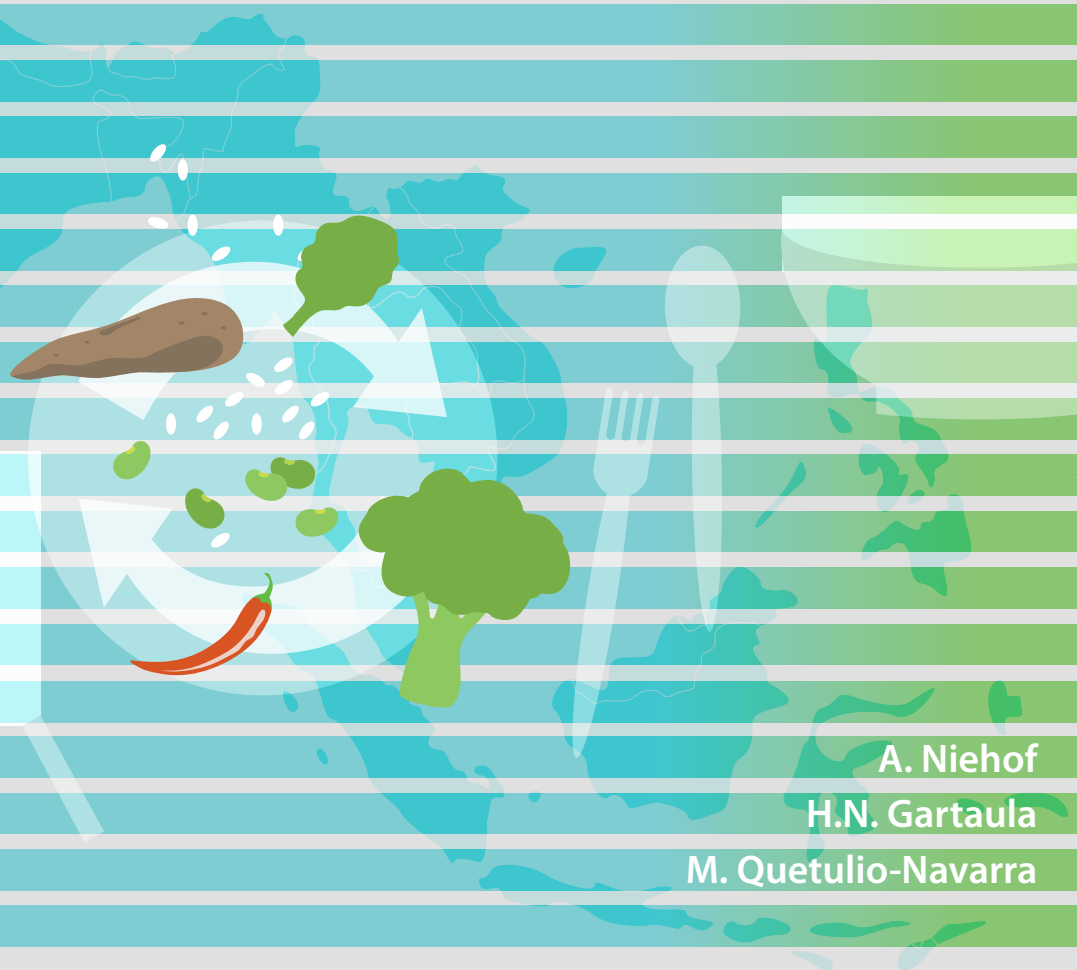


Diversity and change in food wellbeing

Cases from Southeast Asia and Nepal



A. Niehof
H.N. Gartaula
M. Quetulio-Navarra



Wageningen Academic
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edited by:

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9. Parents' characteristics, food habits and physical activity of overweight schoolchildren in Bogor City, Indonesia

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Abstract

Overweight and obesity is a serious problem among urban schoolchildren that continues into adulthood and leads to metabolic and degenerative diseases. In the context of urban development and social change, children's food habits and low physical activity put them at risk of childhood obesity. More specifically, factors such as relatively high educational level and income of parents, provision of pocket money, and easily accessible fast food restaurants, play a role in this. This study aimed to assess the impact of such factors on the nutritional status and physical fitness of middle-class schoolchildren in the city of Bogor, West Java, Indonesia. A cross sectional study involving 224 grade-5 elementary schoolchildren was done. Data collection included a mix of methods. Results shows that overweight risk is 4.5 higher for non-fit children compared to fit children. Overweight children had significantly lower physical fitness scores. Children with pocket money more than IDR 10,000/day (€ 0.66) had 2.7 times more risk to become overweight than children with less pocket money. Low education of the mother decreased overweight risk 0.4 times. Mothers with a high education mostly had an occupation outside the home, hence had less time for food care. High protein adequacy levels of more than 120% decreased overweight risk 0.4 times. These findings suggest that social change and development in the urban context have a negative impact on the nutritional status and fitness of schoolchildren.

Keywords: schoolchildren, overweight, urban environment, Indonesia

9.1 Introduction

Prevalence of overweight and obesity among children increases from year to year in both developed countries and developing countries. According to WHO (2000), one out of 10 children in the world is obese. In Indonesia, according to recent data the prevalence of overweight and obesity among children of 5 to 12 years old is high (18.8%). For adolescents of 13-15 years old it is 10.8%, and for the age group of 16 to 18 it is 7.3%. The prevalence for boys aged 5-12 years is higher (20.2%) than for girls of the same age (17.3%). Incidence of overweight including obesity is higher in urban areas (20.7%) than rural areas (17.2%) (MoH, 2013). Overweight is a condition where the body weight exceeds normal weight, by 20% for men and 25% for women. In the case of obesity, body weight is a result of fat accumulation.

Overweight is a serious problem among schoolchildren because it continues when they grow up and puts them at risk of developing metabolic and degenerative diseases, such as cardiovascular diseases, diabetes mellitus, cancer, and osteoarthritis. Studies have shown that children and teenagers who are overweight have an increased risk of suffering from cardiovascular diseases in adulthood (Oren *et al.*, 2003; Wright *et al.*, 2001).

Incidence of obesity in primary schoolchildren has been associated with low physical activity and consumption of fast foods (Suryaalamasyah, 2009; Pramudita, 2011). There has been a shift in children's play activities. Instead of playing physical outdoor games, nowadays children watch television, play video games or online games on the computer or mobile phone. This limits their physical mobility and negatively affects their health (Kimbro *et al.*, 2011; Vandewater *et al.*, 2004).

Similarly, advancements in food technology have an impact on food choices among children. Children now are more likely to consume fast foods and soft drinks. Fast foods contain energy, fat, and high cholesterol, but have low fibre content. If habitually consumed, this may affect health adversely (Bowman *et al.*, 2004). As fast food consumption is strongly associated with weight gain and insulin resistance, it may contribute to the development of obesity and type 2 diabetes (Pereira *et al.*, 2005).

Social and cultural factors influence the consumption of fast food. A study in China found three factors associated with western fast food consumption among Chinese children: good accessibility of fast foods as in urban areas, college level education of mothers, and the caregiver's positive attitude to western food (Song *et al.*, 2015). Accessibility of fast foods relates to distance and affordability. Austin *et al.* (2005) found that fast-food restaurants are clustered within a short walking distance from schools. This exposes children to poor-quality food environments. Children cannot only reach the fast food restaurants easily, they also can afford buying the foods with their pocket money. In urban China, students with more pocket money consumed more sugary beverages, snacks, fast food or street food, and were more likely to be overweight or obese (Li *et al.*, 2017).

The changes in children's food consumption habits and physical activity reflect social change in urban areas, as indicated by relatively high educational level and high income of parents, provision of pocket money, and accessible fast food restaurants. Increasing work demands and time pressure in the urban context leave people little time for people to prepare food in a traditional manner; they rather buy pre-packaged meals and fast foods (Hill *et al.*, 2003). They also need to go everywhere faster, using any means of transportation instead of walking. All this puts children at risk of childhood obesity. This study aimed to analyse the effects of these factors on the nutritional status and physical fitness of middle-class schoolchildren in the city of Bogor.

9.2 Conceptual framework

Overweight is defined as children who have z-score of body mass index (BMI) for age more than 1 standard deviation (SD) including as well obese children (WHO, 2006; MoH, 2011). Overweight is the result of imbalance between nutrient intakes and physical activity, i.e. high macronutrient intakes combined with low physical activity.

Several factors may influence nutrient intake: household socioeconomic characteristics, characteristics of children, and food habits (Booth *et al.*, 2001; Patrick and Nicklas, 2005). Household characteristics (i.e. household size, parent's education, job and income) influence the amount of pocket money given to children. Children's characteristics and pocket money shape food habits. Suci (2009) found that parents give pocket money to their children because they are worried their children will get hungry at school and they do not have time to prepare meals for breakfast or lunch.

Crucial food habits comprise eating, breakfast in particular, and snacking. Eating habits are shaped by household characteristics. Parent's education, job, and income influence availability of food at home. Parents with low education usually have low-income jobs, which could prevent them to buy nutritious food. It is even more challenging when households are large and with many people to feed. Households with these characteristics usually spend more of their income on food with poor nutritional qualities. Instead of eating a balanced diet, they usually eat high-calorie food, which has immediate satiating effect.

Breakfast has been labelled the most important meal. Current evidence points at poor breakfast habits among schoolchildren. A study by Hardinsyah and Aries (2012) involving 35,000 Indonesian schoolchildren, found that 20 to 40% of the children did not customarily take breakfast in the morning, and that 44.6% of children aged 6-12 years old had breakfast with low nutrients quality. Children usually skip breakfast because they (or their parents) do not have enough time for it. This tempts children to buy foods that are available around the school. These foods tend to have high calorie and fat contents. Skipping breakfast and fast food consumption usually continue in adulthood. Both habits are associated with increased weight gain from adolescence to adulthood (Niemeier *et al.*, 2006). Children who missed breakfast are significantly less likely to consume fruits and vegetables and more likely to be frequent consumers of unhealthy snacks (Uter *et al.*, 2007).

Various types of snacks are being sold around school. Children are willing to buy these snacks because they are hungry and the snacks look attractive. These snacks generally are rich in calories but poor in fibre. This affects children's nutrient intake and nutritional status, i.e. overnutrition in calories and macronutrients but undernutrition in micronutrients. Obesity among children and adolescents is associated with taking carbohydrate-rich foods and sweet drinks (Gillis and Bar-Or, 2003), and obese children snack more (Pramudita, 2011).

Physical activity also has an impact on nutritional status. There is a positive association between physical activity levels and nutrient intake. Children now have lower activity levels than in the past, especially those who live in urban areas. Children prefer to play indoors with their gadgets and video games rather than playing outdoors. They rarely play outdoor games like hide and seek or ball games that burn a lot of energy. Because of high calorie intake and little physical activity, children become overweight and obese. Physical activity of children is positively associated with physical fitness (Boreham and Riddoch, 2001; Bovet *et al.*, 2007; Kim *et al.*, 2005). Finally, obesity in childhood can be carried on to adulthood and has long-term impacts on adult morbidity and mortality (Reilly and Kelly, 2011). However, this can be prevented if the modifiable risk factors are known. As shown in the conceptual framework (Figure 9.1), socio-economic profile, food habits and physical activity, are the risk factors that this study seeks to investigate. To do so, we formulated the following research questions:

1. How do the parent’s characteristics relate to the weight of the schoolchildren?
2. How do the schoolchildren’s food habits, nutritional status, physical activities, and fitness level correlate with their weight?
3. How do the parent’s characteristics, children’s food habits, and physical activities affect the weight of the schoolchildren?

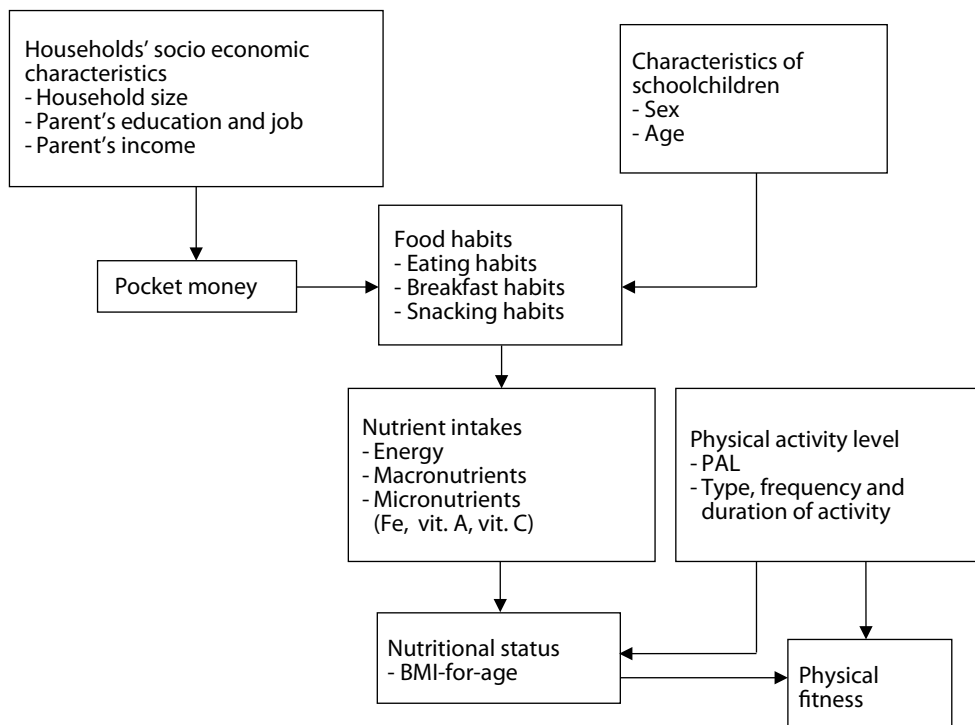


Figure 9.1 Conceptual framework.

4. What are the significant differences between normal and overweight middle-class schoolchildren?
5. How can the results be explained by 'social change and development'?

9.3 Research area and methodology

The study was conducted in Bogor City, West Java, Indonesia. Bogor City is an urban area located 60 km. south of Jakarta. Subjects involved in this study are fifth-grade elementary male and female schoolchildren, aged 10-12 years old. The subjects are overweight/obese and normal students, according to WHO standards. Students were categorised as overweight if the BMI/age + 1SD < Z < +2 SD, obese if BMI/age > +2SD, and normal if BMI/age -2SD < Z < +1 SD (WHO, 2006; MoH, 2011).

Six elementary schools were purposively selected. The major consideration was their similarity in terms of the majority of the children coming from upper middle-class families. Research in Indonesia has shown that overweight and obesity are more prevalent in upper middle-class families and that prevalence increases with quintile of income (MoH, 2013). Using the Slovin formula, given a total of population of ± 494 5th graders in the selected schools, the sample size was determined at 224. The 5th graders in the six schools were screened by measuring their body weight and height. Based on BMI for age, underweight children were excluded. The rest were grouped into normal and overweight, including obese, children. Simple random sampling was applied to each group.

Data collection was done by enumerators, supervised by the research team. All interviews and measurements (anthropometric nutritional, anaemia, and health status) were conducted in the schools, during March-August 2014. Primary data were collected through interviews using a questionnaire, anthropometry measurement, and observation. The schoolchildren reported their characteristics and food habits on a self-administered questionnaire after an explanation by the researcher. For the household characteristics, we used a self-administered questionnaire for the parents. Nutrient intake was measured for three days, two non-consecutive school days and one school holiday, using 24-hour food recall.

Physical Activity Level (PAL) was measured by interviewing schoolchildren about their activities on school days and holidays. Using a questionnaire, data on the frequency and duration of exercise habits and physical activity habits during leisure time and school days were collected. Physical fitness was assessed by several tests: 40 metres sprint, push up and sit up, straight jump, and running 600 metres. The children's speed ability was measured by their sprint performance, cardiovascular endurance through the 600-metres run. Endurance of shoulder and arm muscles was measured by the push-up test, the endurance of the abdominal muscles by the sit-up test. The straight jump tested the explosive power of the leg muscles.

We present descriptive statistics and inferential analysis, using the Mann-Whitney test and the Independent t-test. The first was used to analyse the differences between normal and overweight schoolchildren on variables that are not normally distributed, the t-test for normal distributions. Chi-square tests were done on categorical variables; the Spearman correlation test was applied to numeric variables. Finally, factors affecting overweight were analysed by a regression test.

Ethical clearance was obtained from the ethical committee of the Faculty of Medicine, Universitas Indonesia. The involvement of the schoolchildren was voluntary and permission was obtained from their parents or guardians. All subjects could withdraw from the study at any time. All data were treated confidentially and used for the purpose of this study only.

9.4 Results

9.4.1 Characteristics of the schoolchildren

The 224 schoolchildren were divided equally into two groups: the normal and the overweight group. The children were on average 11 years old. More than half of them are girls. Parents of overweight children gave their children more pocket money than the parents of the normal children. Group averages were IDR 8,036 and IDR 10,167, respectively. Almost half of the normal and overweight children are the first or eldest child in their family, and one-third is a second child.

9.4.2 Household characteristics

Table 9.1 presents the characteristics of the households and parents of the schoolchildren. The average household size in both groups was five. The age of the fathers and the mothers ranged from 39 to 43, the fathers being older than the mothers. Age of the parents did not significantly differ between the normal and overweight group. The t-test results on nutritional status as measured by BMI show that the fathers and mothers of the overweight children have a significantly higher BMI than those of the normal children. The fathers of the overweight children have overweight BMI, while the mothers have a normal BMI ($\geq 18.5 - < 24.9$).

Most parents in both groups are *sarjana* (undergraduate). The percentage of the fathers who reached higher education (diploma, *sarjana*, and postgraduate) was slightly higher in the normal group (79.5%) than in the overweight group (75.9%). Conversely, more mothers reached higher education in the overweight group (73.2%) than in the normal group (66.3%). However, these differences are not significant.

The results show that 48.2% of the fathers and 16.1% of the mothers in the normal group work as private employees. The others work as civil servants, in the police or in the army, as labourers, have their own business, or work in the services sector (as tailors, drivers, or

Table 9.1. Characteristics of households and parents of school children.

Characteristics	Normal	Overweight	P ¹
Household size (%)			0.819
Small (<4 persons)	7.1	8.9	
Medium (4-7 persons)	87.5	87.5	
Large (>7 persons)	5.4	3.6	
Parent's age (year)			
Father	43.9	43.9	0.859
Mother	40.0	40.0	0.844
Parent's nutritional status (BMI)			
Father	24.5	25.6	0.009*
Mother	23.4	24.4	0.019*
Father's education (%)			0.549
Elementary school	0.9	0.9	
Junior high school	1.8	0.9	
Senior high school	17.9	22.3	
Diploma	20.5	17.0	
Sarjana (undergraduate)	43.8	49.1	
Pascasarjana (postgraduate)	15.2	9.8	
Mother's education (%)			0.355
Elementary school	2.6	3.6	
Junior high school	2.6	1.8	
Senior high school	28.4	21.4	
Diploma	19.8	25.0	
Sarjana (undergraduate)	25.0	39.3	
Pascasarjana (postgraduate)	21.5	8.9	
Parent's monthly income (in thousand IDR)			
Father	7,138	6,812	0.550
Mother	2,145	2,002	0.772
Total	9,283	8,814	0.736

¹ * = significant at $P < 0.05$.

mechanics). In this group, 55.4% of the mothers are housewives. Of the overweight children, the majority of the fathers are private employees (45.5%), the others working as civil servants or in the police or the army (22.3%), or are private businessmen (21.4%). Also in this group, most mothers are housewives. The parents' incomes in both groups ranged from IDR 8 to 9 million per month, which is much higher than Bogor City average (IDR 2.4 million). Although the average combined income of father and mother in the normal group was slightly higher than in the overweight group, the difference is not significant.

9.4.3 Food habits and nutritional status of schoolchildren

The frequency of the children's food consumption and eating together with their family were indicators of eating habits. More overweight children ate twice a day (16.1%) than children with normal nutritional status (10.7%). The majority of the children ate three times a day (76.8% in the normal group and 70.5% in the overweight group). According to the Chi-square test there is no association between eating frequency and nutritional status ($P>0.05$).

The proportion of children in the normal and the overweight group who stated 'always eating together with their family' was more or less the same (26.8 and 27.7%, respectively), but in the overweight group, there were more children who seldom ate together with their family (25.0%) than in the normal group (12.5%). The Chi-square test did not show a significant association between the practice of eating together and nutritional status ($P>0.05$). Eating together at dinner (65.3% and 62.0% in the normal and overweight group, respectively) was done more often than eating together at breakfast and lunch times. Dinner is usually the time when all family members are home and can eat together.

The number of schoolchildren in the normal group who always had breakfast (64.3%) was slightly higher than in the overweight group (56.3%). Overall, there was no significant association between the habit of having breakfast and nutritional status ($P>0.05$). Breakfast contributed approximately 26% of the total daily energy intake and 28% of the total protein intake, which can be considered sufficient. Plain water was the most frequently consumed beverage (median 5 times a day), then milk (0.7 – 1 times a day). Less frequently consumed beverages were sweetened tea, coffee, iced syrup, fruit juice, flavoured drinks, and soft drinks. Beverage consumption did not differ between the normal and the overweight group.

The fast foods consumed by the schoolchildren were pizza, burger, French fries, fried chicken, *kebab*, sandwich, etc. In general, fast foods were consumed 0.2 to 2.0 times a week. The frequency of fast food consumption between the normal and overweight groups did not show a difference. Junk food is a snack that is rich in calories but poor in nutrients. In this study, junk foods investigated were salty crispy fried snacks (*chiki-chikian*), wafers, chips, candies, and jelly. Junk food consumption ranged from one to three times per week. The mostly consumed junk food was candy (three times per week). There was no difference in frequency of junk food consumption between the two groups.

Table 9.2 shows that the adequacy levels of energy, protein, calcium, iron, vitamin A and vitamin C were higher in the normal group than in the overweight group, but not significantly so. The energy adequacy levels of both normal and overweight children were deficit (<90% recommended dietary allowances (RDA)). On the other hand, the protein adequacy levels were excessive (>110% RDA). The micronutrients adequacy levels of both groups were also deficit (<77% RDA) (Table 9.2).

Table 9.2 Nutrients adequacy level of schoolchildren by nutritional status.¹

Nutrients	Normal			Overweight		
	Intake	RDA	% RDA	Intake	RDA	% RDA
Energy (kcal)	1,628	2,205	70.9	1,627	2,376	66.4
Protein (g)	40.6	30.1	134.0	38.9	33.9	118.2
Calcium (mg)	373.2	1,200.0	31.1	315.4	1,200.0	26.3
Iron (mg)	10.5	20.0	61.6	9.9	20.0	59.3
Vitamin A (RE)	384.0	600.0	64.0	323.5	600.0	53.9
Vitamin C (mg)	14.0	50.0	28.0	11.6	50.0	23.1

¹ RDA = recommended dietary allowances.

Most of the children (92.4%) had good eating habits, particularly having breakfast, of which the energy contribution was 26.2% and 25.6% for the normal group and the overweight group, respectively. Regarding household characteristics and the children's eating habits, only the association between the mother's working status and food habits of the children is significant (Table 9.3). The eating habit of the children whose mothers did not work was 19.4% better than that of the children of working mothers.

Table 9.3 Correlation between the household socio-economic factors and eating habits.

Variable		Eating habit				χ^2
		Good (n=200)		Bad (n=16)		
		n	%	n	%	
Fathers' education	Low (≤ 12 years)	48	21.4	2	0.9	0.277
	High (> 12 years)	159	71.0	15	6.7	
Mothers' education	Low (≤ 12 years)	63	28.1	6	2.7	0.677
	High (> 12 years)	144	64.3	11	4.9	
Pocket money/day	High ($> \text{IDR}10,000$)	41	18.3	6	2.7	0.132
	Moderate ($\leq \text{IDR}10,000$)	166	74.1	11	4.9	
Income per capita	High ($\geq \text{IDR}1,500,000$)	106	47.3	8	3.6	0.742
	Moderate ($< \text{IDR}1,500,000$)	101	45.1	9	4.0	
Mothers' working status	Not working	119	55.1	5	2.3	0.028
	Working	81	37.5	11	5.1	

Based on BMI-for-age (Table 9.4), the prevalence of overnutrition among the schoolchildren is at 38.5% (consisting of overweight at 20.8% and obesity at 17.7%). It was higher among boys (43.3%) than among girls (33.6%). The prevalence data were obtained from the screening data of the total population of the 5th grade in the selected schools.

Table 9.4 Distribution of children by nutritional status and sex.

BMI/Age	Nutritional status	Sex		Total (%)
		Boy (%)	Girl (%)	
Z-score <-3.0	Very thin	1.2	0.7	1.0
Z-score ≥-3.0 s/d <-2.0	Thin	3.6	4.4	4.0
Z-score ≥-2.0 s/d ≤1.0	Normal	51.9	61.2	56.5
Z-score >1.0 s/d ≤2.0	Overweight	20.1	21.5	20.8
Z-score >2.0	Obese	23.2	12.1	17.7
Total		100.0	100.0	100.0

9.4.4 Physical activities and fitness level of schoolchildren

Most children’s activity levels during school days were considered light, for both groups of children. As Table 9.5 shows, the proportion of light activities was higher among overweight than among normal children (92.9 and 86.6%, respectively), the proportion of moderate and heavy activities higher (13.4%) in the normal than the overweight group (7.2%). The differences in activity levels between the normal and the overweight group during school days are significant ($P<0.05$). The median value of PAL among the overweight children was lower than that of the normal group (1.35 and 1.38, respectively). This shows that the children with normal nutritional status are slightly more active than the overweight children.

The level of the schoolchildren’s activity during a holiday can be generally categorised as light. The proportion of heavy activities was higher among normal than overweight children, but the difference is not significant. The normal group has higher median PAL value (1.53) than the overweight group (1.48). The most frequently played sports among the school children were running, swimming, badminton, jogging, and football, which the children practised during holidays. Other sports played were basketball, futsal, aerobic, volleyball, and martial arts, such as karate and taekwondo. The average frequency of playing sports in a week was 1.5 times for both normal and overweight children. It was also quite similar in duration (64.1 and 63.5 minutes/week, respectively).

Table 9.5 Distribution of schoolchildren by levels of activity during school days and holiday.

PAL	Levels of activity	Normal (%)		Overweight (%)	
		School days	Holiday	School days	Holiday
1.40-1.69	Light	86.6	68.8	92.9	71.4
1.70-1.99	Moderate	11.6	16.1	4.5	18.8
2.00-2.40	Heavy	1.8	15.2	2.7	9.8
Med ¹	PAL	1.38 ^a	1.53	1.35 ^b	1.48

¹ a,b = Mann-Whitney test, significant at $P < 0.05$.

We found that both overweight and normal children spend most of their leisure time watching TV or film. The duration of watching TV among the overweight children was slightly longer (126.7 minutes per week) than that of the normal children (122.0 minutes). Similarly, the overweight group showed a higher frequency (4.9 vs 4.7 times per week) and longer duration (82.7 vs 69.0 minutes per week) than the normal group of playing gadgets. The frequency of listening to music among normal children was higher than among the overweight ones. However, the average duration was longer (46.1 minutes per week) among the overweight children than among the normal children (32.9 minutes). The habit of going to the mall, in terms of weekly frequency and duration, was almost the same for the normal and overweight group: 1.4 times (192.5 minutes) and 1.3 times (168.7 minutes), respectively. Parents usually have their children participate in extra courses to supplement their learning at school. Children in this research were mostly enrolled in a twice-weekly additional course. The weekly frequencies and duration of additional courses among normal and overweight children were 2.4 times (106.9 minutes) and 2.8 times (110.5 minutes), respectively.

Regarding the results of the physical tests (Table 9.6), the normal children could run faster than the overweight ones, but the difference is not significant. For the other performances, the differences between the two groups are significant ($P < 0.05$), with the children in the

Table 9.6 Results of the physical fitness tests.

Physical test	Normal	Overweight	P-value
40 m sprint (second)	9.81±2.49	10.41±2.37	0.065
Push up (times per 30 second)	21±6.6	18±6.1	0.000
Sit up (times per 30 second)	15±3.9	13±4.3	0.011
Straight jump (cm)	25±5.2	23±5.6	0.000
600 m run (minute)	3.59± 0.73	4.52±1.25	0.000

normal group performing better. The result shows that the level of cardiovascular endurance among the normal children is higher than among the overweight children. Likewise, the fitness level of the normal children is higher (25.0%) than that of the overweight children (6.2%).

9.4.5 Correlation of household factors and nutritional status

The Chi-square tests on socio-economic characteristics and nutritional status only yielded a correlation between the children's pocket money per day and their nutritional status (Table 9.7). Prevalence of obesity was found higher among the children whose pocket money was more than IDR 10,000/day. As observed, during breaks at schoolchildren would spend their pocket money buying junk foods such as salty crispy fried snacks, wafers, chips, candy, and jelly. Some schools are in walking distance of well-known fast food restaurants and there are students who would take their lunch there.

Table 9.7 Correlation between household socio-economic factors and nutritional status.

Variables	Nutritional status				χ^2	
	Normal (n=112)		Overweight (n=112)			
	n	%	n	%		
Pocket money/day	High (>IDR10,000)	17	7.6	30	13.4	0.033
	Moderate (\leq IDR10,000)	95	42.4	82	36.6	
Number of household members	Big (>4 persons)	64	28.6	63	28.1	0.893
	Small (\leq 4 persons)	48	21.4	49	21.9	
Fathers' education	Low (\leq 12 years)	23	10.3	27	12.1	0.521
	High (>12 years)	89	39.7	85	37.9	
Mothers' education	Low (\leq 12 years)	39	17.4	30	13.4	0.193
	High (>12 years)	73	32.6	82	36.6	
Income per capita	High (\geq IDR 1,500,000)	53	23.7	61	27.2	0.285
	Enough(<IDR 1,500,000)	59	26.3	51	22.8	
Mothers' working status	Not working	62	28.7	62	28.7	0.874
	Working	47	21.8	45	20.8	

9.4.6 Factors causing overweight in schoolchildren

The results of the logistic regression analysis show that significant factors in the overweight status of school children are fitness, amount of daily pocket money, mothers' education, and protein adequacy level (Table 9.8). The children who daily had more than IDR 10,000 of pocket money were 2.7 times more at risk of being overweight than children getting less than IDR 10,000 (OR=2.756, CI 95%: 1.260-6.030).

Fitness status proved to be the strongest predictor of obesity. The risk of overweight is 4.5 times greater among the unfit children than the fit children (OR=4.499, CI 95%: 1.758-11.513). The data reflect that more children who were fit had a normal nutritional status, were more agile and moved more easily.

Children of mothers with a low level of education seemed to have lower chance of being overweight at 0.4 times (OR=0.400, CI 95%: 0.176-0.909). In addition, children with a protein adequacy level of more than 120% have a lower overweight risk at 45.8%. The adequacy levels of energy, calcium, iron, vitamin A and vitamin C did not affect overweight.

Table 9.8 Factors affecting overweight.

Variables	B	OR (95% CI)	P ¹
Fitness (1=unfit, 0=fit)	1.504	4.499 (1.758-11.513)	0.002*
Pocket money/day (1=>Rp.10,000; 0=<=Rp.10,000)	1.014	2.756 (1.260-6.030)	0.011*
Mothers' education (1=<=12 years, 0=>12 years)	-0.917	0.400 (0.176-0.909)	0.029*
Protein adequacy level (1=>120%, 0=<=120%)	-0.780	0.458 (0.239-0.879)	0.019*
Fathers' education (1=<=12 years, 0=>12 years)	0.413	1.512 (0.672-3.401)	0.318
Number of household members (1=<=4 people, 0=>4 people)	-0.130	0.878 (0.483-1.596)	0.670
Mothers' working status (1=not working, 0=working)	0.437	1.548 (0.808-2.967)	0.187
Habits of having breakfast (1=often, 0=seldom)	-0.315	0.730(0.237-2.245)	0.582
Meal-eating frequency per day (1=3 times, 0=others)	-0.121	0.886 (0.455-1.722)	0.720
Physical activities (1=heavy, 0=light)	-0.900	0.407 (0.048-3.426)	0.408
Energy adequacy level (1=>120%, 0=<=120%)	-0.108	0.898 (0.132-6.110)	0.912
Calcium adequacy level (1=>77%, 0=<=77%)	0.275	1.316 (0.171-10.151)	0.792
Iron adequacy level (1=>77%, 0=<=77%)	0.318	1.374 (0.700-2.698)	0.356
Vitamin A adequacy level (1=>77%, 0=<=77%)	-0.379	0.685 (0.337-1.389)	0.294
Vitamin C adequacy level (1=>77%, 0=<=77%)	0.365	1.441 (0.639-3.251)	0.379
Constant	-0.145		
R ² =0.186			

¹ * = significant at P<0.05.

9.5 Conclusion and discussion

This study found that overnutrition (overweight and obese) in the study group is higher than the national prevalence of 18.8% among 5-12 years old children (MoH, 2013). In this study, overweight among schoolchildren is strongly associated with low physical fitness, high amount of pocket money, high level of the mother's education and low protein adequacy. Among these variables, fitness status is the strongest predictor of overweight among schoolchildren. Overweight affects fitness status, as also found in the study conducted by Kim *et al.* (2005) who showed that physical fitness inversely correlates with overweight among schoolchildren. In this study, schoolchildren with BMI above 80th percentile (overweight) scored lower in fitness tests than those with a normal BMI.

On the other hand, this research could not prove that the level of overweight children's physical activity is lower than the normal children. This is probably because of the similarity in the children's school activities and schedule. Almost all children in the study have a light to moderate physical activities level. They spent most of their time on activities that require only small amounts of energy (like studying and watching TV). Moreover, most parents tend to channel their children's time and energy to activities to improve studies performance, like enrolling them in extra lessons or courses.

The low level of physical activity is also caused by lifestyle changes brought about by technological development. Technology has made life easier. For example, the washing machine and vacuum cleaner lighten the burden of household chores. Apart from this, the practice of hiring domestic help among middle-class families prevents the children from helping with the chores. Technological advancement created many gadgets that make children sit in front of screens. According to Laurson *et al.* (2008), children having little physical activity and more screen time than the recommended one to two hours per day (American Academy of Pediatrics, 2001) were three to four times more prone to be overweight than those having only one to two hours per day screen time. Both the normal and overweight schoolchildren in this study did not achieve the level of daily physical activity of 1.75 as recommended by WHO (1998).

We also found that the high amount of pocket money given to children on school days is a contributing factor to overweight. Kerkadi *et al.* (2005) observed that the prevalence of overweight children increases as the amount of pocket money goes up. Children who get more pocket money tend to spend it on buying street foods, which are calorie-rich but poor in nutrients. A main reason of the parents for giving pocket money to their children is to ensure that they not get hungry in school. Other reasons are reflections of social status. With the money, children can treat their friends and can show they get pocket money (Suci, 2009).

Clearly, the lifestyle changes that seem to engender overweight among children mirror social change and development processes. The parent's current habit to give pocket money

to their children instead of sending them off with a meal box may be due to lack of time in combination with the abundance of fast foods in the vicinity. Similarly, the enabling environment for women's access to education has produced more highly educated women, especially in upper-middle class families. Gender equality in education is a global priority (UNESCO, 2011). It is thought that educating girls and women can break the cycle of poverty as they can work and earn money for their family. However, working mothers have been strongly linked to poor eating habits of children and less time for childcare. As this study shows, children of working mothers had poorer eating habits than those whose mothers did not work, which is a disturbing finding.

The children are also often sent to after-school additional lessons or courses. This limits their time for physical activity and lowers their physical fitness. It would be better if the after-school activity were in the form of a sports program. As Elkins *et al.* (2004) found, higher participation in athletic activities by adolescents lowers their BMI. Therefore, after-school sports activities would be a way of preventing overweight among adolescents.

To conclude, social change and development have an impact on the differences between normal and overweight schoolchildren. Overweight children tend to have higher educated mothers, who are likely to be working mothers. As both parents work and family income increases, parents can afford gadgets and after-school study activity for their children. These in turn decrease the children's physical activity level and physical fitness. In addition, parents give their children pocket money to compensate for the lack of time for preparing a healthy meal. All of these factors contributed to the child being overweight. Normal children tended to have lower educated mothers, little pocket money and high physical fitness.

The high prevalence of overnutrition among schoolchildren has to be a concern to both parents and schools. Initiatives to lower the prevalence of overnutrition are called for, such as increasing the children's physical activities at school. WHO recommends children of 5 to 17 years old do exercises at least three times a week for 30 to 60 minutes each time. Following up this recommendation would be a good start.

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