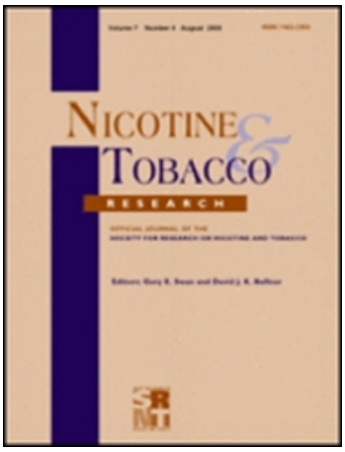

Nicotine & Tobacco Research
Publication details, including instructions for authors and subscription information:
http://www.informaworld.com/smpp/title~content=t713439766

Prevalence and correlates of roll-your-own smoking in Thailand and Malaysia: Findings of the ITC-South East Asia Survey

David Young [a]; Hua-Hie Yong [a]; Ron Borland [a]; Hana Ross [b]; Buppha Sirirassamee [c]; Foong Kin [d]; David Hammond [e]; Richard O'Connor [f]; Geoffrey T. Fong [g]
[a] VicHealth Centre for Tobacco Control, Cancer Council of Victoria, Australia [b] American Cancer Society, Atlanta, GA [c] Institute for Population and Social Research, Mahidol University, Thailand [d] National Poison Centre, Universiti Sains Malaysia, Malaysia [e] Department of Health Studies, University of Waterloo, Canada [f] Department of Health Behavior, Roswell Park Cancer Institute, Buffalo, NY [g] Department of Psychology, University of Waterloo, Canada

Online Publication Date: 01 May 2008

To cite this Article Young, David, Yong, Hua-Hie, Borland, Ron, Ross, Hana, Sirirassamee, Buppha, Kin, Foong, Hammond, David, O'Connor, Richard and Fong, Geoffrey T.(2008)'Prevalence and correlates of roll-your-own smoking in Thailand and Malaysia: Findings of the ITC-South East Asia Survey',Nicotine & Tobacco Research,10:5,907 — 915
To link to this Article: DOI: 10.1080/14622200802027172
URL: http://dx.doi.org/10.1080/14622200802027172

Nicotine & Tobacco Research Volume 10, Number 5 (May 2008) 907–915

informa
healthcare

Prevalence and correlates of roll-your-own smoking in Thailand and Malaysia: Findings of the ITC-South East Asia Survey

David Young, Hua-Hie Yong, Ron Borland, Hana Ross, Buppha Sirirassamee, Foong Kin, David Hammond, Richard O'Connor, Geoffrey T. Fong

Received 27 August 2006; accepted 27 August 2007

Roll-your-own (RYO) cigarette use has been subject to relatively limited research, particularly in developing countries. This paper seeks to describe RYO use in Thailand and Malaysia and relate RYO use to smokers' knowledge of the harmfulness of tobacco. Data come from face-to-face surveys with 4,004 adult smokers from Malaysia (N=2,004) and Thailand (N=2000), collected between January and March 2005. The prevalence of any use of RYO cigarettes varied greatly between Malaysia (17%) and Thailand (58%). In both countries, any RYO use was associated with living in rural areas, older average age, lower level of education, male gender, not being in paid work, slightly lower consumption of cigarettes, higher social acceptability of smoking, and positive attitudes toward tobacco regulation. Among RYO users, exclusive use of RYO cigarettes (compared with mixed use) was associated with older age, female gender (relatively), thinking about the enjoyment of smoking, and not making a special effort to buy cheaper cigarettes if the price goes up. Finally, exclusive RYO smokers were less aware of health warnings (RYO tobacco carries no health warnings), but even so, knowledge of the health effects of tobacco was equivalent.

Introduction

The International Tobacco Control (ITC) surveys are designed to evaluate the effects of tobacco control policies on smoker's intentions, attitudes, beliefs, and behavior by establishing the relative effectiveness of different policies in widely different jurisdictions (Fong et al., 2006). This paper used data from the initial wave of the ITC-South East Asia (SEA) surveys conducted in two developing countries (Malaysia and Thailand) to assess the prevalence of, and motivation for, the use of roll-your-own (RYO) cigarettes.

RYO or "hand-rolled" cigarettes have been the subject of relatively limited research, and nothing was found on them in the scientific literature from Malaysia or Thailand. Despite the increased penetration of manufactured cigarettes during the 20th century, previous research revealed that RYO use is common in some industrialized countries such as the United Kingdom and Australia (Young et al., 2006), Norway (Wangan & Biørn, 2001), and New Zealand (Laugesen, 2003). RYO use may be motivated by different factors in developing countries. In particular, it may be more a function of poverty in these countries.

We know relatively little about the use of RYO cigarettes in developing countries such as Thailand and Malaysia. The little available data suggest that RYO use may be more prevalent in Thailand than in Malaysia (The Dalvey Group, 2004). Thailand has a population of approximately 65 million, and the

David Young, Ph.D., Hua-Hie Yong, Ph.D., Ron Borland, Ph.D., VicHealth Centre for Tobacco Control, Cancer Council of Victoria, Australia; Hana Ross, Ph.D., American Cancer Society, Atlanta, GA; Buppha Sirirassamee, Ph.D., Institute for Population and Social Research, Mahidol University, Thailand; Foong Kin, Ph.D., National Poison Centre, Universiti Sains Malaysia, Malaysia; David Hammond, Ph.D., Department of Health Studies, University of Waterloo, Canada; Geoffrey T. Fong, Ph.D., Department of Psychology, University of Waterloo, Canada; Richard O'Connor, Ph.D., Department of Health Behavior, Roswell Park Cancer Institute, Buffalo, NY.

Correspondence: David Young, VicHealth Centre for Tobacco Control, Cancer Council of Victoria, 100 Drummond Street, Carlton, Victoria, 3053, Australia. Tel: +1 6 13 9635 5123; Fax: +1 6 13 9635 5440; E-mail: david.young@cancervic.org.au

ISSN 1462-2203 print/ISSN 1469-994X online

DOI: 10.1080/14622200802027172

tobacco market is dominated by the state-owned Thailand Tobacco Monopoly, with an estimated 83% share of the country's factory-made (FM) cigarette market (Euromonitor, 2005). Most foreign brands are positioned as luxury cigarettes (Euromonitor, 2005). Thais are among the largest consumers of RYO cigarettes in the world, and the tobacco typically is a product of the informal economy (The Dalvey Group, 2004) with RYO cigarettes sold in small quantities sealed in polythene bags, available through roadside vendors who also sell FM cigarettes, snacks, magazines, and newspapers. It has been argued that many smokers traded down from FM cigarettes to RYO at the onset of the economic crisis in 1997 (The Dalvey Group, 2004). If this assumption is correct, the recent economic recovery may well produce a switch in the opposite direction, thereby increasing the market share of FM cigarettes.

In Malaysia, with a population of 26 million, and an estimated 5 million smokers, RYO tobacco has a relatively small share of a market which, unlike in Thailand, is dominated by three foreign multinationals: Philip Morris, British American Tobacco, and Japan Tobacco Industries (Kuan, 2003). As in Thailand, however, RYO cigarettes are also predominantly a product of the informal economy, sold in polythene bags by roadside vendors.

Although Thailand and Malaysia are neighbors, the tobacco control environments of the two countries are markedly different. Thailand is a leader in tobacco control in Southeast Asia and has had very strong tobacco control measures in place for many years, whereas Malaysia has stepped up its tobacco control efforts only recently.

Young et al. (2006) found that in the West (United States, United Kingdom, Canada, and Australia), RYO users were predominantly poorer, male, and more likely to be younger than exclusive FM smokers. They were more embedded in a smoking culture, had more friends who smoked, viewed smoking as more normative, and claimed to be more addicted, to inhale more deeply, and to be less interested in quitting. They also were more critical, and less trusting, of tobacco companies. Exclusive RYO smokers were older than those who smoked a mixture of RYO and FM cigarettes (mixed users), showing less concern for the financial consequences of their habit, and were more likely to be males. They were even less trusting of tobacco companies, claimed to inhale even more deeply, but had fewer friends who smoked and were more accepting that tobacco use was becoming socially denormalized, compared with mixed smokers.

Only a minority of the RYO smokers in the four developed countries seemed to fit the stereotype of "the poor, old, unsophisticated male." At least three different motives were tentatively identified: economy, since RYO cigarettes are seen as cheaper; perceived lack of harm, since many RYO smokers believed RYO tobacco is more "natural" and thus safer as well as "non-mass market"; and subcultural identification among young, male and female urban smokers who identified strongly with their smoking subculture. The extent to which findings from these four developed countries can be generalized to developing countries is unknown.

Economic motives are obviously extremely important, because RYO cigarettes are typically less expensive than FM cigarettes and serve as a "discount" option for smokers. This is especially true in countries where RYO cigarettes are subject to lower taxes than are FM cigarettes (Health Canada, 2001; Lader & Meltzer, 2001; Mindell & Whynes, 2000; Scollo, Younie, Wakefield, Freeman, & Icasiano, 2003), as they are in both of the countries studied here. We were interested in seeing if economic motives were as important in modernizing Southeast Asian countries such as Thailand and Malaysia.

In both Thailand and Malaysia, most RYO tobacco is typically sold with little or no packaging and no standard labeling requirements, such as the government-mandated health warnings on FM cigarettes. As a result, RYO smokers may be less well informed about the adverse health consequences of smoking, a possibility we aim to explore.

Method

The ITC-SEA survey is a parallel survey (Thompson et al., 2005) modeled after the original ITC Four-Country Survey (Fong et al., 2006; Thompson et al., 2006) with minor adaptations and some questions added to address local issues.

Sampling design

Respondents were selected using a stratified multistage sampling design. The primary strata consisted of regions (five in Thailand, six in Malaysia). In Thailand, respondents were selected from Bangkok and two provinces in each of Thailand's four regions: Chiang Mai, Phrae, Nakhon Ratchasima, Nong Khai, Nakhon Pathom, Samut Sakhon, Nakhon Si Thammarat, and Songkhla. In Malaysia, respondents were drawn from one state in each of the country's six zones: Kedah, Selangor, Johor, Terengganu, Sabah, and Sarawak. In both countries, within each province or state, there was a secondary stratification into urban and rural regions. Ultimate sample allocations within the secondary strata were made proportional to their sizes.

From this stratification, 125 clusters of about 300 households were identified. Each cluster was given a

quota of about 16 adult smokers. Sampling within a cluster proceeded until the respondent quota in each sampling category was filled. To qualify for inclusion, prospective participants had to smoke at least weekly and to have smoked more than 100 cigarettes in their lifetime, in addition to meeting the cluster criteria. Once an eligible household was identified, interviewers enumerated all household members. Both males and females could be recruited from the same household (to maximize female smoker participation). This means that the male and female data are not independent, and the relative proportions should not be used to estimate relative prevalence. A variant of the Kish Grid (Kish, 1949) was used when there were multiple eligible respondents of each gender.

Participants

The adult smoker sample consisted of 2,000 respondents from Thailand (1,846 men and 154 women) and 2,004 respondents from Malaysia (1,906 men and 98 women), reflecting the low smoking prevalence among women in both countries. In Thailand, a combined eligibility and cooperation rate of 58.7% was achieved. In Malaysia, the combined eligibility and cooperation rate was 32.4%, reflecting a more urbanized and heterogeneous population.

Data collection

Smokers participated in face-to-face interviews in English or Malay in Malaysia, and in Thai in Thailand, for about 50 min on average. The surveys were conducted between January and March 2005. In Malaysia, the study was administered by experienced interviewers from the Ministry of Health and from the National Poison Centre (University Sains Malaysia); fieldwork in Thailand was completed by experienced interviewers from the Institute for Population and Social Health Research (University of Mahidol). All survey questions and study procedures were standardized as far as possible across the two countries. The study was approved by the ethics committees of all the investigators' institutions (The Cancer Council Victoria; Roswell Park Cancer Institute; Waterloo University; American Cancer Society; Institute for Population and Social Research, Mahidol University; National Poison Centre, Universiti Sains Malaysia). Further information on the research design and survey methodology is available in Thompson et al. (2005).

Measures

Roll-your-own use. All respondents were asked if they smoked FM cigarettes only, RYO/hand-rolled cigarettes only, or both. Respondents who smoked a mix of FM and RYO cigarettes were asked to report if they smoked "mainly factory-made," mainly hand-rolled," or "about the same." For the present analysis, smokers were categorized as FM only, RYO only, or mixed.

Self-exempting beliefs. Self-exempting beliefs were measured with responses to the question "You have to die of something, so why not enjoy yourself and smoke." Responses were measured on a 5-point scale: 1 (disagree strongly) to 5 (agree strongly).

Social normalization. Normalization of smoking was assessed using three 5-point "disagree strongly" to "agree strongly" scales. The items were "People who are important to you think you shouldn't smoke," "It is appropriate for women to smoke," and "Society disapproves of smoking."

Intention of quitting. Quitting intentions were measured with a 5-point scale: 1 (do not intend to quit), 2 (intend to quit beyond 6 months), 3 (intend to quit in the next 6 months), 4 (intend to quit in the next month, with no date set), 5 (intend to quit in the next month, with a date set).

Aggregate knowledge of health effects of smoking. A 7-point scale (α=.76) was produced by summing respondents' answers to individual items that assessed knowledge of the health effects of smoking: smoking causes stroke, causes impotence, causes lung cancer in smokers, causes lung decay, causes stained teeth, causes premature aging, causes lung cancer in nonsmokers.

Attitudes toward tobacco companies. Two 5-point scales were used to measure attitudes toward tobacco companies. The items were "Tobacco companies should be allowed to advertise as they please" and "The government should do more to tackle the harm caused." Response options were 1 (disagree strongly) to 5 (agree strongly).

Other variables in the analysis

Sociodemographic variables included country, location (urban vs. rural), sex, age, income, education, religion, in paid work or not, and employment status. Coding adjustments were made to the categorical variables age and employment to generate large enough subsamples for logistic regressions (Tables 2 and 3). Education was recoded into the following categories: "lower elementary or less" (low), "upper elementary to upper secondary" (moderate), "tertiary" (high), and "other."

Number of cigarettes per day was derived from answers to questions establishing if respondents smoked daily, weekly, or monthly and the average number of cigarettes smoked, including both FM and RYO cigarettes.

Self-perceived level of addiction was assessed using the question "Do you consider yourself addicted to cigarettes?" Response options were "not at all addicted" (1), "somewhat addicted" (2), and "very addicted" (3).

Smoking-related beliefs were assessed with items related to the frequency of thinking about "the harm my smoking does to others," "the money spent on cigarettes," and "the enjoyment of smoking." Response options were "never" (1), "once in a while" (2), "often" (3), and "very often" (4).

Financial stress was assessed with responses to the following items: reporting having made a special effort to buy cheaper cigarettes, believing they spend too much on cigarettes, and reporting they spent money on cigarettes that would have been better spent on essentials like food.

Finally, awareness of warning labels was measured with 4-point scales ranging from "never" (1) to "very often" (4). Items asked how often warning labels are noticed and how often they are read or looked at closely.

Data analyses

All analyses were carried out SPSS version 12.0.1. Prevalence estimates of variables used data weighted to geographic region or zone, gender, ethnicity, and age. Multivariate analyses were carried out with both weighted and unweighted data; weighting did not affect the results. Significance estimates are from unweighted data. In the multivariate analysis, a model with country interactions for all predictors was tested and, where no significant country effects were found, the analyses reported are based on the simplified model, without these interaction terms.

Results

Table 1 provides overall prevalence for RYO use in Malaysia and Thailand and compares these results with data from Young et al. (2006) for four developed countries. The prevalence of RYO smoking was highest in Thailand, and the difference was most pronounced with respect to exclusive RYO use. A clear majority of Thai smokers (58.2%) used at least some RYO tobacco, and a majority of them used RYO exclusively. By contrast, most Malaysian smokers used FM cigarettes exclusively, and similar minorities used FM/RYO or RYO only.

Table 2 reveals that RYO smoking rates were higher in rural regions in both countries. Although smoking was overwhelmingly a male pursuit in both Southeast Asian countries, and smoking a mix of RYO and FM was associated with the male gender, the small proportion of females who smoked (5% in Malaysia and 6% in Thailand) were far more likely to smoke RYO exclusively than they were to mix RYO and FM cigarettes. In Thailand, women also were more likely to smoke RYO exclusively than FM cigarettes.

Table 2 also shows that RYO use was more common among rural smokers, older smokers, and those with low income and low education. Related to this finding, in Malaysia, part-time employment was disproportionately associated with mixing FM and RYO cigarettes, whereas the unemployed were more likely to smoke RYO exclusively and to mix FM and RYO cigarettes. By contrast, in Thailand the part-time employed were more likely to smoke RYO exclusively as well as to smoke both FM and RYO, whereas unemployment was disproportionately associated only with exclusive use of RYO cigarettes. Although these relationships are quite strong, 25% of high-income Thai smokers also make some use of RYO.

In both countries, exclusive RYO smokers reported smoking fewer cigarettes per day than either mixed smokers or FM smokers, and in both countries, mixed smokers had the highest self-rated addiction level. Exclusive RYO smokers showed the lowest level of agreement with the proposition that they spend too much on cigarettes.

In Malaysia, all RYO smokers reported lower levels of knowledge of the health effects of smoking than did FM smokers, but this was not the case in Thailand. In both countries, RYO smokers were

Table 1. Level of roll-your-own (RYO) use by country (weighted row percentage).

Survey	Mixed	RYO only	Any RYO use
ITC-SEA Survey (χ^2=562.1; p=.000)			
Malaysia	9.8	7.6	17.4
Thailand	25.3	32.9	58.2
ITC Four-Country Survey (Young et al., 2006)			
United Kingdom	11.6	16.8	28.4
Australia	15.3	8.9	24.2
Canada	10.3	6.8	17.1
United States	5.5	1.2	6.7

ITC-SEA, International Tobacco Control-South East Asia survey; ITC, International Tobacco Control.

Table 2. Level of roll-your-own (RYO) use by sociodemographics and smoker attributes (weighted row percentages or means).

Variable	Malaysia (n=2,004)				Thailand (n=2,000)			
Demographics	FM only	Mixed	RYO only	p value	FM only	Mixed	RYO only	p value
				Percentages				
Location				.000				.000
Urban	90.4	6.3	3.3		68.3	12.9	18.8	
Rural	70.4	15.3	14.3		32.5	29.7	37.8	
Sex				.000				.000
Male	83.2	10.0	6.8		41.9	26.4	31.7	
Female	70.5	6.3	23.2		41.8	6.4	51.8	
Age				.000				.000
18–29	88.4	10.3	1.2		82.6	14.0	3.4	
30–40	89.7	6.3	4.0		51.8	29.8	18.3	
41–54	82.8	10.5	6.7		38.6	30.6	30.8	
55+	63.6	12.7	23.7		19.5	19.9	60.6	
Income				.000				.000
Low	75.4	11.8	12.8		16.8	37.7	45.5	
Moderate	83.4	12.5	4.2		41.8	23.6	34.6	
High	92.5	4.6	2.9		74.7	11.3	14.0	
Employed in paid work				.000				.000
Yes	88.9	8.1	3.1		65.1	19.5	15.4	
No	76.2	11.7	12.1		31.4	28.0	40.6	
Employment status				.000				.000
Full-time employed	89.4	6.8	3.8		60.2	19.9	19.9	
Part-time employed	81.4	14.4	4.1		32.0	30.4	37.6	
Unemployed	64.9	12.2	22.9		34.0	15.6	50.5	
Retired/student/home duties/other	73.0	16.4	10.7		83.3	8.1	8.6	
Education				.000				.000
Low	59.4	11.3	29.3		20.1	18.3	61.6	
Moderate	85.4	9.8	4.8		40.6	26.7	15.3	
High	88.3	8.8	2.9		80.0	15.3	4.7	
Financial considerations								
Special effort to buy cheaper				*ns*				.000
Yes	82.7	12.4	4.9		28.4	41.1	30.5	
No	82.5	9.3	8.2		42.5	24.5	33.0	
				Means				
Spend too much on cigarettes	3.50	3.46	2.91	.000	3.85	3.80	3.49	.000
Labels, health knowledge								
Noticed warning labels	2.62	2.76	1.81	.000	3.14	2.72	2.06	.000
Read warning labels	2.32	2.51	1.68	.000	2.69	2.45	1.83	.000
Health effects knowledge	5.31	4.75	4.03	.000	5.66	5.80	5.64	*ns*
Smoking and quitting								
Cigarettes per day	14.46	12.45	11.20	.000	14.20	13.95	11.64	.000
Self-rated addiction level	2.07	2.22	1.92	.000	2.21	2.32	2.23	.005
Intention to quit	1.71	2.05	1.57	.000	1.72	1.79	1.69	*ns*
Number of times tried to quit	4.43	4.44	4.44	ns	4.19	3.42	3.68	.001
Self-efficacy for quitting	1.99	2.12	2.21	.007	1.97	2.10	1.99	.000
Attitudes								
Society disapproves	2.66	2.75	2.85	ns	3.68	3.91	3.94	.000
Okay for women to smoke	2.20	2.25	2.24	ns	2.10	1.72	1.89	.000
Tobacco companies can advertise	2.22	2.16	2.07	.000	1.85	1.64	1.78	.000
Government do more	4.09	4.27	4.10	.000	4.09	4.34	4.11	.000

FM, factory-made.

significantly more likely to agree that the government should do more to tackle the harm caused by smoking and to oppose the proposition that tobacco companies should be free to advertise as they please.

Table 3 shows the outcome of two logistic regression analyses. The first compared smokers of any RYO cigarettes with those who smoked FM cigarettes exclusively. The second compared mixed smokers with exclusive RYO smokers.

Analysis of any RYO use indicated that, compared with exclusive FM cigarette smokers, RYO smokers are more likely to be older, to be rural dwellers, to be Thai, to have lower levels of education, and not to be in paid work. Income, which was related bivariately, was not an independent predictor. RYO users in Thailand and Malaysia reported higher levels of self-rated addiction than did exclusive FM smokers. However, they reported smoking fewer cigarettes per day than did exclusive FM smokers. RYO users also were more inclined than exclusive FM smokers to reject the idea that they spend too much on cigarettes and to accept that society disapproves of smoking.

We found two strong interaction effects by country. The first interaction was between country

Table 3. Logistic regressions: Any use of roll-your-own (RYO) versus factory-made (FM), and RYO only versus mixed (not weighted).

Correlates (n=4,006)	Any RYO vs. FM			RYO only vs. mixed		
Hosmer–Lemeshow goodness-of-fit	χ^2=9.1, *df*=8; *ns*			χ^2=8.3, *df*=8; *ns*		
	OR	*p* value	95% *CI*	*OR*	*p* value	95% *CI*
Country						
Thailand vs. Malaysia	2.29	.008	1.24–4.24	.42	*ns*	0.14–1.26
Location						
Urban vs. rural	.31	.000	0.25–0.38	.75	*ns*	0.53–1.06
Age						
30–40 vs. 18–29	2.07	.000	1.46–2.93	3.24	.002	1.56–6.70
41–54 vs. 18–29	3.35	.000	2.42–4.63	4.98	.000	2.47–10.07
55+ vs. 18–29	6.67	.000	4.66–9.54	11.68	.000	5.70–23.94
Sex						
Male vs. female	1.52	*ns*	0.98–2.37	.37	.008	0.18–0.78
Education						
Moderate vs. low	.69	*ns*	0.49–0.98	.72	*ns*	0.47–1.11
High vs. low	.42	.001	0.25–0.69	.33	.016	0.14–0.82
Income						
Low vs. high	1.58	*ns*	1.02–2.44	.80	*ns*	0.33–1.91
Medium vs. high	1.52	*ns*	0.98–2.35	.91	*ns*	0.39–2.34
Self-rated addiction level	1.27	.005	1.08–1.49	.79	*ns*	0.64–0.98
Cigarettes per day	.98	.001	0.98–0.99	.98	.010	0.96–0.99
In paid work	.61	.000	0.48–0.76	.65	*ns*	0.46–0.91
Think about enjoyment	.93	*ns*	0.83–1.04	1.24	.004	1.07–1.44
Make special effort to buy cheaper	1.14	*ns*	0.82–1.60	.51	.008	0.32–0.84
Spend too much	.77	.000	0.70–0.85	.87	*ns*	0.77–0.98
Society disapproves	1.16	.006	1.05–1.29	1.06	*ns*	0.92–1.21
Acceptable for women to smoke	1.06	*ns*	0.90–1.26	.80	*ns*	0.58–1.09
Government should do more	1.24	.001	1.09–1.39	.83	*ns*	0.70–0.98
Country by income interaction						
Thailand by low income vs. Malaysia by high income	5.31	.000	3.12–9.01	1.46	*ns*	0.56–3.82
Thailand by medium income vs. Malaysia by high income	2.13	.004	1.27–3.59	1.41	*ns*	0.52–3.81
Country by acceptable for women to smoke interaction						
Thailand by acceptable for women to smoke vs. Malaysia	.73	.000	0.59–0.89	1.55	*ns*	1.09–2.19

and level of agreement with the proposition that it is acceptable for women to smoke. Compared with Malaysian smokers, the more that Thai smokers agreed that it is okay for women to smoke, the less likely they were to use RYO cigarettes. The second interaction was between country and income; it reflected a much greater income differential in RYO use in Thailand than in Malaysia.

Compared with mixed smokers, exclusive RYO smokers were significantly older and far more likely to be female. They also were significantly more likely to think about the enjoyment of smoking, and they were less likely to make a special effort to buy cheaper cigarettes.

Table 4 presents the results of a linear regression in which exclusive and mixed use of RYO, country, and the interaction between country and RYO were used as predictors of awareness of warning labels, knowledge of health effects, and propensity to quit (controlling for all demographic variables). As expected, exclusive RYO smokers from both countries were less likely to notice labels and to read them. However, we found no significant relationship with knowledge of health effects, intention to quit, or the number of past quit

Table 4. Predicting noticing labels, reading labels, knowledge of health effects and intention to quit from use of roll-your-own (RYO).[a]

	Standardised β for									
Variable	Notice labels		Read labels		Knowledge of health effects		Intention to quit		Number of quit attempts	
Exclusive use of RYO[a]	−.310	*p=.000*	−.289	*p=.000*	−.012	*ns*	−.030	*ns*	−.023	*ns*
Country (Malaysia)	.015	*ns*	−.020	*ns*	−.250	*p=.000*	.101	*ns*	.085	*ns*
Country by RYO use	−.035	*ns*	−.032	*ns*	−.104	*p=.006*	−.100	*ns*	−.055	*ns*
Mixed use of RYO[a]	.037	*ns*	.052	*ns*	.034	*ns*	.017	*ns*	−.001	*ns*
Country (Malaysia)	−.147	*p=.000*	−.070	*p=.004*	−.176	*ns*	.014	*ns*	.072	*p=.004*
Country by RYO use	.019	*ns*	.006	*ns*	−.058	*ns*	.050	*ns*	.025	

Note. [a]Controlling for all demographics.

attempts. Mixed smokers were as likely as FM smokers to notice and read health warnings.

We found a strong relationship between country and knowledge of health effects, with Thai smokers displaying significantly higher knowledge across the board than Malaysian smokers. For exclusive RYO smokers, we found a significant interaction effect ($\beta = -.104$, $p = .006$) between country and RYO use when predicting knowledge of health effects. Malaysian exclusive RYO smokers were much less aware of the health effects, compared with Malaysians who did not make exclusive use of RYO and with Thai RYO smokers.

Discussion

Data from the present study confirm that any use of RYO tobacco is more prevalent in Thailand (about 58%) than in Malaysia (about 18%). This finding partially reflects the radically different ratio of urban to rural populations in the two countries and the different levels of smoking by age group. In the weighted sample, 61% of Malaysian smokers were urban dwellers, whereas only 26% of the Thai smokers lived in urban areas. This finding is comparable to the United Nations 2005 population projections for Malaysia (65% urban) and Thailand (32% urban; United Nations Population Division, 2005).

Smoking of RYO cigarettes was more strongly associated with rural locations in both countries than it was in the Western countries studied by Young et al. (2006). Whereas rural dwellers in Australia and Canada (the only countries for which urban-rural data were available) also were more likely to be RYO smokers, the odds ratio for mixed smokers was considerably smaller (1.6, $p = .000$), and the odds ratio for exclusive RYO smokers was not significant.

However, even after controlling for urban status, we found that Thai smokers were still more likely to make some use of RYO cigarettes. This finding may be related to RYO use still being more culturally normative in Thailand. Alternatively, it could be related to some unmeasured factors such as the after effects of the economic crisis in the 1990s (which was associated with an increase in RYO use; The Dalvey Group, 2004) or the differential availability, accessibility, and pricing of RYO tobacco in the two countries. The extremely strong interaction between income and country in predicting RYO use may provide support for the hypothesis that low- and middle-income Thai smokers are still making disproportionate mixed use of RYO as a consequence of the economic downturn. Given that mixed use probably has a strong economic component—using RYO when the smoker runs out of money for FM cigarettes (Young et al., 2006)—it will be interesting to monitor the situation if the economic situation in Thailand continues to improve. A combination of factors likely will be needed to explain the much higher rates of ROY use in Thailand than elsewhere.

In both Southeast Asian countries, any use of RYO cigarettes was strongly associated with older age groups. By contrast, in the Four-Country Survey, younger smokers made disproportionate use of mixed FM and RYO cigarettes, whereas older smokers were more polarized, smoking either FM or RYO exclusively (Young et al., 2006).

As with the smokers from the Four-Country Survey (Young et al., 2006), among Southeast Asian smokers, "any RYO" smokers (especially mixed smokers) viewed themselves to be more addicted to smoking than did FM smokers. However, unlike RYO smokers from the Four-Country Survey, Southeast Asian smokers reported smoking fewer cigarettes. It is not clear whether this is a real difference. If it is, it might reflect the possibility that poor, rural Southeast Asians have less discretionary time to smoke, or can afford less.

RYO smokers also were more convinced that society increasingly disapproves of smoking, and they were more likely to support increased government intervention in the tobacco market, views matching those of exclusive RYO smokers in the Four-Country Survey (Young et al., 2006). This finding is consistent with the argument that those who are more socially disadvantaged are more likely to look to governments for protection.

Of particular note in the present study is confirmation of an acceptance of smoking (especially RYO) among some older, predominantly rural women in Southeast Asia: "In Asia, smoking by young women has been frowned upon, although older, less educated, rural women have traditionally used hand rolled or chewed tobacco (often with areca)" (Morrow & Barraclough, 2003, 375).

Given the higher disapproval of women smoking in this part of the world, and the low rates of smoking among women in general, the social status of these older rural women appears to be determined more by their age than their sex. We suspect that with increased urbanization and modernization, this practice is likely to fade away.

As pointed out earlier, unlike in the four developed countries, smoking RYO cigarettes in Thailand and Malaysia was associated much more strongly with older, less well-educated, rural smokers who often are not in paid employment. In the four developed countries (Young et al., 2006), tobacco marketers have managed to position specific RYO brands as non-mass-market, "natural," "non industrial" alternatives for more affluent younger smokers (even though, in fact, RYO is none of these things), while retaining the framing of other brands as the choice of the hardened working-class smoker (Devlin, Eadie, &

Angus, 2003). However, this market differentiation does not appear to have occurred in Thailand and Malaysia. FM cigarettes are overwhelmingly the choice of younger, more affluent, educated smokers. This is probably, at least partly, the result of companies marketing them as symbols of modernity and urbanity, something to which they aspire.

One possible exception to this pattern is the 16% of smokers (25% in Thailand) making any use of RYO who have high incomes. However, this group was predominantly older; only 5% of high-income smokers under age 30 used RYO. If a "counter-cultural" market is emerging, it is likely to be among this very small group.

The finding that RYO use was not associated with lower knowledge of health effects of smoking is reassuring and important. As would be expected, exclusive RYO users were less aware of health warning on packs. However, this did not emerge as a barrier to knowledge—especially in Thailand. They either saw the warnings on other people's packs often enough to get the message, or they got it from other places. The significant interaction effect between country and exclusive RYO use when predicting knowledge of health effects may indicate fewer alternative channels from which to get the health information in Malaysia (RYO smokers in Malaysia are less exposed to the multipronged antismoking initiatives that characterize the Thai scene). In light of these results, one could argue that, so far as policy is concerned, the range of anti-tobacco measures (i.e., the "information density") is what matters, not whether warnings appear in a specific context.

Given that RYO smokers are older and less educated, their high knowledge is impressive because these demographic variables are typically associated with lower knowledge. This finding suggests that education and its correlates are not necessarily the only explanation for the frequent socioeconomic-based differences in knowledge often found in developed Western countries (Siahpush, McNeill, Hammond, & Fong, 2006). It may be that in the West, the disadvantaged are less trusting of authority and thus less likely to accept messages of this kind.

For whatever reason, the finding of no knowledge deficit among RYO users in Thailand has important policy implications. It suggests that attempting to mandate health warnings on a noncommodified, barely processed agricultural product (a structurally difficult task) need not be such a high priority. That said, ongoing research and monitoring of RYO use is important for at least two reasons. First, little is known about the health risks of RYO tobacco use relative to FM cigarettes. Standard machine-determined yields of RYO cigarettes suggest that RYO smokers may be exposed to higher levels of smoke constituents per cigarette compared with smokers of FM cigarettes (Darrall & Figgins, 1998; Djordjevic, 2004; Dymond, 1996; Kaiserman & Rickert, 1992). However, given that estimates of exposure were made using variants of standardized puffing regimes that do not accurately reflect human exposures (Hammond et al., 2007), the possible adverse health effects remain pure speculation. Exposures also could be greater if RYO cigarettes are used mainly without filters. However, the proportion of RYO smokers who use a filter when making their cigarettes is unclear. One study of RYO use in the United Kingdom reported that most RYO smokers do not use a filter (Devlin et al., 2003). This is probably the norm in Southeast Asia as well (we plan to study this topic in the next wave of the survey).

Second, Philip Morris recently called for equalization of taxes on RYO and FM products in Thailand (*Bangkok Post*, 2006). We are concerned that such a change would likely drive consumption increasingly to the FM products of companies like Philip Morris. In addition, evidence from some countries indicates that RYO tobacco manufacturers are beginning to target a young, urban, market segment (Devlin et al., 2003; Gay, 2006; Simpson, 2001). This does not appear to be happening yet in Thailand and Malaysia. However, if RYO tobacco moved from being a simple (albeit addictive) agricultural product, to a branded, promoted, commodified consumer product, the potential for such targeting to occur would increase dramatically. Traditional economic analysis suggests that excise equalization and the consequent increase in the prices of cheaper RYO products would reduce consumption, but this does not take into account the inevitable increase in the commodification of the product, something that could drive up consumption over time. Further, and more refined, research is required to evaluate these competing forces.

The potential down side of leaving the situation alone is that RYO cigarettes are largely unregulated. However, does this really matter? As noted earlier, no good evidence has indicated that RYO is more harmful than FM, and RYO is far less prone to modern marketing techniques. It might matter if evidence indicated that the sector was being dominated by organized crime, but we do not believe this to be the case in Thailand and Malaysia. It also could matter if important consumer information, mandated on cigarette packets, was not getting through to RYO smokers. The present study demonstrates that this does not appear to be a problem. Strategies are needed to help poorer (and richer) Southeast Asian smokers stop using tobacco. However, we are not convinced that regulations that concentrate the market on FM and commodified RYO tobacco will contribute to this goal.

This paper relied on self-reported data from cross-sectional surveys in the two countries. We are not aware of any biases that might affect the results (e.g., from the differences in languages), but we cannot rule them out. We also had limited measures of the respondents' socioeconomic status, and any unmeasured aspects of this variable, such as amount of discretionary income, could have affected consumption choices in ways we cannot assess.

In summary, RYO smokers in Thailand and Malaysia are substantially different from those in the four developed countries we have studied. In many ways, they are more like the exclusive RYO users in the West, in that they are older, poorer, and less well educated (i.e., stereotypical old, poor, unsophisticated RYO smoker), but they have a stronger tendency to come from rural areas. Finally, the West has nothing to compare with the mainly exclusively RYO smoking older women we found, especially in Thailand.

Acknowledgments

Funding for this study was provided by National Cancer Institute grants CA100362 and CA111236 (through the Roswell Park Transdisciplinary Tobacco Use Research Center) and by support from the Malaysian Ministry of Health, Canadian Institutes of Health Research (57897), and National Health and Medical Research Council of Australia (265903). All authors are employed by academic institutions or cancer control charities and have no competing financial interests. This work was conducted without any financial or other support or assistance from any tobacco company or individual or entity acting on behalf of the tobacco industry.

References

Bangkok Post. (2006). *Tobacco giant unhappy to roll with taxation*. Retrieved from www.bangkokpost.com/printhis.php

The Dalvey Group. (2004, July). Amazing Thailand. *Tobacco Journal International*. Retrieved from http://lists.essential.org/pipermail/intl-tobacco/2004q3/001120.html

Darrall, K. G., & Figgins, J. A. (1998). Roll-your-own smoke yields: Theoretical and practical aspects. *Tobacco Control*, *7*, 168–175.

Devlin, E., Eadie, D., & Angus, K. (2003). *Rolling tobacco*. Report prepared for the National Health Service, Scotland: The Centre for Tobacco Control Research, The University of Strathclyde.

Djordjevic, M. V. (2004). Nicotine dosing characteristics across tobacco products. In: P. Boyle, N. Gray, J. Henningfield, J. Seffrin, & W. Zatonski (Eds.), *Tobacco: Science, policy and public health*. Oxford, United Kingdom: Oxford University Press.

Dymond, H. F. (1996). Making habits of roll-your-own smokers in the Netherlands and tar and nicotine yields from the resulting products. *Tobacco Science*, *40*, 87–91.

Euromonitor. (2005, May). *Thai tobacco operates as a monopoly market*. Retrieved from www.euromonitor.com/Tobacco in Thailand.

Fong, G. T., Cummings, K. M., Borland, R., Hastings, G., Hyland, A., & Giovino, G. A., et al. (2006). The conceptual framework of the International Tobacco Control Policy Evaluation Project. *Tobacco Control*, *15*(Suppl. 3), iii3–iii11.

Gay, G. (2006, June). Fine-cut by name, fine smoke by nature. *Tobacco Reporter*, 24–26.

Hammond, D., Wiebel, F., Kozlowski, L. T., Borland, R., Cummings, K. M., & O'Connor, R. J., et al. (2007). Revising the ISO machine smoking regime for cigarette emissions: Implications for tobacco control policy. *Tobacco Control*, *16*, 8–14.

Health Canada. (2001). Canadian Tobacco Use Monitoring Survey: Supplementary tables. In *CTUMS annual report*. Retrieved from www.hc-sc.gc.ca/hecs-sesc/tobacco/research/ctums/2001/table_10.html

Kaiserman, M. J., & Rickert, W. S. (1992). Handmade cigarettes: It's the tube that counts. *American Journal of Public Health*, *82*(1), 107–109.

Kish, L. (1949). A procedure for objective respondent selection within the household. *Journal of the American Statistical Association*, *44*, 380–387.

Kuan, M. (2003, March 20). BAT, JTI still favourites for defensive quality. *The Edge Daily (Kuala Lumpur, Malaysia)*. Retrieved from www.theedgedaily.com/cms/index.jsp

Lader, D., & Meltzer, H. (2001). *Smoking related behaviour and attitudes*. London: Office for National Statistics.

Laugesen, M. (2003). *Tobacco manufacturers' returns for calendar year 2002*. Report to the Ministry of Health New Zealand. Retrieved from www.ash.org.nz/pdf/TobaccoIndustry/Conduct/Articles/SFRTN2002Final.doc

Mindell, J., & Whynes, D. (2000). Cigarette consumption in the Netherlands 1970–1995: Does tax policy encourage the use of hand-rolling tobacco. *European Journal of Public Health*, *10*(3), 214–219.

Morrow, M., & Barraclough, S. (2003). Tobacco control and gender in South-East Asia. *Health Promotion International*, *18*(4), 373–380.

Scollo, M., Younie, S., Wakefield, M., Freeman, J., & Icasiano, M. (2003). Impact of tobacco tax reforms on tobacco prices and tobacco use in Australia. *Tobacco Control*, *12*(Suppl. 2), ii59–ii66.

Siahpush, M., McNeill, A., Hammond, D., & Fong, G. T. (2006). Socioeconomic and country variations in knowledge of health risks of tobacco smoking and toxic constituents of smoke: Results from the 2002 International Tobacco Control (ITC) Four Country Survey. *Tobacco Control*, *15*(Suppl. 3), iii65–iii70.

Simpson, D. (2001). France: Rolling round the curbs. *Tobacco Control*, *10*, 6.

Thompson, M. E., & Hammond, D., et al. (2005). *International Tobacco Control—South East Asia technical report*. Retrieved from www.itcproject.org/

Thompson, M., Fong, G. T., Hammond, D., Boudreau, C., Driezen, P., & Hyland, A., et al. (2006). Methods of the International Tobacco Control (ITC) Four-Country Survey. *Tobacco Control*, *15*(Suppl. 3), iii12–iii18.

United Nations Population Division. (2005). *Urban-Rural percentages for Malaysia and Thailand*. Retrieved from http://esa.un.org/unpp/.

Wangan, K. R., & Biørn, E. (2001). *Prevalence and substitution effects in tobacco consumption: A discrete choice analysis of panel data*. Discussion Paper 312, Research Department, Statistics Norway. Retrieved from www.ssb.no/publikasjoner/DP/pdf/dp312.pdf.

Young, D., Borland, R., Hammond, D., Cummings, K. M., Devlin, E., & Yong, H.-H., et al. (2006). Prevalence and attributes of roll-your-own smokers in the ITC Four-Country Survey. *Tobacco Control*, *15*(Suppl. 3), iii76–iii82.