The Economic Burden of Smoking-Related Disease in Thailand: A Prevalence-Based Analysis

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Objective: To estimate the direct out-of-pocket medical costs of treating major diseases attributable to smoking in Thailand in 2006.

Material and Method: A prevalence-based, disease-specific, approach was used to estimate the direct medical costs of treating lung cancer, chronic obstructive pulmonary disease (COPD), and coronary heart disease (CHD) attributable to smoking. Epidemiological parameters were obtained from the literature; historical out-of-pocket cost data were used to estimate 2006 expenditure.

Results: The number of cases attributable to smoking in 2006 was 5,299 for lung cancer, 624,309 for COPD, and 52,605 for CHD. The out-of-pocket expenditures for treatment were 368.49 million baht for lung cancer, 7,714.88 million baht for COPD, and 1,773.65 million baht for CHD. Total smoking-attributable out-of-pocket medical costs amounted to 9,857.02 million baht, 0.48% of GDP in 2006.

Conclusion: The prevalence-based, disease-specific, analysis described here shows that the health and economic impact of smoking in Thailand are substantial, and should be reduced by implementing smoking-cessation and related tobacco control policies of the types found effective in reducing the prevalence of smoking in other countries.

Keywords: Smoking prevalence, Smoking-related diseases, Cost of smoking

Smoking is an important behavior problem due to its harmful health consequences. The US Surgeon General in 2004 reported on the many morbid conditions known to be causally related to smoking, most of which resulted in premature mortality and/or disability[1]. It has been estimated that globally in 2000, there were about 4.83 million premature deaths attributable to smoking, due mainly to cardiovascular disease (CVD), chronic obstructive pulmonary disease (COPD), and lung cancer[2]. Additionally, the World Health Organization estimated that smoking caused 4 million deaths worldwide in 2002, and if the current trends continue, by 2030, smoking will kill 1 in 6 people[3]. It is of major concern that these health risks have also been observed in secondhand (passive) smokers. Several studies have shown that the risks of smoking-related diseases are similar in both current smokers and those affected by secondhand smoke[4,5].

Regarding the health hazards of smoking, much research to date has focused on CVD, COPD, and lung cancer[6-9]. These diseases are established as the leading causes of death from smoking in both industrialized and developing countries[10]. In 2000 in industrialized countries there were 0.52 million deaths from lung cancer, 1.02 million deaths from CVD, and 0.31 million deaths from COPD, while in the developing world there were 0.33 million deaths from lung cancer, 0.67 million deaths from CVD, and 0.65 million deaths from COPD[10].

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In Thailand, the recent survey on smoking behavior undertaken by the National Statistical Office showed that in 2005 smoking prevalence was 16.1% of the total population[11].

The economic impact on health of tobacco use in Thailand has been reported in previous studies, which used various methodologies and epidemiological data for smoking prevalence and related morbidity. In 1991 Wanchai studied the economic impact of lung cancer, Coronary Heart Disease (CHD), and COPD related to smoking, and found that the average direct treatment costs per patient were baht 5,777, 4,186 and 8,784, respectively[12]. In 1994 Theera estimated that the total lifetime economic loss due to lung cancer caused by smoking, consisting of the direct medical cost of treatment and the opportunity cost of work loss, was baht 2,233 million for a cohort of 7,800 smokers[13]. Again in 1996 the economic impact of lung cancer caused by smoking was reported by Kunaluck to be baht 54,434 per patient[14]. In 2001 Jayantan examined the impacts of smoking on COPD and CHD healthcare expenditure and quality of life, and showed that the average direct medical cost for COPD was baht 13,265 per person per year, and the total expenditure on treatment associated with CHD was baht 17,746 per person per year[15].

These older studies provide a clear picture of how smoking affects health in Thailand, and the economic consequences in terms of healthcare resources consumed. In 2006, an analysis of the economic burden of smoking-related healthcare based on updated epidemiological data from the patient's perspective was undertaken, and is reported here.

Material and Method

In the present study, the prevalence-based, disease-specific, approach was applied to estimate the direct medical costs of treating smoking-related diseases from the patient's perspective. The three major smoking-related diseases considered were lung cancer, CHD and COPD, and the disease-specific population attributable fraction (PAF%) used to estimate the number of patients with disease attributable to smoking[16].

Data sources

Smoking prevalence: The smoking prevalence rate in 2006 was estimated by applying linear regression to the historical (1999-2005) smoking prevalence data reported in the Thai behavioral risk factor surveillance report[11] and the National Statistical Office survey report[17].

Relative risks: The relative risks of target diseases for smokers were obtained from published studies[18,19] (Table 1).

Disease prevalence: Since there was no 2006 data on lung cancer prevalence, the most recent data from 1999 were used: 9.9 and 26.8 cases per 100,000 men and women, respectively[20]. A COPD prevalence of 3,592 per 100,000 population was also taken from the Thailand Health Profile 2001-2004[20]. CHD prevalence was obtained from a study of CHD and major cardiovascular risk factors in Thailand: 9.2 and 10.7 per 1000 men and women, respectively[21]. The total number of disease cases was estimated by multiplying the sex-specific prevalence rates by the Thai population in 2006: 31,007,857 men and 31,820,849 women[22].

Treatment costs: The average direct costs of treatment (Table 2) were based on the Pongpanich study of out-of-pocket payments to hospital[23], inflated to 2006 prices using the medical price index reported by the Thai Ministry of Commerce[24].

Population Attributable Fraction(%): The disease-specific PAF was calculated from the relative risk and prevalence of smoking, as indicated below:

$$\text{PAF}_d(\%) = 100\left[P_S(\text{RR}_d-1)/1+P_S(\text{RR}_d-1)\right]$$

Where Ps denotes the smoking prevalence rate and RR$_d$ denotes the relative risk of the disease of interest.

The direct out-of-pocket treatment costs for cases attributable to smoking were calculated by multiplying the average direct medical costs per patient (ADC) by the PAF, as shown below:

Disease-specific direct out-of-pocket treatment cost attributable to smoking $_d$ = ADC$_d$ x [PAF$_d$% x total disease cases$_d$]

Results
Smoking prevalence rate

Because the prevalence of smoking in Thailand has been falling since 1996, the 2006 prevalence rate was estimated to be 15.3% by extrapolation of the historical data using linear regression (smoking prevalence rate = 602.24 – 0.29 year; R^2 = 0.89; Fig. 1).

PAF (%), Smoking-Attributable Cases and Direct Treatment Costs

The disease-specific relative risks, population-attributable fractions (PAF%), number of disease cases, and the smoking-attributable direct treatment costs for the Thai community in 2006 are shown in Tables 1 and 2.

Based on the relative risk for disease and the prevalence of smoking, lung cancer showed the
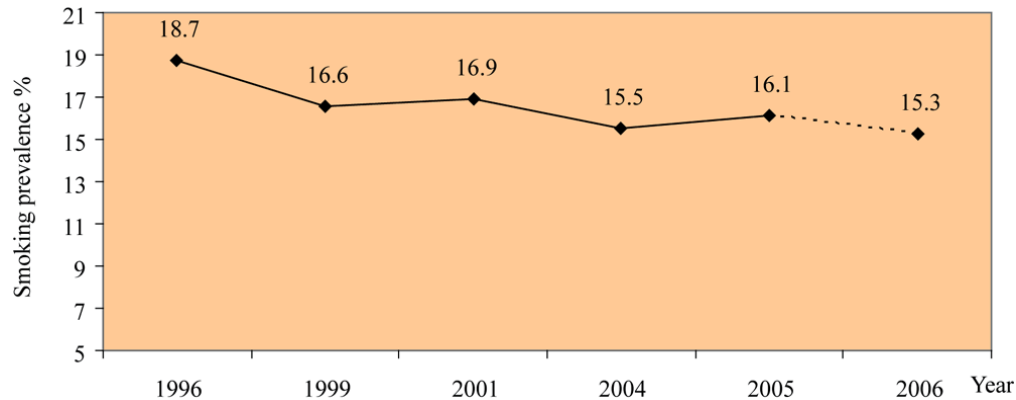
Fig. 1 Smoking prevalence rates (%) in Thailand, 1996-2006

Table 1. Disease-specific relative risks and population-attributable fractions (PAF %)

Disease	Relative risk	PAF %	Data source for relative risk
Lung cancer	6.5	45.69	18
COPD	3.5	27.66	18
CHD	1.60	8.41	19

Table 2. Number of disease cases, number of cases attributable to smoking and direct out-of-pocket treatment costs

Disease	Total number of disease cases	Number of disease cases attributable to smoking	Average direct out-of-pocket treatment cost/patient (baht)	Total direct out-of-pocket treatment costs (million baht)
Lung cancer	11,598	5,299	69,536.32	368.49
COPD	2,256,807	624,309	12,357.47	7,714.88
CHD	625,755	52,605	33,716.40	1,773.65
Total				9,857.02

greatest PAF (45.69%), followed by COPD (27.66%) and CHD (8.41%). The corresponding number of cases attributable to smoking were 5,299 (lung cancer), 624,309 (COPD) and 52,605 (CHD).

The out-of-pocket expenditure for COPD was the highest, amounting to 7,714.88 million baht, followed by CHD (1,773.65 million baht), and lung cancer (368.49 million baht). The disease-specific prevalence-based approach used in the present analysis indicates that the combined economic cost of lung cancer, COPD and CHD attributable to smoking in Thailand in 2006 was 9,857.02 million baht.

Discussion

The results of the present study show that cigarette smoking cost the Thailand economy an estimated 9.86 million baht in 2006, representing 0.48% of GDP in that year. This confirms that even though the prevalence of smoking in Thailand is not as high as in other countries in Asia, it imposes a substantial economic burden as well as a considerable public health impact.

The cost-modeling in the present analysis was based on the work of Pongpanich[23], a study that attempted to quantify the economic impact of smoking-

related diseases by determining the costs of treatment across a broad range of healthcare services, including four university (government) hospitals in different regions across the country, and two large urban private hospitals. Although he collected cost data by surveying patients about out-of-pocket expenditure during their hospital visits (instead of collecting cost data from hospital records), nevertheless he considered this a reasonable proxy for direct treatment costs. In view of the other strengths of the Pongpanich work, using his out-of-pocket expenditure data corrected for inflation was considered to provide good estimates for direct out-of-pocket treatment costs in 2006.

Because treatment costs in private hospitals in Thailand are generally higher than those in government hospitals, it is possible that the estimates of direct costs presented here are skewed upwards. However, comparing the results from previous studies that used similar approaches to quantify the economic impacts of smoking, the results presented here provide plausible updated estimates of the costs to patients for treatment of smoking-related diseases.

The prevalence-based, disease-specific, analysis described here shows clearly that the health and economic impact of smoking in Thailand are substantial, and should be reduced by implementing smoking-cessation and related tobacco control policies of the types that have been found effective in reducing the prevalence of smoking in other countries.

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ภาระทางเศรษฐศาสตร์ของโรคที่เกี่ยวข้องกับการสูบบุหรี่: การวิเคราะห์จากความชุก

จิตตระกูล เลิศสกุลพาณิช, วิมล งานทวี, ยูจีน ซาโลล

การศึกษาครั้งนี้มีวัตถุประสงค์เพื่อประมาณค่าใช้จ่ายตรงทางการแพทย์ในการรักษาโรคสำคัญที่เกิดจากการสูบบุหรี่ในปี พ.ศ. 2549 โดยอาศัยวิธีการประมาณทางระบาดวิทยาและความชุกการเกิดโรคแต่ละโรคซึ่งได้แก่ มะเร็งปอด, โรคหัวใจและหลอดเลือด และ โรคปอดอุดกั้นเรื้อรัง ตัวแปรทางระบาดวิทยาและค่าใช้จ่ายตรงทางการแพทย์ โดยใช้มุมมองของผู้ป่วยซึ่งใช้ในการคำนวณได้มาจากงานวิจัยในอดีต ผลการศึกษาพบว่า มีผู้ป่วยมะเร็งปอดจำนวน 5,299 คน, โรคปอดอุดกั้นเรื้อรังจำนวน 624,309 คน และโรคหัวใจและหลอดเลือดจำนวน 52,605 คน ที่มีสาเหตุการเกิดโรคมาจากการสูบบุหรี่ ซึ่งในจำนวนผู้ป่วยเหล่านี้ ค่าใช้จ่ายตรงทางการแพทย์ในการรักษาโรคปอด อุดกั้นเรื้อรัง มีค่าสูงที่สุด ได้แก่ 7,714.88 ล้านบาท ตามมาด้วยโรคหัวใจและหลอดเลือด และโรคมะเร็งปอด ซึ่งคิดเป็นจำนวนเงินทั้งสิ้น 1,773.65 และ 368.49 ล้านบาทตามลำดับ มูลค่ารวมของค่าใช้จ่ายตรงทางการแพทย์ของโรคทั้งสามมีค่าเท่ากับ 9,857.02 ล้านบาท ซึ่งมีค่าเป็น 0.48% ของมูลค่าผลิตภัณฑ์มวลรวมในประเทศ

จากผลการศึกษานี้ชี้ให้เห็นว่าผลกระทบเชิงเศรษฐศาสตร์ของการสูบบุหรี่ในประเทศไทยมีค่าสูงและมูลค่าเหล่านี้จะสามารถลดลงได้เมื่อมีมาตรการในเชิงนโยบายในการควบคุมการบริโภคยาสูบและสนับสนุนให้มีการเลิกบุหรี่อย่างจริงจัง