleasant due to label						
No		90.0	1			
Yes		93.3	1.55	0.73–3.27		
Feel less smoking in workplace						
No		85.6	1			
Yes		94.9	3.11	1.66–5.83		
Feel less smoking at home						
No		87.7	1			
Yes		96.2	3.55	2.00–6.31		
Satisfied with smoke-free act						
No		64.2	1			
Yes		94.8	10.22	5.86–17.87		

Pre-law (July 2008), $N = 1074$; post-law (March 2009), $N = 1094$. For multivariate logistic regression model, $N = 1878$, yes $n = 1502$ and no $n = 376$, -2 Log L = 1562.1.

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Table IV. *Factors associated with thoughts about quitting among smokers*

	Weighted percentage		Unadjusted		Adjusted	
	Pre	Post	OR	95% CI	OR	95% CI
Survey time						
Pre-law	30.2		1		1	
Post-law		51.7	2.48	1.55–3.98	2.39	1.48–3.87
Gender						
Female	18.0	47.5	1		1	
Male	31.6	52.0	1.77	0.74–4.23	1.68	0.66–4.26
Age (years)						
15–39	25.7	51.3	1		1	
40–59	27.1	53.6	1.06	0.64–1.76	1.03	0.60–1.76
60+	55.0	48.5	1.72	0.86–3.43	1.47	0.67–3.21
Education						
Elementary and middle	30.9	53.9	1		1	
High school	31.3	52.5	0.97	0.56–1.67	1.18	0.65–2.14
College and higher	27.8	48.0	0.80	0.44–1.47	0.93	0.47–1.86
Monthly income						
NT$<20 000	39.8	53.2	1		1	
NT$20 000–49 999	24.4	48.0	0.64	0.37–1.08	0.66	0.37–1.19
NT$⩾50 000	29.4	54.9	0.76	0.39–1.49	0.87	0.41–1.85
Unknown	51.6	70.8	2.15	0.49–9.39	1.81	0.40–8.19
Workplace SHS exposure						
No	27.7	52.2	1			
Yes	30.6	45.7	0.69	0.30–1.56		
Household SHS exposure						
No	21.1	56.9	1			
Yes	33.8	46.5	0.82	0.51–1.32		
Notice warning label						
No	14.4	87.2	1			
Yes	33.7	48.8	1.28	0.64–2.58		
Thought about health hazards						
No	11.0	16.3	1			
Yes	49.4	62.9	9.49	4.85–18.59		
Feel unpleasant due to label						
No		44.7	1			
Yes		55.4	1.53	0.68–3.47		
Feel less smoking in workplace						
No		35.1	1			
Yes		66.9	3.74	1.65–8.50		
Feel less smoking at home						
No		40.2	1			
Yes		67.3	3.06	1.49–6.29		
Satisfied with smoke-free act						
No		14.0	1			
Yes		64.1	10.92	3.51–34.02		

Pre-law (July 2008), smokers $N = 149$; Post-law (March 2009), $N = 151$. For multivariate logistic regression model, $N = 292$, yes $n = 118$ and no $n = 174$, -2 Log L = 384.2. Thoughts about quitting due to the new act were analyzed for Table IV.

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to predict an increase in the prevalence of thinking about the health hazards of smoking: the 2009 amended act, being female, being older, having an elementary/middle-school level of education, monthly income less than NT$20 000, not being exposed to SHS in the workplace/household, reporting that fewer people smoke in the workplace and home after the new act, being a non-smoker and being satisfied with smoke-free environments after the new act (Table III).

Results of the multivariate analyses indicated that after adjusting for socioeconomic and demographic variables and for smoking status, the odds of thoughts about health hazards [odds ratio (OR) = 6.39, 95% confidence interval (CI) = 4.84–8.44] increased after implementation of the new act. In addition, after adjusting for survey time, socioeconomic and demographic variables, older individuals of more than 60 years of age were more likely to report thoughts about health hazards, while current smokers and people with college-level, or higher, educations were less likely to report thoughts about health hazards.

Factors related to thoughts about quitting

The univariate results showed that the implementation of graphic warnings and the smoke-free law significantly increased the odds of thoughts of quitting smoking (Table IV). Moreover, people who reported that fewer people smoked in the workplace and at home after the implementation of the new act and being satisfied with smoke-free environments were more likely to have thoughts about quitting smoking. In addition, smokers who thought about the health hazards of smoking were more likely to report thoughts about quitting (OR = 9.49, 95% CI = 4.85–18.59). Results of the multivariate analyses indicated that after adjusting for socioeconomic and demographic variables, the odds that smokers would have thoughts about quitting (OR = 2.39, 95% CI = 1.48–3.87) increased after implementation of the new act.

Discussion

This study showed that implementation of graphic cigarette warnings and a smoke-free law was associated with an increase in warning label salience and on thoughts about health hazards and quitting. For example, compared with text-only warning labels, the implementation of graphic warning labels increased the prevalence of thinking about quitting by one-third (from 30.2 to 42.5%), while the new act (combination of graphic warnings and smoke-free law) increased the prevalence of thinking about quitting by two-thirds (to 51.7%). Our findings are consistent with prior studies [1, 10, 22, 23] that indicate the implementation of stringent smoke-free laws and policies that promote the use of graphic warnings were associated with a greater impact on prompting smokers to think of quitting.

The results found in the present study are consistent with other studies [7, 8, 22, 24–26] indicating that graphic warning labels were significantly more effective than text-only warnings in increasing the public awareness of the health hazards of smoking and in prompting smokers to think of quitting. In addition, we found that smokers who thought about the health hazards of smoking were more likely to report thinking about quitting. This result demonstrated the positive effect of graphic health warnings on promoting smoking cessation. Similarly, a study found that cognitive and behavioral responses toward health warnings predicted quit intentions and self-efficacy [27]. According to Taiwan quitline utilization data, after the introduction of graphic warnings, which included the Taiwan toll-free quitline number on cigarette packages, the number of calls to the quitline between January and June 2009 (20 458 calls) had more than doubled from the previous year for the same time period (9065 calls). This result is consistent with results from a study in Australia [28] that found that the introduction of graphic warnings and the quitline number on cigarette packets boosted demand for quitline services. Similarly, another study found that warning label salience, thoughts about health hazards and thoughts of quitting were independently predictive of quitting activity [22].

After implementation of the new act, there was a nationwide reduction in self-reported SHS in workplaces and homes. Our findings are generally

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in accord with other studies [11, 14, 15, 29–36] that found smoke-free laws to be effective in reducing SHS exposure in workplaces, restaurants and bars. Moreover, respondents who reported that fewer people smoked in the workplace and at home were more likely to report thinking about the health hazards and of quitting smoking, while smokers and people being exposed to SHS had a lower probability of thinking about the health hazards of smoking and SHS. These results help illuminate the potential advantageous effects of motivational thoughts about quitting smoking and in establishing smoke-free environments. This study is consistent with other studies [10, 19, 37] that support the importance of enforcing smoke-free laws and expanding smoke-free environments to promote thoughts of quitting, quit attempts and long-term abstinence. A study in Taiwan also showed that three-fourths of smokers said that they smoked less in front of children and non-smokers after the introduction of the 2009 amended law [38]. A review study showed that a smoke-free home could not only decrease household SHS but also encourage smokers to make a quit attempt and be abstinent [17].

This study indicated that the implementation of the new law was associated with increases in awareness of the health hazards of smoking and thoughts of quitting across different socioeconomic and demographic groups. Young adults were less likely to think about the health hazards of smoking compared with elderly. However, we found that the prevalence of thinking about the health hazards of smoking among young people had increased significantly. Since most young people work, the smoke-free workplace policies combined with graphic warnings may have a stronger impact on increasing a young adult's thoughts about the health hazards of smoking. In addition, the act media campaign and the fine strategies may also have contributed to the increase in respondents' thoughts about health hazards and quitting after implementation of the amended act. Other studies [28, 39] have found that comprehensive smoke-free policies can increase the social unacceptability of smoking and an awareness of the health risks.

In addition, this study found that the prevalence of smokers who reported that implementation of the new act was likely to prompt general smokers to think about quitting smoking was higher than the prevalence of the new act to prompt smokers themselves to think about quitting. This result demonstrated the third-person effect that people tend to believe that media message has a more powerful influence on the attitudes and behaviors of others than on themselves [40]. Non-smokers were also influenced by the implementation of graphic warning labels. This study indicated more than half of non-smokers reported feeling unpleasant due to graphic warnings, and approximately three-fourths of non-smokers reported that graphic warnings made them think about giving quitting advice to their family and friends. The 'third-person effect' of the smoke-free act campaigns and graphic warnings could positively influence smokers to quit as well as preventing youth from beginning [41].

Prior studies [1, 42, 43] found that smokers who reported greater negative emotional reactions to warnings were more likely to have quit attempts. The present study showed that about two-thirds of smokers felt unpleasant due to graphic warnings, while half of smokers thought about quitting. Future research should monitor the effectiveness of existing graphic warnings and should develop more effective larger sizes of warnings with vivid pictures that evoke negative emotional responses to enhance quit attempts over time. A prospective study [7] found that changes in health warnings were associated with increased effectiveness and that it decreased the wear-out effect of warnings. Also, large graphic warnings were more likely to retain warning salience over time. In addition, the long-term impact of graphic warnings combined with smoke-free laws and how they effect thoughts about quitting and smoking cessation activities—such as the utilization of outpatient smoking cessation services and the quitline—as well as cessation prevalence and health effects among various subgroups of the population should be examined further.

Limitations

This research has some limitations. First, the present study used a cross-sectional design and no

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control group. Historical events such as media campaigns, educational activities and other elements of the law such as cigarette display restrictions and magazine advertisement bans may have influenced the prevalence of thoughts about health hazards and quitting. Second, the effects of the 'smoke-free law' and the 'warning labels' may not be separated clearly since these regulations were implemented at the same time. However, we used different questions to measure the effects of 'smoke-free laws' and 'warning labels' separately. Third, instrumentation bias may occur due to different wording for the questions on the pre- and post-law surveys to measure 'thoughts about health hazards' and 'thoughts about quitting' from text-only warnings to graphic warnings and smoke-free law. This study described the pre- and post-law results separately. Fourth, the study used self-reported data. Measures of SHS exposure that are self-reported are potentially less accurate than measures obtained using biomarkers. However, a prior study [44] showed that workers who reported workplace or household SHS were about 90% accurate according to measurements of serum cotinine.

Fifth, the samples recruited in the two surveys showed some small socioeconomic differences, but these differences were controlled by weighting the findings according to age, sex, area and education distribution of the 2007 Taiwan census. This technique also ensured that changes in response were not the result of changes in age, gender, area and education distribution of respondents in different surveys. Sixth, the sample size of smokers was small. However, only socioeconomic and demographic variables were included in the multivariate analysis. Finally, potential biases from selection and refusal to participate must be considered. For example, some smokers may dislike talking about smoking ban issues. Despite these limitations, our study provides evidence to support the enactment of a comprehensive smoke-free law in combination with graphic warning labels on cigarette packages to increase awareness of the health hazards of smoking and SHS, to prompt smokers to think about quitting and to decrease SHS exposure in the workplace, at home and in public places.

Conclusions

In conclusion, the implementation of smoke-free legislation in combination with graphic health warnings on cigarette packages in Taiwan was associated with raising the awareness of the health hazards of smoking, prompting smokers to think of quitting and reducing SHS exposure. The new graphic warnings were more likely to be noticed than the previous text-only warnings. A combination of the effects of smoke-free law and graphic warnings significantly increased the odds of thoughts about the health hazards of smoking and quitting. In addition, those who reported fewer people smoked in the workplace and at home, and who reported being satisfied with smoke-free environments after the new act were more likely to report thinking about health hazards and were motivated by thoughts of quitting. Smokers who thought about the health hazards of smoking were more likely to report thinking about quitting. Further efforts are needed to develop effective and vivid pictorial warnings, promote smoke-free homes and smoking cessation and to strengthen enforcement of existing legislation.

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Conflict of interest statement

None declared.

References

1. World Health Organization. *MPOWER: A Policy Package to Reverse the Tobacco Epidemic*. Geneva: World Health Organization, 2008.

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2. McNabola A, Gill LW. The control of environmental tobacco smoke: a policy review. *Int J Environ Res Public Health* 2009; **6**: 741–58.
3. Thrasher JF, Boado M, Sebrie EM *et al*. Smoke-free policies and the social acceptability of smoking in Uruguay and Mexico: findings from the International Tobacco Control Policy Evaluation Project. *Nicotine Tob Res* 2009; **11**: 591–9.
4. Silpasuwan P, Yaowaluk N, Viwatwongkasem C *et al*. Potential effectiveness of health warning labels among employees in Thailand. *J Med Assoc Thai* 2008; **91**: 551–8.
5. White V, Webster B, Wakefield M *et al*. Do graphic health warning labels have an impact on adolescents' smoking-related beliefs and behaviours? *Addiction* 2008; **103**: 1562–71.
6. Hammond D, Fong GT, McDonald PW *et al*. Impact of the graphic Canadian warning labels on adult smoking behaviour. *Tob Control* 2003; **12**: 391–5.
7. Borland R, Wilson N, Fong GT *et al*. Impact of graphic and text warnings on cigarette packs: findings from four countries over five years. *Tob Control* 2009; **18**: 358–64.
8. Thrasher JF, Hammond D, Fong GT *et al*. Smokers' reactions to cigarette package warnings with graphic imagery and with only text: a comparison between Mexico and Canada. *Salud Publica Mex* 2007; **49**(Suppl. 2):S233–40.
9. Hammond D, Fong GT, Borland R *et al*. Text and graphic warnings on cigarette packages: findings from the international tobacco control four country study. *Am J Prev Med* 2007; **32**: 202–9.
10. Fathelrahman AI, Omar M, Awang R *et al*. Smokers' responses toward cigarette pack warning labels in predicting quit intention, stage of change, and self-efficacy. *Nicotine Tob Res* 2009; **11**: 248–53.
11. Heloma A, Jaakkola MS. Four-year follow-up of smoke exposure, attitudes and smoking behaviour following enactment of Finland's national smoke-free work-place law. *Addiction* 2003; **98**: 1111–7.
12. Wilson N, Edwards R, Maher A *et al*. National smokefree law in New Zealand improves air quality inside bars, pubs and restaurants. *BMC Public Health* 2007; **7**: 85.
13. Haw SJ, Gruer L. Changes in exposure of adult non-smokers to secondhand smoke after implementation of smoke-free legislation in Scotland: national cross sectional survey. *BMJ* 2007; **335**: 549.
14. Nebot M, Lopez MJ, Ariza C *et al*. Impact of the Spanish smoking law on exposure to secondhand smoke in offices and hospitality venues: before-and-after study. *Environ Health Perspect* 2009; **117**: 344–7.
15. Larsson M, Boethius G, Axelsson S *et al*. Exposure to environmental tobacco smoke and health effects among hospitality workers in Sweden–before and after the implementation of a smoke-free law. *Scand J Work Environ Health* 2008; **34**: 267–77.
16. Kim B. Workplace smoking ban policy and smoking behavior. *J Prev Med Public Health* 2009; **42**: 293–7.
17. Mills AL, Messer K, Gilpin EA *et al*. The effect of smoke-free homes on adult smoking behavior: a review. *Nicotine Tob Res* 2009; **11**: 1131–41.
18. Fowkes FJ, Stewart MC, Fowkes FG *et al*. Scottish smoke-free legislation and trends in smoking cessation. *Addiction* 2008; **103**: 1888–95.
19. Shmueli D, Fletcher L, Hall SE *et al*. Changes in psychiatric patients' thoughts about quitting smoking during a smoke-free hospitalization. *Nicotine Tob Res* 2008; **10**: 875–81.
20. Bureau of Health Promotion. *Taiwan Tobacco Control 2008 Annual Report*. Taipei, Taiwan: Bureau of Health Promotion, Department of Health, Taiwan, 2008.
21. Chang FC, Hu TW, Lo SY *et al*. Quit smoking advice from health professionals in Taiwan: the role of funding policy and smoker socioeconomic status. *Tob Control* 2010; **19**: 44–9.
22. Borland R, Yong HH, Wilson N *et al*. How reactions to cigarette packet health warnings influence quitting: findings from the ITC Four-Country survey. *Addiction* 2009; **104**: 669–75.
23. Hammond D, McDonald PW, Fong GT *et al*. The impact of cigarette warning labels and smoke-free bylaws on smoking cessation: evidence from former smokers. *Can J Public Health* 2004; **95**: 201–4.
24. O'Hegarty M, Pederson LL, Yenokyan G *et al*. Young adults' perceptions of cigarette warning labels in the United States and Canada. *Prev Chronic Dis* 2007; **4**: A27.
25. O'Hegarty M, Pederson LL, Nelson DE *et al*. Reactions of young adult smokers to warning labels on cigarette packages. *Am J Prev Med* 2006; **30**: 467–73.
26. Hammond D, Fong GT, McNeill A *et al*. Effectiveness of cigarette warning labels in informing smokers about the risks of smoking: findings from the International Tobacco Control (ITC) Four Country Survey. *Tob Control* 2006; **15**(Suppl. 3):iii19–25.
27. Etter JF, Cornuz J. Are graphic warnings on cigarette packs useful? *Rev Med Suisse* 2009; **5**: 1476–9.
28. Miller CL, Hill DJ, Quester PG *et al*. Impact on the Australian Quitline of new graphic cigarette pack warnings including the Quitline number. *Tob Control* 2009; **18**: 235–7.
29. Pearson J, Windsor R, El-Mohandes A *et al*. Evaluation of the immediate impact of the Washington, D.C., smoke-free indoor air policy on bar employee environmental tobacco smoke exposure. *Public Health Rep* 2009; **124**(Suppl. 1): 134–42.
30. Hyland A, Hassan LM, Higbee C *et al*. The impact of smokefree legislation in Scotland: results from the Scottish ITC: Scotland/UK longitudinal surveys. *Eur J Public Health* 2009; **19**: 198–205.
31. Galan I, Mata N, Estrada C *et al*. Impact of the ''Tobacco control law'' on exposure to environmental tobacco smoke in Spain. *BMC Public Health* 2007; **7**: 224.
32. Ruprecht A, Boffi R, Mazza R *et al*. A comparison between indoor air quality before and after the implementation of the smoking ban in public places in Italy. *Epidemiol Prev* 2006; **30**: 334–7.
33. Gotz NK, van Tongeren M, Wareing H *et al*. Changes in air quality and second-hand smoke exposure in hospitality sector businesses after introduction of the English Smoke-free legislation. *J Public Health (Oxf)* 2008; **30**: 421–8.
34. Gorini G, Moshammer H, Sbrogio L *et al*. Italy and Austria before and after study: second-hand smoke exposure in hospitality premises before and after 2 years from the introduction of the Italian smoking ban. *Indoor Air* 2008; **18**: 328–34.

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35. Semple S, Maccalman L, Naji AA *et al*. Bar workers' exposure to second-hand smoke: the effect of Scottish smoke-free legislation on occupational exposure. *Ann Occup Hyg* 2007; **51**: 571–80.
36. Semple S, Creely KS, Naji A *et al*. Secondhand smoke levels in Scottish pubs: the effect of smoke-free legislation. *Tob Control* 2007; **16**: 127–32.
37. Lee CW, Kahende J. Factors associated with successful smoking cessation in the United States, 2000. *Am J Public Health* 2007; **97**: 1503–9.
38. Bureau of Health Promotion. Effects of Taiwan Tobacco Hazards Amendment Act [Press release]. Taipei: Bureau of Health Promotion, Department of Health; 2009.
39. Hyland A, Higbee C, Borland R *et al*. Attitudes and beliefs about secondhand smoke and smoke-free policies in four countries: findings from the International tobacco control four country survey. *Nicotine Tob Res* 2009; **11**: 642–9.
40. Davison WP. The third-person effect in communication. *Public Opin Q* 1983; **47**: 1–15.
41. Miller CL, Hill DJ, Quester PG *et al*. Response of mass media, tobacco industry and smokers to the introduction of graphic cigarette pack warnings in Australia. *Eur J Public Health* 2009; **19**: 644–9.
42. Hammond D, Fong GT, McDonald PW *et al*. Graphic Canadian cigarette warning labels and adverse outcomes: evidence from Canadian smokers. *Am J Public Health* 2004; **94**: 1442–5.
43. Nascimento BE, Oliveira L, Vieira AS *et al*. Avoidance of smoking: the impact of warning labels in Brazil. *Tob Control* 2008; **17**: 405–9.
44. Arheart KL, Lee DJ, Fleming LE *et al*. Accuracy of self-reported smoking and secondhand smoke exposure in the US workforce: the National Health and Nutrition Examination Surveys. *J Occup Environ Med* 2008; **50**: 1414–20.

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