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A Gender Synthesis on NCD Risk Factors: Evidence from KDSS

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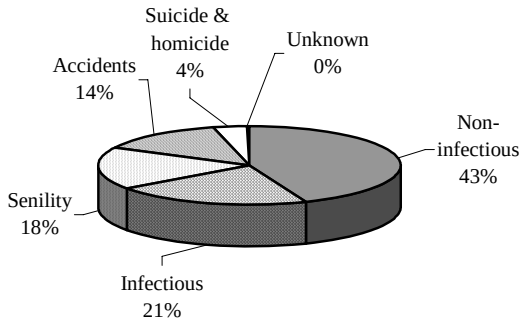
Introduction

The world health scenario is undergoing an unprecedented epidemiological transition with a shifting disease pattern towards the non communicable diseases (NCDs). The World Health Report 2004 indicated that NCDs account for 58.8 percent of deaths (WHO, 2004a). Based on current trends, it is projected that by year 2020 these diseases are expected to account for 73 percent of deaths and 60 percent of the disease burden (WHO, 2002a). NCDs burden is not confined to any region of the world and currently they are the leading causes for deaths in almost all regions of the world. At present both males and females are equally affected by the NCDs and does not show any gender domination pattern (WHO, 2005). Current epidemiological pattern shows the weight of NCDs problem is heavier in developing countries than developed countries. Globally, in year 2005, of the total 58 million deaths from all causes, 35 million were due to NCDs and 80 percent occurred in developing countries (Strong et al., 2005). The death rates from these diseases are higher in low income and middle income countries than in high income countries (Strong et al., 2005). Earlier it was considered majority of NCDs are occurring in groups with higher socioeconomic status, but at present, especially in developing countries, NCDs burden is moving to lower and lower socioeconomic groups making the problem more serious (WHO, 2003). South-East Asia is a region with rapid change in the economic, social and demographic situation and upward trend in consumption of unhealthy food, tobacco and sedentary lifestyle. This has created an environment to make NCDs a serious public health problem (WHO, 2002a). In Thailand, according to Thailand health profile 2001-2004, NCDs have become leading causes of morbidity and mortality among Thai people. The admission rate of heart diseases per 100,000 population has increased from 56.5 in 1985 to 109.4 in 1994 and to 397.0 in 2003. Cancer, admission rate per 100,000 population has risen 34.7 in 1994 to 89.4 in 2003. Besides, diabetes mellitus also has shown rapid rising trend from 33.3 per 100,000 population in 1985 to 91.0 in 1994 and to 380.7 in 2003 (Ministry of Public Health, 2005). Report of Round 4 census (2003) of Kanchanaburi project revealed the highest percentage of deaths (43%) in Kanchanaburi Demographic Surveillance System (KDSS) site in Thailand were due to NCDs (non-

infectious diseases) (Figure 1) and this has increased to 46 percent in year 2004 (IPSR, 2005 and IPSR, 2006).

While the age specific death rates due to NCDs are declining in many high-income countries, the burden of these epidemics is accelerating in low income and middle income countries, driven by both population ageing and rapid social and environmental changes that are increasing the prevalence of common risk factors in these countries (Epping-Jordan, Tukuitonga, Beaglehole, 2005). This acceleration is alarming considering that chronic diseases are highly preventable. At least 80 percent of heart diseases, stroke, and type 2 diabetes, and 40 percent of cancer could be avoided through effective controlling of risk factors (WHO, 2002b). Data on disease outcome, such as death or hospitalization, tend to focus on the need for palliative or curative services. In contrast, assessment of burden resulting from risk factors will estimate the potential of prevention (WHO, 2002c). This will require collection, analysing and communication of standardized core information on NCDs risk factors. Thus focusing on reliable and comparable analysis of risk factors to health is the key for prevention of diseases (Ezzati et al., 2002d). Even though NCDs share common risk factors, such as tobacco use, alcohol consumption, sedentary lifestyle, obesity and lack of exercise (Grundy, et al., 2000), prevalence and clustering of these risk factors are not similar in each community (Rodgers, Lawes and MacMahon, 2000). Socio-demographic factors in each society have a strong impact on risk factors for NCDs (Bartley et al., 1999).

Figure 1
Percentage distribution of deaths by cause of death in Kanchanaburi Province 2003



Source: Report of Round 4 Census (2003), Kanchanaburi Project, Institute for Population and Social Research Mahidol University

Gender is the other important factor which causes not only inequity in health directly but has impact on other socio demographic factors and hence risk factors for NCDs which ultimately lead to imbalance of health among males and females (WHO, 2002e). The basic risk factors for NCDs, which afflict men and women, are the same. However rates, trends, and specific types of these risk factors differ between women and men and vary with the complex pattern of roles, responsibilities, norms, values, freedom and limitations in each society (WHO, 2006). Gender analysis, that is, examination of relationship between NCDs risk factors and socioeconomic conditions with differences between men and women, is a required step to mainstream strategies addressing these diseases. As men and women are varying in their behaviour in different socioeconomic conditions, research on NCDs risk factors in relation to gender would be helpful to explicate health impact and provide a sound basis for policies and programmes. Considering all these facts, this research attempts to identify diversity of risk factors for non communicable diseases in males and females according to different socio-economic conditions and pattern of change from year 2000 to 2004 in KDSS site.

Methodology and Data Source

This study used the longitudinal data collected under the Kanchanaburi project carried out by the Institute for Population and Social Research (IPSR), Mahidiol University, Thailand with the support of the Wellcome Trust, United Kingdom.

Kanchanaburi is a large province located in the western part of Thailand. The province shares a long border with Myanmar and contains a variety of ethnic groups and migrants from Myanmar. The province has many industries, plantation areas and is one of the major tourist destinations in Thailand.

Kanchanaburi Project was started in year 2000 and concluded in 2004. Data were collected by the IPSR on an annual basis in every household and in each individual aged 15 and over in each selected village / block. The primary sampling units were villages for rural areas and census blocks for urban areas. Stratified systematic sampling design was used to select the sample and it was comprised of 86 villages and 14 census blocks. The sample, in 2000, comprised of 27,830 participants of which 45.4 were males and 54.6 percent were females. There was a slight increase in the population in 2004 to 28,254 with the proportion of males and females remaining almost similar to the 2000.

The study area was divided into five strata which were categorized according to the main occupation of the population and land area patterns. These strata are; 1) urban / semi-urban, 2) rice, 3) plantation, 4) upland areas, and 5) mixed economy. For data collection, structured interview method with three sets of questionnaires, village, household and individual, were used.

For the present study, individuals were categorized into five groups using wealth index which was calculated based on household assets using factor analysis in preference to principle components analysis. For the purpose of this analysis the lowest quintile is considered as a socio-economic status (wealth) proxy for the very poor and the highest quintile represents the very rich households. The groups are; 1) very poor, 2) poor, 3) moderate, 4) rich and 5) very rich.

In relation to working status, males were divided into 1) working, 2) studying and 3) do not work groups and females were divided in to 1) working, 2) studying, 3) housewife and 4) do not work groups. Concerning the status of employment in formal and informal sectors, individuals were divided into four groups as, 1) private sector employee / employer 2) state employee 3) work at home and 4) labourer. Body Mass Index (BMI) was calculated for each individual and for that following formula was used.

$$BMI = \frac{\text{Weight in kilograms}}{(\text{Height in meters})^2}$$

Using BMI value “Overweight” and “Obese” individuals were identified according to the World Health Organization guidelines (WHO, 2000 and WHO, 2004b) as follows;

BMI 25 to 29 as overweight and BMI 30 and over as Obese

For this study, from the database, individual data and household data pertaining to the study in the first round (2000) and the last round (2004) were used. For data analysis both descriptive and analytical tools were used. Data were processed using the SPSS software.

Results

In this paper, risk factors for NCDS are discussed with respect to five major risk behavioural aspects: a) smoking of cigarette, b) consuming of liquor, c) having risky food habits, d) doing regular exercise and e) over weight and obesity. The paper then examines the association between presence of risk factors and socioeconomic status. The paper concludes by highlighting the principle findings, discussion and the policy implications.

Smoking, consumption of liquor, having risky food habits, not doing regular exercise and overweight and obesity, were the risk factors identified for this study in relation to NCDs. For smoking and consumption of liquor, data were analysed for year 2000 and 2004 but for the rest of risk factors data were analysed only for 2004 as data were not available for 2000.

I. Consumption of cigarette

Total smoking rates had not changed much and show more or less static both in males and females from year 2000 to 2004 (about 57% for males and 11% for females). According to the age group, male adults (25 to 59 years) were the highest smokers (about 63-64%) but among females both adult and elderly groups had high smoking rates (about 12-13%) compared to adolescent and young adults. A sharp increase of smoking rates was observed among males after the age of 19 years in both years and make male young adults smoking rate close to average rate. Male adolescents smoking rate had increased from 19 percent in year 2000 to 22.9 percent in year 2004. Anyway smoking rate among adolescent females had come down during the same period. Regarding strata, upland stratum had very high smoking rates both in males and females compare to other strata. About seventy percent of males and thirty percent of females were smokers in this stratum in both years. Rate among females were more notable as smoking rates among females in other strata were less than seven percent. According to wealth index, it had shown smoking was a burning problem among very poor groups as 82.7 and 75.8 percent of males, and 34.5 and 30.0 percent of females, in this group were smokers in 2000 and 2004 respectively. It was observed that smoking rates were gradually declining from poorest groups to richest groups both in males and females. The percentage gap between smoking rates of the poorest groups and the richest groups were notably huge and this was more visible among females as smoking

rate among the poorest group was eight times high in 2000 and 13 times high in 2004 compare to richest group. Anyway smoking rates had come down to 75.8 from 82.7 percent among males and to 30 percent from 34.5 percent among females from 2000 to 2004. As in wealth index, level of education also showed marked gap in smoking between the low and high level of education groups. In both years among males, about two third with primary or less than primary level were smokers but only one third in higher than secondary level. Among females, about 14 percent smokers observed in primary or less than primary level and there were only about one percent of smokers in higher than secondary level. Regarding working status, it was found male and female labourers were the highest smokers and this is compatible with the findings in relation to wealth index and educational level as majority of labourers are belong to low education and low income groups. Concerning occupation, it was identified males and females in agricultural sector were the highest smokers and rates had not shown much change from year 2000 to 2004. In year 2004, data were available according to working, do not working, studying and housewives status and in relation to this information it was found among males, working people and among females, housewives were the highest smokers. In relation to nationality Non-Thai people were more smokers than Thai people (Table 1). As most of Non-Thai people live in high land area close to forests their high smoking practice may be use to drive insects away from them.

Table 1: Percentage distribution of total population by prevalence of smoking within each personal characteristic in 2000 and 2004

	2000		2004	
	Male	Female	Male	Female
Age group				
Adolescent (15 to 19yrs)	19.0	1.7	22.9	0.8
Young adults (20 to 24yrs)	53.9	4.2	51.0	4.1
Adult (25yrs to 59yrs)	64.0	12.8	62.5	12.8
Elderly (60yrs & above)	57.8	12.9	55.1	12.4
Strata				
Urban/semi-urban	43.1	4.3	45.9	3.9
Rice field	56.8	2.0	55.2	3.2
Plantation	60.1	6.6	54.7	6.8
Uplands	71.6	31.3	69.5	29.8
Mixed economy	52.7	6.9	53.8	6.8

Table 1: (Continued)

	2000		2004	
	Male	Female	Male	Female
Wealth Index				
Very poor	82.7	34.5	75.8	30.0
Poor	72.6	17.8	64.0	11.5
Moderate	64.7	8.4	56.2	7.3
Rich	56.9	7.8	50.4	4.5
Very rich	41.8	4.2	36.1	2.3
Level of Education				
Primary and less	66.6	13.8	64.9	13.9
Secondary	37.3	2.0	48.4	1.9
Higher than secondary	36.7	1.0	31.2	0.4
Working Status				
Working	NA	NA	60.1	10.7
Studying	NA	NA	7.9	0.1
Housewife	NA	NA	--	16.5
Do not work				
Status of Employment				
Private Sector Employee	58.7	8.6	NA	NA
State Employee	48.3	5.8	NA	NA
Work at Home	59.2	8.5	NA	NA
Labourer	74.2	18.5	NA	NA
Occupation				
Agriculture	66.0	12.3	65.6	13.8
Non-agriculture	50.5	10.0	51.4	7.3
Nationality				
Thai	NA	NA	54.2	6.9
Non-Thai	NA	NA	74.3	44.3
Total	57.2	10.8	56.6	11.0
(N)	(12,642)	(15,188)	(12,808)	(15,446)

Note: NA – Data not available

II. Consumption of liquor

Consumption of liquor was defined as individuals who consumed branded liquor or traditional liquor three times or more than three times per week. From 2000 to 2004 total liquor consumption rate had increased considerably among males from 61.1 percent to 64.9 percent and slightly among females from 22.1 percent to 22.9 percent. According to age group, among males, young adult and adult groups were the highest consumers of liquor and among females it was the adult group. Liquor consumption rates had increased in all age groups among males from 2000 to 2004 but not shown much change in females. The increases in adolescent and young adult groups were more momentous. Liquor consumption rate had increased among males in all strata except in rice field where it has shown slight reduction. Among females, liquor consumption rate had not changed much in strata but in rice field stratum it had shown reduction from 25.2 to 21.9 percent from 2000 to 2004 (Table 2).

Table 2: Percentage distribution of total population by prevalence of consuming liquor within each personal characteristic in 2000 and 2004

	2000		2004	
	Male	Female	Male	Female
Age group				
Adolescent (15 to 19yrs)	34.8	6.9	39.1	4.7
Young adult (20 to 24yrs)	65.4	13.0	71.9	11.6
Adult (25yrs to 59yrs)	68.8	26.8	72.1	27.8
Elderly (60yrs & above)	41.9	16.7	46.0	16.3
Strata				
Urban/semi-urban	60.5	17.4	65.7	16.8
Rice field	68.5	25.2	67.4	21.9
Plantation	62.6	26.1	66.0	25.7
Uplands	57.1	23.4	62.4	27.9
Mixed economy	59.2	20.4	64.4	21.9
Wealth Index				
Very poor	58.8	28.5	61.5	25.0
Poor	65.9	30.7	65.0	25.6
Moderate	65.2	24.6	67.1	24.9
Rich	66.6	25.2	67.3	21.7
Very rich	61.9	21.4	63.6	17.2

Table 2: (Continued)

	2000		2004	
	Male	Female	Male	Female
Level of Education				
Primary and less	62.2	24.8	65.2	26.0
Secondary	54.9	12.6	72.3	18.3
Higher than secondary	66.4	15.2	67.8	14.5
Working Status				
Working	NA	NA	69.3	26.6
Studying	NA	NA	28.8	4.6
Housewife	NA	NA	-	19.5
Do not work	NA	NA	38.9	13.0
Status of Employment				
Private Sector Employee	68.0	22.7	NA	NA
State Employee	68.3	18.8	NA	NA
Work at Home	63.8	24.1	NA	NA
Labourer	68.7	33.4	NA	NA
Occupation				
Agriculture	65.6	28.2	67.2	28.4
Non-agriculture	57.6	18.6	65.8	20.6
Nationality				
Thai	NA	NA	66.7	23.5
Non-Thai	NA	NA	51.5	18.0
Total	61.1	22.1	64.9	22.9
(N)	(12,642)	(15,188)	(12,795)	(15,434)

Note: NA – Data not available

Regarding wealth index, among males an observable difference couldn't visible between groups, however among females poor groups had higher percentages of consuming liquor compare to rich groups. Liquor consumption rate had shown a slight reduction in male poor group but increased in all other groups from 2000 to 2004. It was identified that education didn't have much influence on consumption of liquor among males but among females it was not so, higher percentage of females who had low level of education consumed liquor. In relation to education from 2000 to 2004 liquor consumption rate had increased in all male groups but among females it had increased only in low education groups and it had reduced in higher education group.

As in education, status of employment didn't have much influence on consumption of liquor among males but among females, labourers were the highest consumers of liquor. Regarding occupation more males and females in agricultural sector consumed liquor compare to people in non-agricultural sector. Concerning nationality, contrast to smoking; it was the Thai people who consumed liquor more than Non-Thai people (Table 2). This may be because of Thai culture as they love fun and usually make all occasions to enjoy with drinking liquor.

III. Having Risky Food Habits

Dietary pattern with regular having of junk foods and other foods high in fat, sugar, salt and refined carbohydrate is a predominant cause for NCDs and act as risky food habits in relation to theses diseases (WHO, 2003b). In this research risky food habits was defined as regular eating of salty food, sweetly food, instant food, fatty food, fast food and snacks. Data were available on risky food habits only in year 2004. In that year, nearly half of males and females had risky food habits. It was observed younger groups and females were more prone to have risky food habits. Highest percentages of risky food habits were recorded from male and female adolescent groups and young adult groups respectively. In these groups rates in females were higher than males. Regarding strata, it was found rice field stratum had the highest percentage of having risky food habits both among males and females and second highest was urban / semi-urban stratum. Rates of having risky food habits were higher among females in all strata except mixed economy stratum. In relation to wealth index, considerable difference was not observed between groups; however the highest rates were recorded from very poor and moderate groups in males and females. Lowest percentages of having risky food habits were found in very rich groups of males and females. Concerning the working status, studying groups of males and females had the highest percentage of having risky food habits and the percentage among female studying group was very high (71.6%). Males and females who were in agricultural sector had higher percentage of having risky food habits than people in non-agricultural sector. Regarding nationality Non-Thai males and females had higher rates of having risky food habits than Thai people (Table 3).

Table 3: Percentage distribution of total population by prevalence of risky food habits within each personal characteristic in 2004

	Male	Female	Total
Age group			
Adolescent (15 to 19yrs)	61.8	70.4	66.1
Young adults (20 to 24yrs)	57.3	61.8	59.6
Adult (25yrs to 59yrs)	49.4	47.9	48.7
Elderly (60yrs & above)	29.7	28.4	29.1
Strata			
Urban/semi-urban	54.6	56.8	55.7
Rice field	61.8	61.3	61.6
Plantation	53.2	53.7	53.5
Uplands	42.3	42.5	42.4
Mixed economy	51.4	50.0	50.7
Wealth Index			
Very poor	53.0	49.8	51.4
Poor	47.5	47.2	47.4
Moderate	50.1	50.6	50.4
Rich	46.6	48.4	47.5
Very rich	43.6	43.4	43.5
Level of Education			
Primary and less	53.2	54.3	53.8
Secondary	50.7	48.0	49.4
Higher than secondary	56.5	58.6	57.6
Working Status			
Working	49.1	48.9	49.0
Studying	61.8	71.6	66.7
Housewife	--	47.3	47.3
Do not work	30.6	30.7	30.7
Occupation			
Agriculture	50.0	50.1	50.1
Non-agriculture	44.3	42.5	43.4
Nationality			
Thai	47.1	47.1	47.1
Non-Thai	55.7	54.0	54.9
Total	48.2	47.9	48.1
(N)	(12,795)	(15,434)	(28,229)

IV. Doing Regular Exercise

Data were available on doing regular exercise only for year 2004. According to that year data, only small proportion of population were doing exercise regularly. Among men the percentage was 18.1 and among females this was less than half of males' percentage as it was only 7.5 percent. Regarding age group, higher percentages of male and female adolescents and young adults were doing regular exercises. However, rate in females were much lower than male groups. In relation to strata, highest percentage of doing regular exercise was recorded in urban / semi-urban stratum for both males and females. It was found that males and females with higher than secondary education had the highest rate of doing regular exercise and the lowest was among least educated groups. Regarding nationality, Thai people had the highest percentage of doing regular exercise compare to Non-Thai people (4).

Table 4: Percentage distribution of total population by prevalence of doing regular exercise within each personal characteristic in 2004

	Male	Female	Total
Age group			
Adolescent (15 to 19yrs)	59.4	24.3	41.9
Young adults (20 to 24yrs)	40.0	8.4	24.2
Adult (25yrs to 59yrs)	12.1	5.9	9.0
Elderly (60yrs & above)	7.8	4.6	6.2
Strata			
Urban/semi-urban	25.6	15.0	20.3
Rice field	15.9	5.1	10.5
Plantation	17.9	6.0	12.0
Uplands	15.6	4.7	10.2
Mixed economy	16.1	6.4	11.3
Wealth Index			
Very poor	12.6	2.0	7.3
Poor	14.4	4.4	9.4
Moderate	17.6	7.1	24.7
Rich	20.1	8.4	14.3
Very rich	26.1	15.6	20.9

Table 4: (Continued)

	Male	Female	Total
Level of Education			
Primary and less	8.9	3.4	6.2
Secondary	28.3	11.6	20.0
Higher than secondary	36.6	23.7	30.2
Working Status			
Working	15.2	5.7	10.5
Studying	71.7	37.9	54.8
Housewife	--	6.5	6.5
Do not work	12.6	5.3	9.0
Occupation			
Agriculture	10.5	2.3	6.4
Non-agriculture	20.7	9.4	15.1
Nationality			
Thai	18.9	8.2	13.6
Non-Thai	12.0	1.9	7.0
Total	18.1	7.5	12.8
(N)	(12,795)	(15,434)	(28,229)

V. Overweight and Obesity

Overweight and obesity raise the risk of NCDs due to adverse metabolic changes and hence leading to unfavourable cholesterol levels, increase blood pressure and increase insulin resistance (WHO, 2002c). In this research BMI was calculated for all males and females for year 2004 and using the BMI overweight and obesity were identified. Calculation of BMI was not possible for year 2000 as data on height and weight were not available for that year. It was found 13.8 percent males were overweight and 2.8 percent were obese in year 2004. Among females this rates were higher than males as 21.3 percent were overweight and 6.9 percent were obese. Highest rates of overweight and obesity were identified in adult and elderly groups particularly in females. Urban/semi-urban stratum recorded the highest percentage of overweight and obesity for both males and females, and the second highest was from mixed economy. In relation to educational level, the highest percentage of overweight and obesity were observed from males with higher than secondary level but among females, the highest percentage of overweight and obesity observed in females with primary and

less than primary level. Regarding working status, among males overweight and obesity were highest among working males but among females it was housewives. Concerning occupation, people in non-agricultural sector had more overweight and obesity than who were in agriculture sector. In relation to nationality, Thai people were remarkably overweight and obese than Non-Thai people particularly Thai females (Table 5).

Table 5: Percentage distribution of total population by prevalence of overweight and obesity classified by each personal characteristic in 2004

	Male		Female		Total	
	Over weight	Obesity	Over weight	Obesity	Over weight	Obesity
Age group						
Adolescent (15 to 19yrs)	5.0	1.3	6.2	2.2	5.6	1.8
Youth (20 to 24yrs)	7.2	3.1	11.6	3.9	9.4	3.5
Adult (25yrs to 59yrs)	16.5	3.3	24.5	8.1	20.5	5.7
Elderly (60yrs & above)	11.0	1.6	20.4	5.5	15.7	3.6
Strata						
Urban/semi-urban	20.2	4.6	22.5	8.7	21.4	6.7
Rice field	14.1	2.7	21.9	6.6	18.0	4.7
Plantation	12.6	2.3	21.4	6.8	17.0	3.4
Uplands	8.0	1.8	18.6	5.3	13.3	3.6
Mixed economy	15.5	2.8	22.6	7.0	19.1	4.9
Wealth Index						
Very poor	5.1	0.7	14.8	4.9	10.0	2.8
Poor	10.2	2.3	20.5	6.5	15.4	4.4
Moderate	13.3	2.8	24.3	7.9	18.8	10.7
Rich	17.1	3.4	22.9	8.2	20.0	5.8
Very rich	23.9	4.8	23.9	6.8	23.9	5.8
Level of Education						
Primary and less	12.4	2.1	23.7	7.5	18.1	4.8
Secondary	17.8	4.2	18.3	6.6	18.1	5.4
Higher than secondary	22.7	6.0	15.9	4.9	19.3	5.5
Working Status						
Working	14.5	2.9	22.7	6.9	18.6	4.9
Studying	5.8	1.7	5.5	1.6	5.7	1.7
Housewife	--	--	22.3	8.4	22.3	8.4
Do not work	11.3	2.1	19.5	7.2	15.4	4.7

Table 5: (Continued)

	Male		Female		Total	
	Over weight	Obesity	Over weight	Obesity	Over weight	Obesity
Occupation						
Agriculture	10.8	1.9	22.4	6.1	16.6	4.0
Non-agriculture	18.4	3.9	22.0	7.8	20.2	5.9
Nationality						
Thai	15.3	3.1	22.2	7.4	18.8	5.3
Non-Thai	3.3	0.3	14.5	3.0	8.9	1.7
Total	13.8	2.8	21.3	6.9	17.6	4.9
(N)	(12,795)	(12,795)	(15,434)	(15,434)	(28,229)	(28,229)

VI. Multivariate logistic regression analysis

Multivariate logistic regression models were constructed to further analyse the association between socioeconomic factors and NCDs risk factors. Association between socioeconomic factors and, presence of one risk factor and presence of two risk factors or more were analysed separately as risk accumulation carries more impact for the occurrence of NCDs (WHO, 2005; WHO, 2002c). The analysis was done separately for males and females and for year 2000 and 2004.

In 2000, according to age group (by controlling the effects of other variables), adults had higher chance of having one and two or more risk factors while youth group had less likely to have one and two or more risk factors compared to elderly group. Among male adults, the occurrence of having two or more risk factors were two times higher than one risk factor (4.2 times and 2.2 times more likely than the elderly). Regarding level of education, males and females with low education were more likely to have one and two or more risk factors than those in higher education levels. The least educated (primary and less) females had higher occurrence of risk factors compared to males with the same educational level. The least educated females had 8.2 times of chance to have two or more risk factors, but it was only 2.3 times among the least educated males compared to those in higher than secondary group. In term of household economic status, males and females in poor household had higher chance to have risk factors compared to the rich household and the chance to have two or more risk factors were higher among females than males in poor households (1.7 times for one risk factor and 4.7 times for two or more risk factors). Regarding strata,

upland stratum had the highest chance of having risk factors compared to mixed economy for both males and females. Within this stratum the chance of having one and two or more risk factors were higher among females than males.

In year 2004, the socio-economic groups with higher chance of having risk factors among males and females were adults, those with primary and lower level of education, those in poor household and those who are living in upland stratum as in the year 2000. Occurrence of risk factors had increased both in male and female youth and adult groups from 2000 to 2004. But the chance of having risk factors decreased from year 2000 to 2004 in male and female poor and least educated groups.

Regarding multivariate analysis, the results show that all personal factors were significantly influencing one and two or more risk factors and the influence was confirmed by predicted probability tests, for example males are positively and significantly have two or more risk factors than females and showed higher probability than one risk factor. Results suggests that some clusters may respond to population based or area based anti smoking, anti drinking, anti obesity and exercise promoting interventions in a same package, where as others (e.g. occupation) will probably require more focus interventions.

Table 6: Odds Ratio with 95% confidence interval from multivariate logistic regression for presence of risk factor in relation to socioeconomic factors in year 2000 and 2004

	One risk factor		Two or more risk factors	
	Males	Females	Males	Females
Year 2000				
Age group				
Youth	0.7 (0.6-0.8)***	0.6 (0.5-0.7)***	0.9 (0.8-1.1)	0.1 (0.1-0.2)*
Adult	2.2 (1.9-2.5)***	1.6 (1.5-1.9)***	4.2 (3.6-4.8)***	1.5 (1.2-2.0)**
Elderly ®				
Level of education				
Primary or less	1.1 (0.9-1.4)	2.0 (1.6-2.3)***	2.3 (1.9-2.8)***	8.2(3.8-17.4)***
Secondary	0.7 (0.6-0.9)***	1.1 (0.9-1.3)	1.0 (0.7-1.1)	3.1 (1.3-7.3)*
Higher than secondary ®				
Wealth index				
Poor	1.8 (1.6-2.1)***	1.7 (1.5-2.1)***	2.9 (2.5-3.4)***	4.7 (3.3-6.6))***
Moderate	1.3 (1.1-1.5)*	1.2 (0.9-1.4)	1.8 (1.6-2.1)***	1.2 (0.8-2.0)
Rich ®				

Table 6: (Continued)

	One risk factor		Two or more risk factors	
	Males	Females	Males	Females
Strata				
Urban/semi urban	1.0 (0.9-1.2)	0.8 (0.7-0.9)*	0.9 (0.8-1.1)	1.0 (0.7-1.3)
Rice field	1.4 (1.2-1.6)***	1.1 (1.0-1.3)	1.7 (1.4-2.0)***	0.4 (0.3-0.6)***
Plantation	1.2 (1.0-1.5)*	1.3 (1.1-1.5)***	1.4 (1.2-1.6)***	1.1 (0.8-1.5)
Uplands	1.5 (1.3-1.8)***	2.1 (1.9-2.4)***	1.7 (1.4-2.0)***	4.7 (3.7-6.0)***
Mixed economy ®				
Year 2004				
Age group				
Youth	1.5 (0.8-2.7)	2.3 (1.6-3.5)***	2.9 (1.7-4.9)***	1.8 (1.0-3.0)*
Adult	2.5 (2.0-3.0)***	1.7 (1.5-2.0)***	5.3 (4.4-6.3)***	4.3 (3.5-5.2)***
Elderly ®				
Level of education				
Primary or less	1.2 (0.8-0.6)	2.1 (1.6-2.8)**	1.7 (1.3-2.5)**	4.3 (3.0-6.2)***
Secondary	1.1 (0.8-1.6)	1.6 (1.1-2.3)*	1.6 (1.1-2.3)*	2.9 (1.9-4.5)***
Higher than secondary ®				
Wealth index				
Poor	1.0 (0.8-1.3)	0.8 (0.7-0.9)**	1.4 (1.2-1.8)**	1.1 (0.9-1.3)
Moderate	0.9 (0.7-1.2)	0.9 (0.7-1.1)	1.2 (0.9-1.5)	1.2 (0.9-1.5)
Rich ®				
Strata				
Urban/semi urban	0.8 (0.6-1.1)	0.9 (0.7-1.1)	0.8 (0.7-1.1)	0.7 (0.6-0.9)**
Rice field	1.0 (0.8-1.3)	0.7 (0.6-0.9)**	0.9 (0.8-1.3)	0.5 (0.4-0.6)***
Plantation	1.3 (1.0-1.7)	0.9 (0.7-1.2)	1.3 (1.0-1.7)	0.8 (0.6-1.1)
Uplands	1.4 (1.0-1.9)*	1.6 (1.2-2.0)***	1.8 (1.3-2.3)***	2.4 (1.9-3.2)***
Mixed economy ®				

Note: p value $\leq$ 0.001(***), p value$\leq$ 0.01(**), p value $\leq$ 0.05(*).

Discussion

Prevention of NCDs has to be approached by implementing effective programmes to control and reduce risk factors. As a example, death rate from cardiovascular disease have reduce dramatically over the past three decades in several countries where effective programmes have been introduced, but have increases in countries where no such programmes exist. While Australia, Canada, the United

Kingdom and the United States have achieved steady declines in heart disease death rates, the rates in countries, such as Brazil and the Russian Federation, have remained the same or increased (WHO, 2005). To reduce the burden of NCDs in future, it is imperative to detect the prototype of prevalence of risk factors and design strategies accordingly. In this regard, it is vital to detect the prevalence of risk factors for NCDs in males and females in different socioeconomic conditions and pattern of change with time. The presence study reveals that prevalence of risk factors is high in similar groups among males and females in each socioeconomic status, but with varying risk prevalence rates.

The findings of this study indicate that the overall smoking rates have not changed much both in males and females from year 2000 to 2004. Smoking rates have increased in male adolescent group which is the most sensitive group among all age groups as it is the starting point of smoking to be a regular behaviour in future life. David C. Miller, in a longitudinal analysis where the smoking behaviour of a nationally representative cohort of 1988 eighth-graders was assessed at various time points that spanned three grade levels, grade 8,10 and 12 (i.e., from about age 14 to 26). In this study he found that cigarette smoking was increasing with advancing of age as 6 percent in 8^{th} grade, 12 percent at 10^{th} grade and 17 percent at 12^{th} grade (David C. Miller, 2005).This implies the necessity of starting effective anti-tobacco school health programmes as these programmes can achieve high results with very low cost (UNESCO/UNICEF/WHO/World Bank, 2000). Upland stratum shows high rate of smoking both in males and females in year 2000 and this has not changed perceptibly even after four years as the trend also remained so in 2004. It is worthwhile to plan and implement community based programme for prevention of smoking with the partnership of community based organizations, policy-makers, health providers and community leaders, as such interventions have demonstrated considerable potential for effectiveness in developing countries (Nissinen, Berrios and Puska, 2001). The results further highlight the importance of formulating strategies in tobacco prevention programme targeting less educated population as level of education has showed inverse relationship with the smoking of both males and females. This is compatible with the results of the study done by Bartley and associates which was found the poor and people with less education are more likely to use tobacco products (Bartley et al., 2000). Labourers, who represent low income and low educated sectors of the society, have shown the highest smoking rates and this trend is more discernible among females. This opens up another pathway from which future tobacco prevention programmes should be moved forward and future researches should be streamlined. It became evident that

smoking is more of a rural problem than urban problem as smoking rates were high among males and females in agricultural sector than people in the non-agricultural sector. Early addressing of this issue must be crucial as there was notable increase in smoking rates among females in agricultural sector from year 2000 to 2004. Another important concern emerged from this research for future anti-tobacco programmes and researches was, extraordinary high rates of smoking among Non-Thai males and females compared to Thai people. It is worthwhile to do more research to explore this smoking culture and the impact of smoking on health status of Non-Thai compared to Thai people with the view of launching target based anti-tobacco programmes in future.

The analysis shows that total liquor consumption rate has increased both in males and females from year 2000 to 2004. There is discernible evidence linking alcohol to a number of NCDs, including cardiovascular diseases, cancers, cirrhosis and mental disorders. The net impact of alcohol on NCDs is substantial loss of life and increased disability (Giesbrecht, Roerecke and Rehm, 2005) Intensification of prevention programmes and exploration of new policies in relation to alcohol trade is decisive as more than two third of males and more than one fifth of females were consuming liquor and the trend remains intact over time. It is found that more than one third of male adolescent population consume liquor regularly with upward trend from year 2000 to 2004, and this is to be considered by education and health authorities with adequate weight, as adolescent period is the crucial period of making shape for a healthy future life. Early alcohol use is a strong predictor of life time dependency rates of alcohol. Using longitudinal data, Grant and Dawson (1997) found that onset of drinking at age 14 is associated with four times the risk of life time dependence compared to onset of drinking after the age 20 (Grant and Dawson 1997). As it was found agricultural people have high rate of drinking it is worthwhile to explore the pooling of risk factors among these people in relation to NCDs and the underlying causes for these high rates in future researches.

Currently there is a nutritional transition in Asian countries shifting diet into high total fat, saturated fat, sugar, salt, alcohol, refined grains and food of animal origin. This nutritional transition with life style shift increased the risk of major diet-related NCDs such as Type 2 Diabetes, Cardiovascular Diseases, Cerebrovascular Diseases and Cancer (Barry, et al., 2001,). In this research, risky food habits, that is, regular intake of salty food, sweetish food, instant food, fatty food, fast food and snacks, were explored as it is the risk factor for NCDs with rising trend in Asian countries. According to the results it was found that nearly half of males and females have risky food habits.

Adolescents were the worst affected group. This highlighted the important of initiating diet-related programs to control NCDs as it is highly cost-effective. In United States, for example, the government-backed campaign that had the effect of reducing national fat consumption by during 1 percent to 3 percent of total calories has been estimated to save $4.1 to $12.7 billion in medical costs and lost productivity (Centers for Disease Control and Prevention, 1999). Another point identified from this research which should be explored in-depth with future researches is that very poor groups especially males have the highest rates of risky food habits while very rich groups have the lowest rates.

Doing regular exercise influences health favourably by preventing occurrence of NCDs (Mohan, et al., 2006). Not doing regular exercise is a risk factor for NCDs in people with sedentary lifestyle but it is not a serious issue for some people who are in agricultural field and in occupation like labourers as they are getting physical exertion from their occupation. In this research it was found that only 15.2 percent of males and 5.7 percent females working in government or private sector were doing regular exercise. This reveals the importance of doing social marketing regarding doing regular exercise for the prevention of NCDs for these groups as most of them are in middle age and having sedentary lifestyle.

Overweight and obesity is one of ten risk factors identified by the WHO that causes most damage to health in terms of death and disability (WHO, 2002c). In this research it was found more than one fifth of females were overweight and about seven percent were obese. Anyway rates were much lower in males as about 14 percent were overweight and about 3 percent were obese. The analysis exposed the importance of focusing more attention to urban / semi-urban and mixed economy strata in future overweight and obesity prevention programmes as they recorded the highest percentage of overweight and obesity. Another interesting point emerged from this research is, the inverse relationship between overweight and obesity among females with their level of education. For instance, higher rates of overweight and obesity were observed among low educated females and decreasing rates with increasing level of education. Where as, among males the reverse was the case, that is, increasing rates of overweight and obesity with increasing level of education.

Policy implications

- As there was not considerable reduction of consumption of cigarette from year 2000 to 2004, it is important to review all ongoing smoking prevention activities and approach with new strategies to combat reduction of consumption of cigarette.
- As smoking and drinking rates shows sharp increase after the age of 19 it is vital to start health education programmes and social marketing programmes targeting adolescents to prevent future generation on smoking and drinking. Necessity of this matter illustrates crucial as there was increase in the rate of smoking among the male adolescents from year 2000 to year 2004.
- As smoking rates among males and females in upland stratum were abnormally high an integrated community based intervention programme should be started for this stratum for the prevention of smoking after a thorough study of underline causes. This stratum should also select for future research activities on consumption of cigarette.
- Reduction of NCDs risk factors is reduction of future burden of NCDs (Bonita et al., 2002). As several risk factors for NCDs had been discovered from this research, it is essential to establish a surveillance system to monitor the trend of risk factors with time, to start or to do necessary changes in future NCDs prevention programmes.
- It is a prime need to launch more awareness programme to educate public on NCDs risk factors especially prevention of smoking, safe food habits, regular exercise and keep healthy Body Mass Index (BMI)
- Upland area, uneducated group, poor community, labourers and Non-Thai people should be selected as risk groups in future smoking prevention programmes and area based or target based programmes should be introduced.

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