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Demographic and Regional Trends of Smoking among Thai Females from 1986 to 2014

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ABSTRACT

Background: Smoking is a major public health burden causing substantial morbidity and mortality. The aim of the study was to assess the prevalences and demographic trends of smoking among Thai females.
Methods Data from Thailand's National Statistics Office for 1986 to 2014 were used. Multiple logistic regression was implemented to identify the prevalences and trends of female smoking by region (Bangkok, Central, Northeast, North, and South) and area (Rural and Urban).
Results: The overall prevalence of smoking was 3.4% among females aged 15 years and above in 2014. Gradually decreasing trends of smoking were observed from 1991 to 2007. Afterwards, the trends of smoking was found higher in 2011 to 2014 among aged 15-39 years. Furthermore, there were substantial differences in female smoking in different regions and areas. Of those, the Northern Thailand and rural areas had the highest prevalence of smokers.
Conclusion: Smoking among Thai females in the past 20 years had a decreasing trend, but it can be seen that since 2007 the trend of smoking had shown an increasing trend and a variation among the regions. This imply that, tobacco control policies are important and in need particularly for young females, living in rural areas and Northern provinces.

Key words: Cigarette smoking; multiple logistic; smoking trend

INTRODUCTION

Smoking is a legal practice of inhaling and exhaling of burning tobacco fume via cigars, pipes, and cigarettes [1]. This process is associated with carcinoma of lungs, stroke, cardiovascular and respiratory disease [2,3]. However, it is not only associated with fatal illness among smokers but also effects their family, community, and the nation [4]. There are more than 6,000 chemical substances in a cigarette, comprising high amounts of carbon monoxide, nicotine, ammonia, and heavy metals [5]. These chemicals are inhaled by smokers, leading to consequent sickness and premature death [1]. It has been reported that every year, seven million people die due to the effects of active cigarette smoking and there are 890,000 deaths due to passive smoking. Additionally, it was found that 1.8 billion people are living with serious smoking-related illness [6-9]. If this trend remains constant smoking will cause eight million additional deaths by 2030, mostly occurring in developing countries, due to a

lack of access to medical resources and treatments [5,10].

Female cigarette smoking varies by age and country [11,12,13]. Globally, 175 million females currently smoke, with more than three quarters of those from developed countries [14]. A study of overall smoking prevalence from 187 countries showed that prevalence of daily smoking in female declined by 42% from 10.6% in 1980 to 6.2% in 2012 [13]. Another study of smoking prevalence in 195 countries revealed that smoking prevalence declined by 34.4% from 8.2% in 1990 to 5.4% in 2015 [15]. In Thailand, since tobacco control policies were implemented between 1991 and 2006, the prevalence of smoking was decreased by 25% [16] and the prevalence of female smoking in 2015 was 3.3% [15].

Thailand National Statistical Office (NSO) has established a national survey for monitoring tobacco use for 30 years among population aged 15 year and above. However, the utilization of these data was mainly for a descriptive analysis. Previous studies have introduced a logistic model to investigate the demographic and regional prevalence and trends of smoking in Thai males. There have been few studies applying a logistic model to look at the prevalence and trend of smoking among Thai females. Therefore, in this study, we applied the logistic model to adjust smoking prevalences by demographic and regional factors. Then, the prevalences of smoking across survey year, region and area can be compared.

MATERIALS AND METHODS

Data source

The data in this study were retrieved from Thailand National Statistics Office (NSO). There were three sources of survey data used in this study: the Health and Welfare Survey (HWS), the Smoking Behavior Survey (SBS), and the Smoking and Drinking Behavior of the Population Survey (SDBPS). Health and Welfare surveys data were conducted in years 1986, 1991, 1996, 2001, and 2003; Smoking Behavior Survey was conducted in 1999 and Smoking and Drinking Behavior Surveys were conducted in years 2007, 2011 and 2014. The details of data collection by the NSO has been explained in the previous study [17].

This study included only female respondents' aged 15 years and above and living in Thailand. Additionally, age, survey years, urban and rural municipal and females smoking status of a survey were selected as factors of interest. Age groups were classified into 5-year intervals from 15-19, 20- 24, 70-74 and 75 – 80 years. Provinces consisted of 13 Public Health Areas (PHAs). PHA coded as 1 to 4, and 5 to 7 were assigned as the Central region, and the Northeast region, respectively. Similarly, 8 to 10 PHAs were named as the North region, and PHAs

of the South region were from the 11 and 12 PHA while Bangkok was the 13 PHAs. Survey year (9 surveys) was combined with age group (14 groups) resulting in 126 categories and region (4 regions) was combined with area (4 rural and 5 urban areas) resulting in 9 categories.

Statistical analysis

The descriptive statistical analysis was performed to calculate smoking prevalence in rural and urban areas for each survey year. A multiple logistic regression model was applied to identify the prevalences of Thai female smoking. This regression model created the logit function of probability that females are smokers as an additive linear function of the determinant factors and was formulated as

$$ln(P_{ij}) - ln(1 - P_{ij}) = \mu + \alpha_i + \beta_j$$

Where, P_{ij} is the probability of being a female smoker in year-age group i and region group j, μ is a constant, α_i are the coefficients for year-age group i, and β_j are the coefficients for area-region j. Adjusted percentages of female smokers were categorized by survey year-age groups, and regions and were subsequently plotted. Nevertheless, such plots can be distorted the result when risk factors are mutually correlated, so these plots were also shown by 95% confidence intervals for adjusted percentages based on the regression model by using the weighted sum contrasts [18]. For all the analysis, R software was used for statistical analysis of the Thai female smoking data [19].

RESULTS

The prevalences of female smoking trends were varied. Table 1 shows the prevalences of Thai female smoking for different year and areas from 1986 to 2014. Over the periods from 1986 to 2014, females who were living in a rural area of Thailand with the higher prevalence of smoking compared to that of females living in on urban region. It was also revealed that the prevalence of smoking was the highest (5.8 %) in 1991 whereas 2011 remains the lowest (2.7%) in a rural setting of Thailand, small inconsistency trends of smoking were also noted in urban areas. Subsequently, the overall prevalence of smoking remained unstable during the survey period. However, it was found that the trend of smoking prevalence was declined from 2003 to 2011, while the trend of smoking seemed getting increased after 2011.

Adjusted percentages of smoking with 95% confidence intervals from the multiple logistic models with year-age are shown in Figure 1.

The overall percentage of smoking for all nine

TABLE 1. Smoking percentage by survey year and areas

Survey year	Total	Percent of smokers		
		Rural	Urban	Overall
1986	29,256	5.3	3.8	4.3
1991	37,472	5.8	4.0	4.7
1996	31,203	4.0	3.3	3.6
1999	35,473	4.3	2.6	3.2
2001	90,344	3.8	2.7	3.1
2003	21,416	4.1	2.7	3.3
2007	90,857	2.7	1.9	2.2
2011	76,544	2.8	1.9	2.2
2014	11,387	3.8	2.9	3.4

FIGURE 1. Adjusted percentage of smoking with 95% confidence intervals of Female smoking by year-age groups
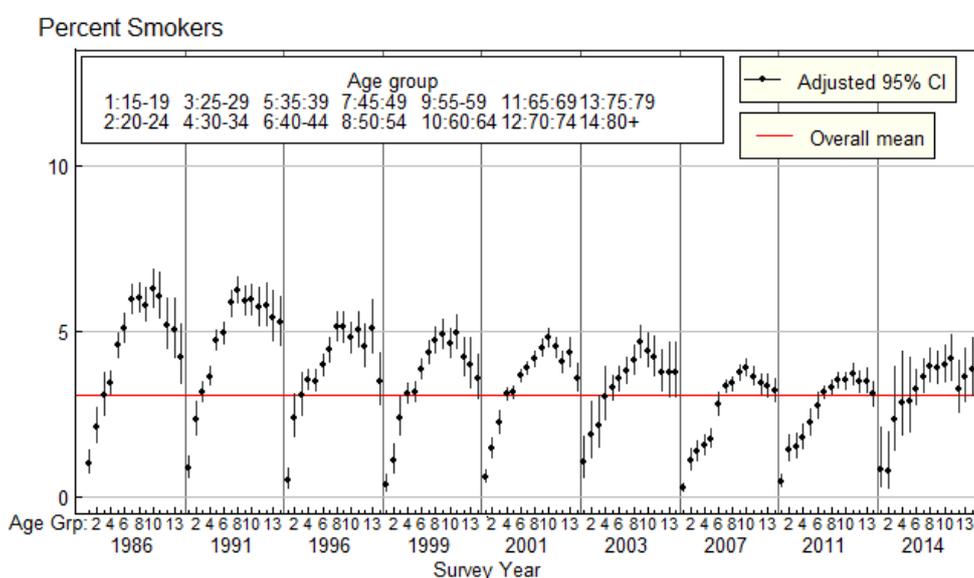
surveys was 3% as shown by the red horizontal line. The lowest smoking rate was in age group 15-19 years. The significantly lower than overall mean of smoking rates were found in age group 15-24 in year 1986 and 1991, age group 15-19 in year 1996, age group 15-29 in year 1999, 2001 and 2003, age group 15-39 in year 2007 and 2011 and age 15-24 in year 2014. The steeply increasing smoking rate was found at aged 15-44 years in all surveys. The substantially higher than overall mean of smoking rates were found in age group 30 and over in year 1986 and 1991, 30-79 in year 1996, 40-79 in year 1999, 2001 and 2003, 45-74 in year 2007, 50-79 in year 2011 and 45-69 in year 2014. The higher smoking rate than overall mean was mainly found in aged 45 years and older in most of the surveys. Smoking from surveys in 1991 to 2007 decreased continuously and increasing trends appeared in 2011 to 2014 in aged 15-39 years except for age group 20-24 in year 2014.

Table 2 shows adjusted percentages with 95% CI of female smoking by region and area (urban and rural) from the logistic model. In the table, regions-areas were significantly associated with smoking prevalences, however, Central-urban and South-rural were not significantly associated with the overall mean, which was found to be 3%. The Females from Central-rural area had a higher smoking prevalence than overall mean whereas females from South-urban had a lower smoking prevalence compared to displayed the overall mean. Additionally, smoking prevalences of females were found lower than the overall mean for both rural and urban areas of Northeast Thailand, while, Bangkok also revealed to be a lower smoking prevalence area which was also lower than overall mean.

Furthermore, North Thailand was found the highest

rate of smoking prevalence whereas Northeast the lowest.

A thematic map provides a blueprint in understanding and knowing graphically how smoking prevalences have been spreading in Thailand from 1986 to 2014. Therefore, Figure 2 deals with the thematic map providing the adjusted smoking prevalences by Public Health Area (PHA). PHA is a combination of rural and urban areas which is denoted by RR and UB, respectively. Hence, the figure grasps the prevalence of smoking in both rural and urban areas of Thai females. The females Thai female smokers in North (rural, urban) Thailand has a higher percentage in comparison to those from Northeast (rural, urban).

DISCUSSION

This study provided the demographic and regional trends of Thai female smoking by analyzing the through nine different surveys. Multiple logistic regression models were applied with year-age and region as the independent variables. The overall prevalence of smoking for all nine surveys was 3% while the prevalence in the last survey was 3.4% in 2014.

In this study, declining patterns of smoking appeared between1991 to 2007. Afterwards, the trend of smoking increased from 2011 to 2014 in aged 15-39 years except for age group 20-24 in year 2014.

This is possibly due to the lack of awareness and the knowledge relating to the smoking and its effects, thus it is needed to introduce the considerable programs for preventing and controlling of smoking.

The finding of the study was also well matching with other literatures, which found that an overall trend of smoking had been decreasing gradually from 1991 to 2009, but in the recent years the trend of smoking has been increasing [20,21]. Furthermore, the results were also consistent with a study conducted on smoking by World Health Organization (WHO)revealing that the smoking trend was found declining from 4.9% to 1.9% in last 17 years [22].

The higher smoking rate than overall mean was mainly found in aged 45 years and older in most of the surveys. This results from our study are agreeable with some studies which revealed that cigarette smoking was more common after the age of 30 years [22,23]. Older female smokers with a higher prevalence might be because of the social and cultural belief, low fear, and stigma relating to smoking, and positive attitude towards smoking [24].

The highest prevalence of female smoking was found in the North whereas the lowest was found in the Northeast. The possible reason are from social prestige, culture and life style. Our findings are consistent with the Global Adult Tobacco Survey (GATS) reported by WHO [25], which is suggesting that the place of living is associated with smoking behaviors [26,27].

In our study, we found that the prevalences of female smoking in rural areas was higher than those in urban areas. The result supports the previous studies [22,25]. This is possibly due to the higher enforcement of smoking ban policies, and bad effects caused by smoking and the policy and provisions of anti-smoking places in urban areas.

In conclusion, the smoking rate among Thai females declined from 1991 until 2007, whereas an increasing trend appeared afterward. Therefore, anti-smoking policies should be introduced to reduce the smoking prevalence on young females, living especially in rural and northern region of Thailand.

TABLE 2. Adjusted percentage of smoking with 95% confidence intervals of smoking by Regions and Areas from logistic model using sum contrast

Region-area	Percent of smoking (95% CI)	P-value
Bangkok	2.5 (2.3 – 2.7)	< 0.001
Central		
Rural	3.4 (3.3 – 3.5)	< 0.001
Urban	3.0 (2.9 – 3.1)	0.399
North		
Rural	6.2 (6.1 – 6.4)	< 0.001
Urban	4.3 (4.2 – 4.4)	< 0.001
Northeast		
Rural	1.5 (1.4 – 1.6)	< 0.001
Urban	1.5 (1.4 – 1.6)	< 0.001
South		
Rural	3.1 (2.9 – 3.2)	0.911
Urban	2.7 (2.5 – 2.9)	< 0.001

FIGURE 2. Thematic map showing the prevalence of smoking among Thai female in Rural and Urban of Thailand
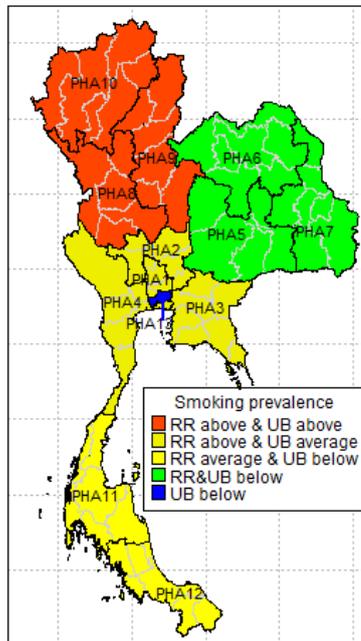
Limitation of the Study

This study has some limitations. Primarily, this study utilized the secondary data so it was not possible to evaluate other factors known to be associated with smoking. Secondly, there is a chance of some response bias may suffer from recall bias and possible social desirable responses.

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Conflict of interest

The authors declared no potential conflicts of interest with respect to this article.

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27. Barnett JR. Does place of residence matter? Contextual effects and smoking in Christchurch. N. Z. Med. J. 2000; 113(1120):433. Figure 2. Thematic map showing the prevalence of smoking among Thai female in Rural and Urban of Thailand

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