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Short Communication

Obesity among School Children in a Province of Southern Thailand and its Association with Socioeconomic Status

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Abstract

The association of nutrition status of children aged 7-12 years (n=663) with socioeconomic factors in a province of southern Thailand in 1995 was investigated. Three type of schools were surveyed: a school with a higher educational standard (elite school) in the municipality of the province, a school with many children from low-income families (low-income school) in the same municipality, and five ordinary schools in rural areas of the province (district schools). The proportions of obese children were 22.1%, 5.8% and 2.7%, respectively for the three type of schools, when obesity was defined as weight to height of over 120% of the median of children in Bangkok. The risk ratios and 95% confidence intervals for obesity in the elite and the low-income schools were 5.0 (3.5-7.2) and 1.9 (0.8-4.8), respectively, taking the district schools as a reference. Our research suggested that the high prevalence of obesity among elite-school children could be related to the comparatively high socioeconomic status of the children's families. It also shows that the children in the province studied were as a whole considerably leaner than children in the big cities of Thailand. These results imply a need for appropriate interventions which cannot only prevent obesity, but also improve the malnutrition of school children in the rural provinces of southern Thailand.

Key words: Obesity, School children, Socioeconomic status, Rural area, Thailand

Introduction

Increasing economic development with its associated changes in lifestyle often leads to a high calorie intake with lack of daily exercise, which subsequently causes obesity[1-3]. Obesity is one of the risk factors for many non-communicable diseases such as diabetes mellitus and cardiovascular diseases[4-7]. Since such lifestyle-related diseases have become the primary causes of death in developed countries, it is important to make interventions to prevent obesity in developing countries where economic growth is changing lifestyle and threatening an increase of the lifestyle-related diseases. Obesity has been a growing health issue in Singapore[8] where the economic development has led to lifestyle changes like those in developed countries. Thailand, with its growing economy[9] has begun to experience lifestyle-related health issues, as lifestyle has been changing. Bangkok, which is the fastest runner of economic development among all cities in Thailand, has already observed such changes of health status[10-12]. However, there are few reports on obesity in the provinces of Thailand, where malnutrition is a major problem[13-16]. As economic development extends to the provinces of Thailand, its effects on health status can be observed even in the rural areas of Thailand.

Our research is designed to survey the nutrition status of school children in a provincial area of Thailand and to investigate the relation between obesity and socioeconomic factors for the school children in order to identify the causes of obesity. Children were surveyed as subjects for our research because it is especially important to prevent obesity among children which in turn can cause lifestyle-related diseases in adulthood[17]. Southern Thailand was chosen as the field of research because the economy is growing, and the transient state of change in lifestyle could hopefully be observed.

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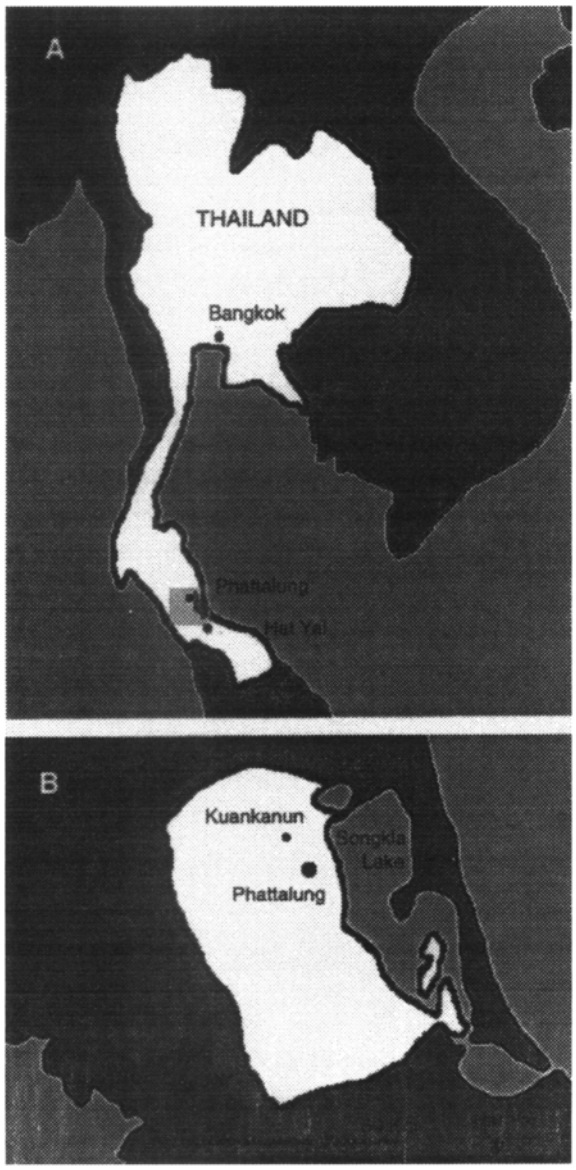

Fig. 1 **Study area. A, map of Thailand. Forest area is the location of Phattalung Province. B, the location of the municipality and district studied in Phattalung Province.**

Subjects and Methods

1) Geographical area and subjects

Our study was conducted in Phattalung Province, located on the western border of the Songkla Lake in southern Thailand, 860 km from Bangkok (Fig.1). Phattalung Province is 3,424 km^2 with a population of 484,202 in 1995. The birth rate, death rate and population increase rates were 14.1, 3.8 and 10.3, as of 1995[18]. The main products of Phattalung Province are rice, gum, fruit and fish. GPP per capita was 19,299 Baht in 1993[19], which was the lowest in southern Thailand and ranked 57th out of the 72 provinces of Thailand. Additional occupational, educational and age-related data are shown in Table 1. Administratively, Phattalung Province is divided into seven districts, three subdistricts and a municipality. We selected the municipality with a population of 39,188 and one district, Kuankanun, which is the biggest neighboring district with a population of 85,065 as our study areas. The largest hospital with 355 beds is located in the municipality and the second most important hospital with 60 beds is in Kuankanun. One or two primary care health centers are located in each village in Kuankanun.

There were nine schools in the municipality, but many parents wanted their children to enter an "elite" provincial school because of its higher educational standard. Children entering it are selected by lottery, but there is bending of the rules to accommodate some influential parents. Therefore most of the middle-ranked or senior public servants in Phattalung Province have their children enter the elite school. In order to clarify the effects of socioeconomic conditions on child nutrition, we targeted at two primary schools chosen from the nine in the municipality: one "elite" provincial school and the other with many children from low income households while we selected five primary schools from the 46 in Kuankanun using two-stage sampling. Since Kuankanun is divided into the seat of the district office or so-called "sanitary district" in Thailand and 11 villages, the sanitary district and four villages randomly selected from the 11 were studied. School with the biggest number of children among the schools in the sanitary district and each village were

Table 1 **A comparison of social indicators between Thailand nationally and Phattalung Province[1].**

	Thailand			Phattalung Province		
	Total	Municipal area	Non-municipal area	Total	Municipal area	Non-municipal area
Percent distribution of population	100	18.7	81.3	100	7.6	92.4
Percentage of population by age						
under 15 years	28.8	23.0	30.2	32.3	27.8	32.7
15-59 years	63.9	70.7	62.3	59.6	64.2	59.2
60 years and over	7.3	6.3	7.5	8.1	8.0	8.1
Percentage of population by occupation[2]						
Agriculture	66.5	5.0	78.3	83.4	17.6	88.0
Sales worker	7.8	23.3	4.8	4.6	27.3	3.1
Craftsmen, production workers and laborers	11.1	25.6	8.3	4.0	14.8	3.3
Professional, technical and related workers	7.1	20.4	4.6	3.5	16.7	2.6
Service workers	2.9	10.2	1.5	<1.0	<1.0	<1.0
Percentage of literate persons aged 6 years and over	93.0	96.8	92.1	94.5	97.2	94.3
Percentage of persons with schooling above primary school	19.0	44.8	12.9	18.8	43.8	16.8

[1] Source: 1990 Population and hoursing census. National Statistical Office. [2] Data related to population over 13 years.

Table 2 Schools, areas and numbers of students.

	Type of school	Area	Numbe of students			Number of class
			Boy	Girl	Total	
1	Low-income school	Municipality	106	111	217	7
2	Elite school	Municipality	461	467	928	24
3	District school	Sanitary district[1)]	138	120	258	10
4	District school	Village	70	74	144	6
5	District school	Village	74	94	168	6
6	District school	Village	123	137	260	10
7	District school	Village	149	152	301	12

[1)] It means the seat of the district office in the district studied.

chosen in order to obtain an even distribution of subjects regarding age and sex. Table 2 shows a description of the schools by number of students and type.

One class from each year of first to sixth grades were chosen in each selected school. If any year group had two classes the larger class were selected. In case of the elite school in the municipality, one out of four classes in each grade was chosen at random. In each class ten boys and ten girls were selected at random as subjects for our research.

The data of children were collected in August 1995 by using questionnaires with the help of teachers from each school. It included questions about weight and height, place of domicile, father's occupation, and various life-quality items related to possession of modern appliances. Of 840 children who responded, 663 aged between seven to twelve years who gave valid answers on weight and height, place of domicile and father's occupation were subsequently studied.

2) Data processing and statistical analysis

Obesity was defined as weight to height of over 120% of the median of children in Bangkok[20]. Socioeconomic status was classified by type of school attended and father's occupation. Schools were divided into three groups: 1) an elite provincial school in the municipality (elite school) ; 2) a school with many children of low-income families in the municipality (low-income school) and 3) five ordinary schools in the neighboring district (district schools). A father's occupation was classified into four groups: 1) agricultural worker, 2) merchant, 3) employee and 4) public servant. Agricultural workers included gum workers and fishermen.

Chi-square test was used to assess the association of obesity with age and association of the type of school with the possession of appliances in children's houses. The Cochran-Mantel-Haenszel method was adopted to analyze the associations of obesity with sex, type of school and father's occupation. The associations of obesity with sex and type of school were analyzed with age adjustment. When analyzing father's occupation, adjustment was made for type of school. P values less than 0.05 were regarded as statistically significant. The computations were performed using an SPSS statistical package (SPSS Inc.) and HALBAU (Gendaisugaku Co.).

Results

Table 3 shows father's occupation and living area of children classified by type of school. In the elite school in the municipality there were 78.9% of children whose fathers were public servants and few children of agricultural workers. This distribution of occupations in the elite school was very different from that of the municipality of province shown in Table 1. In contrast, there were 57.1% of children whose fathers were agricultural workers in district schools. In the low-income school in the municipality the proportions by father's occupation were as follows: agricultural worker (29.0%), merchant (29.0%), public servant (21.7%) and employee (20.3%). Nearly 20% of children in the elite school came from the areas outside the municipality, although most of the children in the low-income school and district schools attended schools located in the areas where the children lived.

Figure 2 shows the distributions of the weights and heights of the children studied, with lines which indicate ±10% of the

Table 3 Distribution of father's occupation (A) and living area (B) classified by type of school.

(A)

Type of school	Agricultural worker n(%)	Merchant n(%)	Employee n(%)	Public servant n(%)	Total n(%)
Low-income school	20 (29.0)	20 (29.0)	14 (20.3)	15 (21.7)	69 (100)
Elite school	2 (1.9)	7 (6.7)	13 (12.5)	82 (78.9)	104 (100)
District schools	280 (57.1)	66 (13.4)	80 (16.3)	64 (13.1)	490 (100)
Total	302 (45.6)	93 (14.0)	107 (16.1)	161 (24.3)	663 (100)

(B)

Type of school	Municipality n(%)	Sanitary district[1)] n(%)	Village n(%)	Total n(%)
Low-income school	65 (94.2)	0 (0.0)	4 (5.8)	69 (100)
Elite school	84 (80.8)	12 (11.5)	8 (7.7)	104 (100)
District schools	1 (0.2)	86 (17.6)	403 (82.2)	490 (100)
Total	150 (22.6)	98 (14.8)	415 (62.6)	663 (100)

[1)] It means the seat of the district office in the district studied.

Table 4 Proportion of obesity among children studied classified by age and sex.

Age	Boys			Girls*			All		
	Total n	Obesity n(%)	Non-obesity n(%)	Total n	Obesity n(%)	Non-obesity n(%)	Total n	Obesity n(%)	Non-obesity n(%)
7	42	4 (9.5)	38 (90.5)	46	5 (10.9)	41 (89.1)	88	9 (10.2)	79 (89.8)
8	58	3 (5.2)	55 (94.8)	57	2 (3.5)	55 (96.5)	115	5 (4.3)	110 (95.7)
9	60	2 (3.3)	58 (96.7)	60	6 (10.0)	54 (90.0)	120	8 (6.7)	112 (93.3)
10	52	5 (9.6)	47 (90.4)	54	2 (3.7)	52 (96.3)	106	7 (6.6)	99 (93.4)
11	53	3 (5.7)	50 (94.3)	61	1 (1.6)	60 (98.4)	114	4 (3.5)	110 (96.5)
12	59	2 (3.4)	57 (96.6)	61	5 (8.2)	56 (91.8)	120	7 (5.8)	113 (94.2)
Total	324	19 (5.9)	305 (94.1)	339	21 (6.2)	318 (93.8)	663	40 (6.0)	623 (94.0)

*$p < 0.05$. The associations between obesity and age were analyzed using chi-square test in boys, girls and all children.

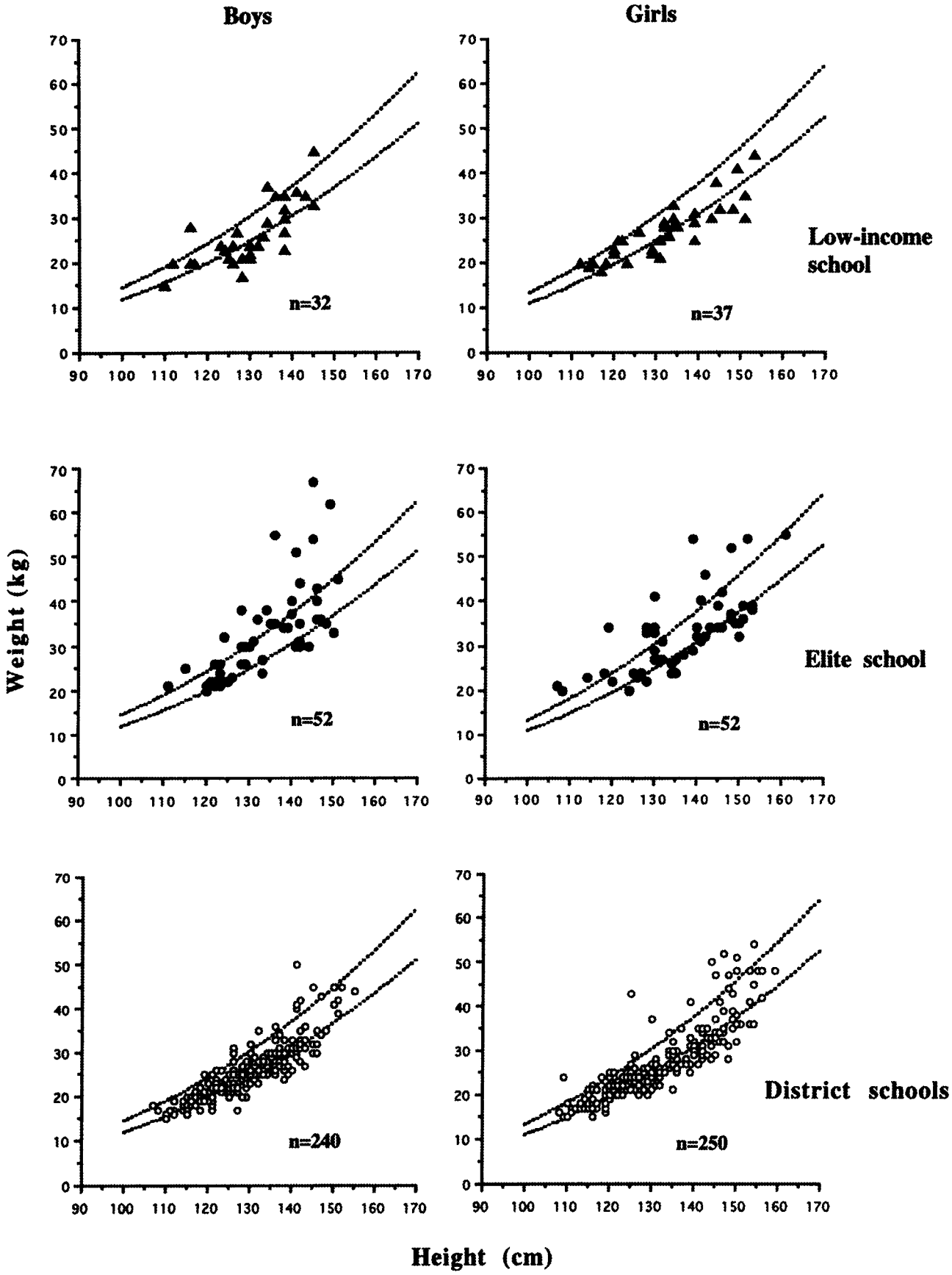

Fig. 2 Weights and heights of school children studied classified by sex and school type in Phattalung Province. Dotted lines indicate ± 10% of the median of weight to height of children in Bangkok.

Table 5 Age-adjusted risk ratios (RR) in association with obesity.

Type of school	Obesity n(%)	Non-obesity n(%)	RR(95% CI)
Low-income school	4 (5.8)	65 (94.2)	1.9 (0.8-4.8)
Elite school	23 (22.1)	81 (77.9)	5.0 (3.5-7.2) ***
District school	13 (2.7)	477 (97.3)	1.0

CI: confidence interval, ***p<0.0001.

Table 6 School type-adjusted risk ratios (RR) in association with obesity.

Father's occupation	Obesity n(%)	Non-obesity n(%)	RR(95% CI)
Public servant	18 (11.2)	143 (88.8)	1.0 (0.8-1.3)
Merchant	6 (5.6)	101 (94.4)	0.8 (0.4-1.5)
Employee	6 (6.5)	87 (93.5)	0.8 (0.4-1.7)
Agricultural worker	10 (3.3)	292 (96.7)	1.0

CI: confidence interval.

median of children in Bangkok. Overall, the proportion of children whose weight to height was less than 90% of the median of children in Bangkok was 36.7% and that of children whose weight to height was more than 110% of the median of children in Bangkok was 12.3%. This means that the distribution of weight to height among children studied in our research shifts to the lighter side compared to children in Bangkok.

Table 4 shows the age and sex distributions of children studied. There were 88 seven-year-old, 115 eight-year-old, 120 nine-year-old, 106 ten-year-old, 114 eleven-year-old and 120 twelve-year-old students. The subjects included 324 boys and 339 girls with an average age of 9.6 years (SD 1.7 years) for both sexes. Table 4 also shows the proportion of obesity by age and sex among the children studied. Age was significantly associated with obesity in girls ($p<0.05$), but not in boys. Sex had no statistically significant relationship with obesity after age adjustment.

Tables 5 shows that type of school had a statistically significant relationship with obesity by using the Cochran-Mantel-Haenszel method with age adjustment. The proportion of the obese was the highest in the elite school (22.1%), while a few obese children were identified in the low-income school (5.8%) and in the district schools (2.7%). The risk ratio and 95% confidence interval for obesity in the elite school were 5.0 (3.5-7.2) using the district schools as reference.

Father's occupation had no statistically significant relationship with obesity by using the Cochran-Mantel-Haenszel method with school type adjustment (Table 6).

Table 7 shows that school type was significantly associated with the possession of modern appliances in the children's houses. The prevalence of modern appliances was comparatively higher in the elite school children's households.

Discussion

Our study showed a very high proportion (22.1%) of obesity in the elite school. This was higher than that in Hat Yai (15.6%)[21], which is one of the largest cities in Thailand and only 95 km from Phattalung Province. The high prevalence of obesity in the elite school indicated that even in rural provinces like Phattalung it is still necessary to clarify the causes of obesity in order to prevent it.

In a study of children in Hat Yai[22], higher parental income was associated with increased risk of child obesity. Another study in Jakarta[23] has shown a high prevalence of obesity in high socioeconomic class children. These reports suggested that obesity in childhood may be related to the lifestyle of the high-income class in developing countries. Our research did not examine directly the income of children's families. As there exists a strong relationship in general between occupation and income, we adopted the father's occupation as an indicator of socioeconomic status. The distribution of father's occupation in the elite school was very different from that in the low-income school and district schools. It was also different from that of the municipality where the elite school was located and having a considerably high (78.9%) proportion of children whose fathers were public servants. Most of the middle-ranked or senior public servants in Phattalung Province have their children enter the elite school. According to household income statistics for the whole of Thailand in 1988, the average income of the top occupational group including many of the public servants was more than twice of those in other occupational groups[24]. Therefore, we had suspected that the high prevalence of the obese among the elite school children could be related to the father's occupation. Father's occupation, however, had no significant relationship with nutrition status in our study. There is possibly a need for a more detailed classifications of occupation, social status of parents or income per household to describe the socioeconomic status of children's families.

In our research the comparatively higher prevalence of modern appliances in elite-school children's households suggested that the economic status of children's families in the elite school was higher compared to those of children in other schools. In addition, there was a discrepancy between the location of the elite school and the living area of some children in the elite school. Nearly 20% of children in the elite school attended from non-municipal areas, although the elite school was located in the center of the municipality. This fact also suggested that some deviations of socioeconomic status of children existed in the elite school. It is likely that these deviations in socioeconomic status are related with the high prevalence of the obese among children in the elite school. However, it is necessary to make further investigations in order to identify the high risk groups of the obese among children in the municipality of the rural province.

When we looked at the distribution of weight to height among all children studied in our research, the proportion of

Table 7 Prevalence of appliances among children's households classified by type of school.

	Total %	Low-income school %	Elite school %	District schools %	p - values
Gas for cooking	89.1	87.0	98.1	87.6	< 0.01
Refrigerator	69.9	88.2	100.0	60.9	< 0.0001
Tap water	12.7	30.4	43.3	3.7	< 0.0001
Toilet in house	71.2	79.4	94.2	65.1	< 0.0001

p - values: chi-square test.

children whose weight to height was less than 90% of the median values of children in Bangkok was 37% as a whole. This figure is more than double the figure, 17%, reported for children in Hat Yai[22]. On the other hand the proportion of children whose weight to height was over 110% of the median values of children in Bangkok was about a half of that in Hat Yai[22]. These results indicated that children in our study were generally leaner than those in big cities of Thailand like Hat Yai and Bangkok as a whole. Traditional health problems like malnutrition still exist in Phattalung Province and such prevalence is consistent with the previous reports of health issues in the rural areas of Thailand[13-16]. Improvement of malnutrition has been generally implemented as a priority in Phattalung Province.

The results obtained in our research also indicated the existence of a disparity in child nutrition inside the municipality. It is relatively important to improve nutrition for children in the low-income school in the municipality since this school had a higher proportion of children whose weight to height was less than 90% of the median values of children in Bangkok. On the other hand, it is rather more important to prevent obesity in the elite school. In the municipal area the appropriate health interventions will vary from one school to another. Khor reported that there were intra-city differentials in child nutrition in Kuala Lumpur[25], the capital city of Malaysia, with an economy growing as quickly as that in Thailand. She pointed out that such intra-city variances in health reflect a wide disparity in socioeconomic status between the advantaged and the poor groups. Though economic development in the second half of the 1980s has benefited both metropolitan areas and rural provinces of Thailand, the gap in income by region and individual has widened[26]. The extension of economic development probably causes disparities in the living conditions of residents in the provinces of Thailand, which in turn may have effects on health status. The results of our research partly support this probability.

In conclusion, our study demonstrates that health issues depending on socioeconomic status exist in Phattalung Province. Phattalung was ranked 57th out of the 72 provinces of Thailand in GPP per capita in 1993. This fact may make one believe that obesity is going to be a health issue in many provinces where economic development is similar or faster than that in Phattalung Province. Any health plan for children in Thailand must therefore take both malnutrition and obesity and their associations with socioeconomic status into account.

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