Overweight among primary school-age children in Malaysia

Balkish Binti Mahadir Naidu, Siti Zuraidah Binti Mahmud, Rashidah Binti Ambak, Syafinaz Binti Mohd Sallehuddin, Hatta Bin Mutalip, **Riyanti Binti Saari,** Norhafizah Binti Sahril, Hamizatul Akmal Binti Abdul Hamid

INTRODUCTION

- Childhood obesity poses global public health threat and has risen to an alarming level throughout the world.

- Environmental factors, lifestyle preferences and culture play important roles in the rising prevalence of obesity worldwide

- Overweight children (10-12 years old) in Singapore **22.5%**
- Thailand, **7.9%** of urban school children were overweight.

OBJECTIVES

- To determine the prevalence of overweight among Malaysian children aged 7-12 years in order to provide internationally comparable findings by using IOTF cut-off point.

- To examine factor associated with overweight children, in extension of defining potential risk factors.

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ALCOHOL

DIETARY BEHAVIOUR

DRUG USE

HYGIENE

MENTAL HEALTH PROBLEMS

PHYSICAL ACTIVITY

PROTECTIVE FACTORS

SEXUAL BEHAVIOURS

TOBACCO USE

VIOLENCE AND UNINTENTIONAL INJURY

Material & Methods

- Secondary Data Analysis from National Health & Morbidity Survey 2006(NHMS IIII)
- Target Subpopulation: Children aged 7-12 years who complete anthropometry assessment.

Material & Methods

Data Source

- The NHMS III(2006) is a national health survey.
- Household survey
- Using the sampling frame provided by the Malaysian Department of Statistics.

- Study Design: Cross sectional

Material & Methods

- Sampling frame for the NHMS 2006: Enumeration Blocks (EBs).
- Sampling Design:

A two-stage stratified sample design was used.

- The Primary sampling unit(PSU) -EBs

-Secondary Sampling unit (SSU) -Living Quarters (LQ).

-All households and persons within a selected LQ were included in the survey.

Material & Methods

- The selection of EBs was carried out independently within each state (as a primary stratum) and within urban or rural areas (as a secondary stratum) in accordance with the selection rate determined for each stratum

Material & Methods

- Field data collection was conducted for 4 months in 2006.
- A bilingual (Malay and English) precoded questionnaire was designed, pre-tested and piloted prior to the administration of the survey.
- Trained research assistants conducted face-to-face interviews with parents or guardians of children.
- After completing the questionnaire, trained nurses obtained child weight and height measurement.

Material & Methods

- A portable body meter (SECA 206, Germany) was used to measure the child's height to the nearest 0.1 cm.
- Body weight was measured using a digital lithium weighing scale (Tanita 318, Japan) and measurements were recorded to the nearest 0.1 kg and taken twice per child to generate an average value for data entry.

DEFINITIONS

- Age- and sex-specific cut-offs proposed by IOTF were used to define overweight (including obesity).
- The use of this reference was acceptable widely for the purpose of international comparison .
- Children aged 7-12 years were categorized into groups of non-overweight and overweight

DEFINITIONS

Age (years)	Body mass index 25 kg/m^2		Body mass index 30 kg/m^2	
	Males	Females	Males	Females
2	18.41	18.02	20.09	19.81
2.5	18.13	17.76	19.8	19.55
3	17.89	17.56	19.57	19.36
3.5	17.69	17.4	19.39	19.23
4	17.55	17.28	19.29	19.15
4.5	17.47	17.19	19.26	19.12
5	17.42	17.15	19.3	19.17
5.5	17.45	17.2	19.47	19.34
6	17.55	17.34	19.78	19.65
6.5	17.71	17.53	20.23	20.08
7	17.92	17.75	20.63	20.51
7.5	18.16	18.03	21.09	21.01
8	18.44	18.35	21.6	21.57
8.5	18.76	18.69	22.17	22.18
9	19.1	19.07	22.77	22.81
9.5	19.46	19.45	23.39	23.46
10	19.84	19.86	24	24.11
10.5	20.2	20.29	24.57	24.77
11	20.55	20.74	25.1	25.42
11.5	20.89	21.2	25.58	26.05
12	21.22	21.68	26.02	26.67
12.5	21.56	22.14	26.43	27.24
13	21.91	22.58	26.84	27.76
13.5	22.27	22.98	27.25	28.2
14	22.62	23.34	27.63	28.57
14.5	22.96	23.66	27.98	28.87
15	23.29	23.94	28.3	29.11
15.5	23.6	24.17	28.6	29.29
16	23.9	24.37	28.88	29.43
16.5	24.19	24.54	29.14	29.56
17	24.46	24.7	29.41	29.69
17.5	24.73	24.85	29.7	29.84
18	25	25	30	30

Table1: International cut off points for body mass index for overweight and obesity by sex between 2 and 18 years, defined to pass through body mass index of 25 and 30 kg/m2 at age 18, obtained by averaging data from Brazil, Great Britain, Hong Kong, Netherlands, Singapore, and United States

Data Analysis

- Survey data were analysed using SPSS version 19.0 and Stata version 11.0.
- Complex sample descriptive analysis were used to calculate estimated prevalence of overall overweight of primary school-aged children in Malaysia and prevalence by the socio-demographic profiles. We utilized the Taylor series linearization method for variance estimation.
- Statistical Modeling using Complex Sample Logistic Regression was used to determine the factor associated with overweight children.

Logit Model

- Single indicator

$y = 1$ if $\beta_0 + \beta_1 x + \epsilon > 0$
$y = 0$, otherwise

$$\sigma(t) = \frac{e^t}{e^t + 1} = \frac{1}{1 + e^{-t}}$$

$$t = \beta_0 + \beta_1 x$$

We can now define the inverse of the logistic function, g, the logit (log odds):

$$g(F(x)) = \ln\left(\frac{F(x)}{1 - F(x)}\right) = \beta_0 + \beta_1 x,$$

and equivalently, after exponentiating both sides:

$$\frac{F(x)}{1 - F(x)} = e^{\beta_0 + \beta_1 x}.$$

$$\text{odds} = e^{\beta_0 + \beta_1 x}.$$

Logit Model

- Multiple Model

If there are multiple variables, $\beta_0 + \beta_1 x$ can be revised to

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_m x_m.$$

Data Analysis-Logistic Regression

- First, simple logistic regression was used to test for all variables independently.
- Second, all predictors and variables of nterests that have the $p<0.25$ in Rao-Scott test were included in the initial multivariate logistic regression model.
- A multiple logistic regression model was used to examine the effects of socio-demographic determinants for age, gender, residence (urban versus rural), socio-demographic factors (family background education, ethnicity), and guardian BMI status .
- Preliminary assessment for the selected model was done with the evaluation of the fitted model including adjusted Wald Tests to test the contribution of individual model parameters.

Data Analysis-Logistic Regression

- A diagnostic testing for the Goodness-of-Fit was also done to ensure the fit of a logistic regression model for individual cases or covariates.

- Interaction testing was assessed to ensure whether any interactions were scientifically relevant among the predictors that may affect the model in terms of multicollinearity.

- Finally, a final model is created that will include all those predictors and interactions that were significantly associated at level of $p<0.05$ and those variable that statically proven as predictors

Data Analysis-Logistic Regression

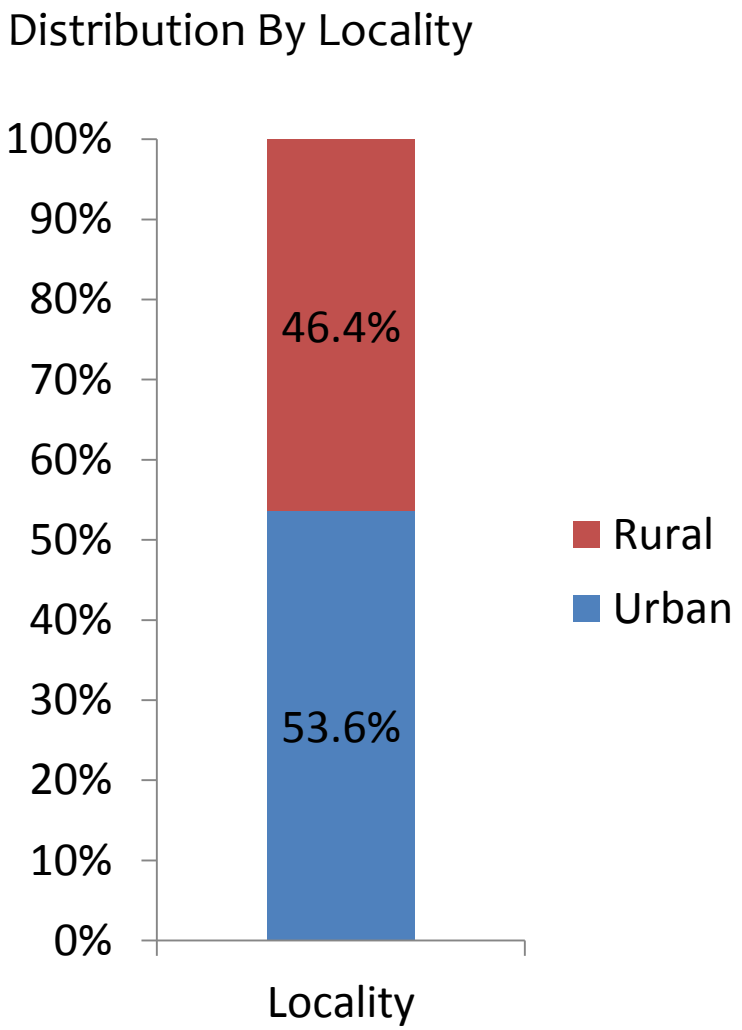
- The finding presented as crude and adjusted odd ratio with 95% confidence interval.
- All analyses were done using complex sampling design to ensure that sample weight and study design were accounted.

RESULTS

Socio-demographic profile

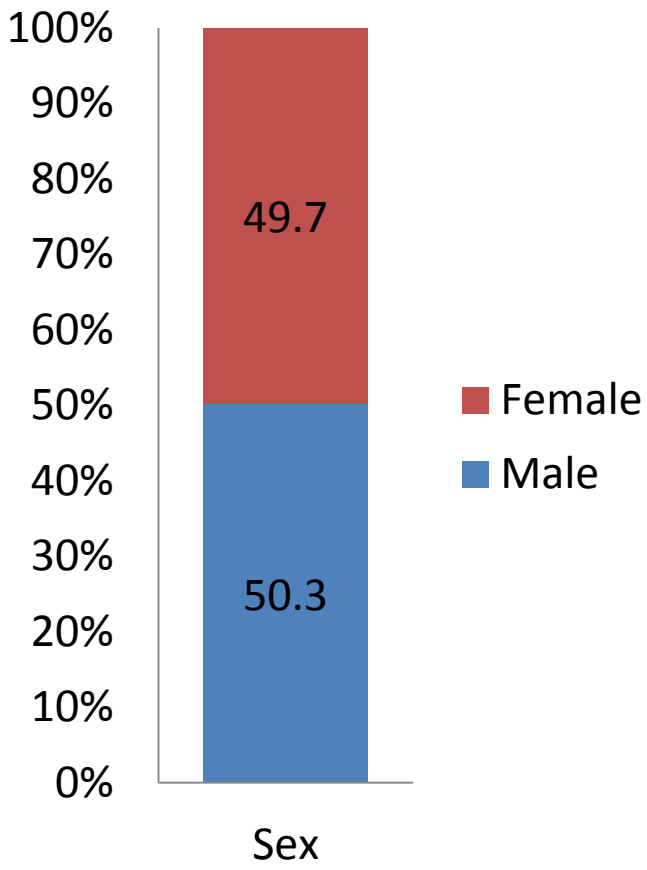
A total of 7749 children were included in this study .

This count was estimated to **2.8 million** of Malaysian children population aged 7-12 years old in 2006

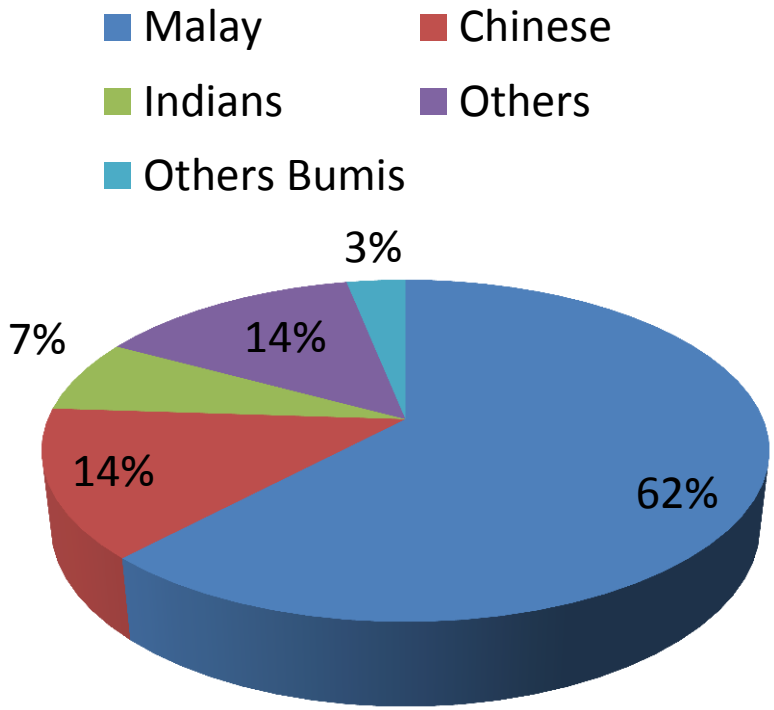


Socio-demographic profile

Distribution By Sex

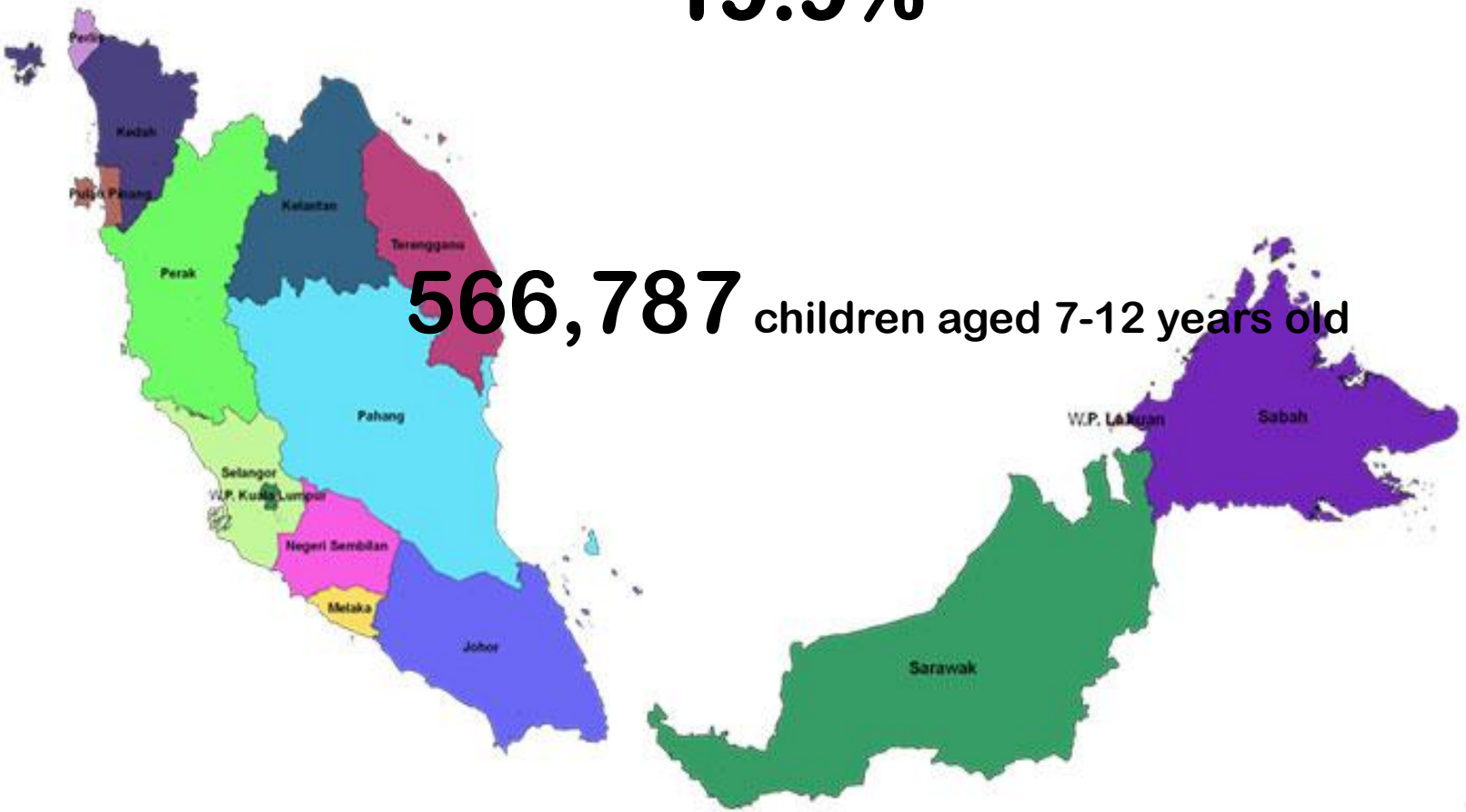


Distribution By Ethnicity



Prevalence Of Overweight Children

19.9%

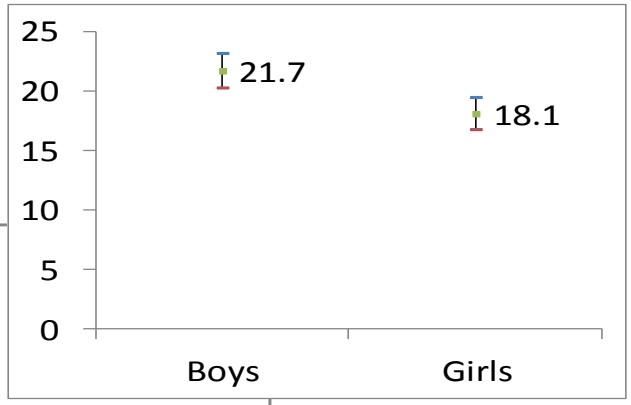


566,787 children aged 7-12 years old

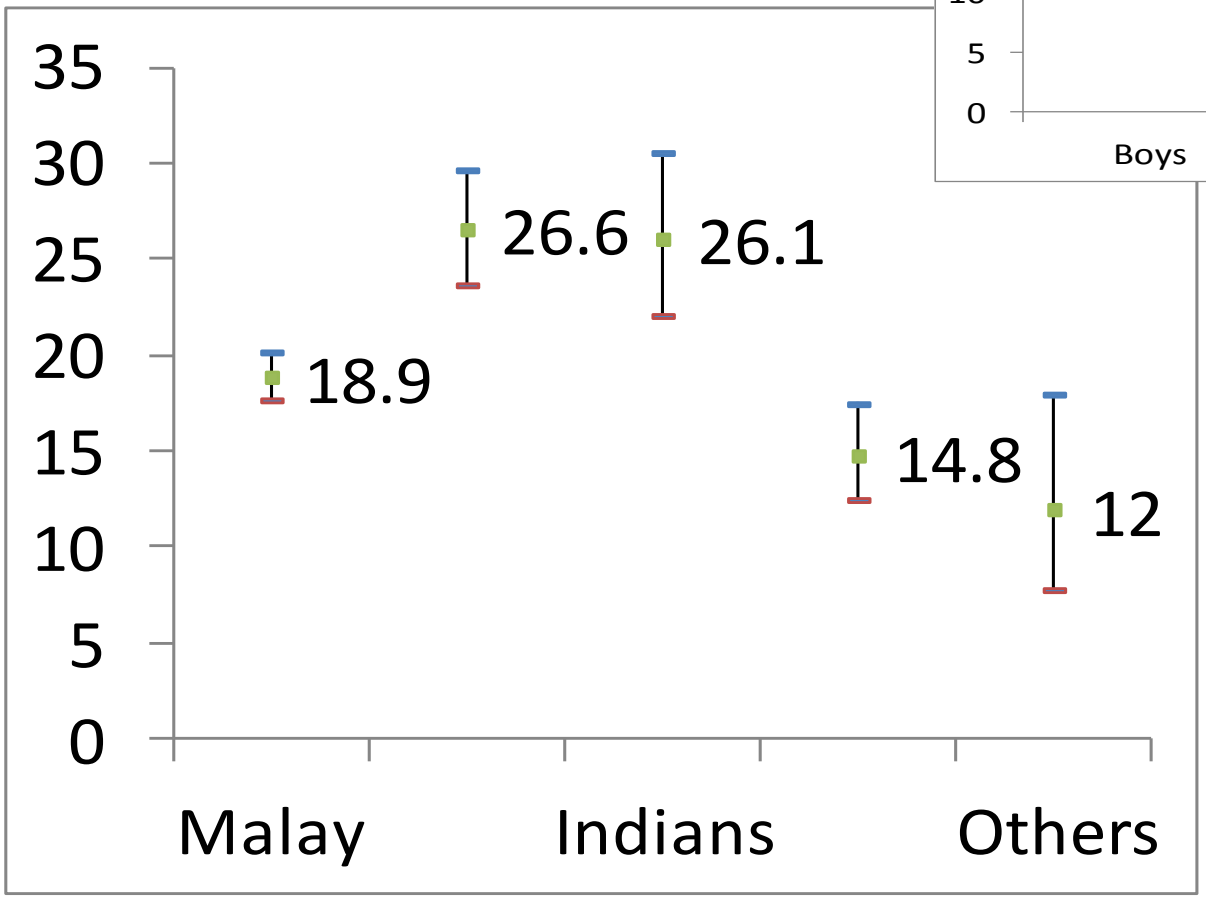
Urban: 21.2%

Rural: 14.7%

Prevalence By sex



Prevalence By Ethnicity



Among every **100 overweight Guardian** :

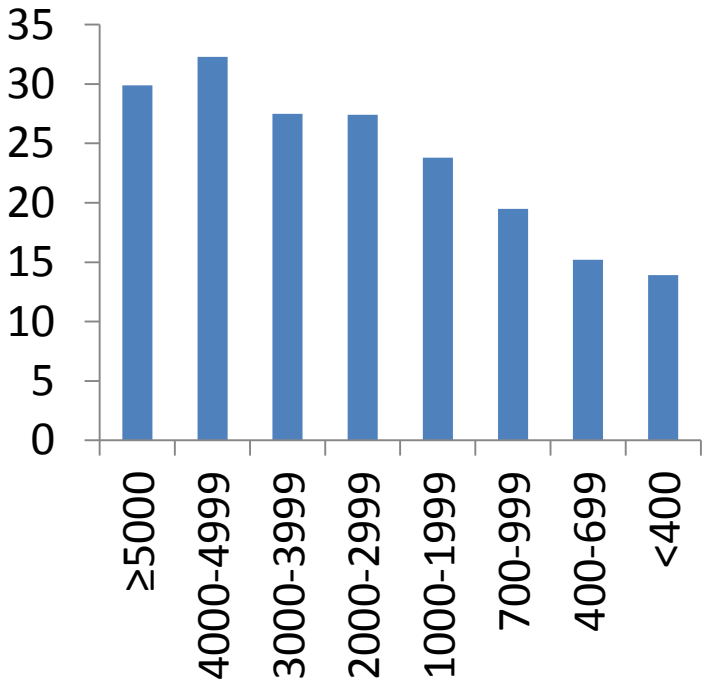
- **25** had overweight children

Among every **100 normal-BMI Guardian** :

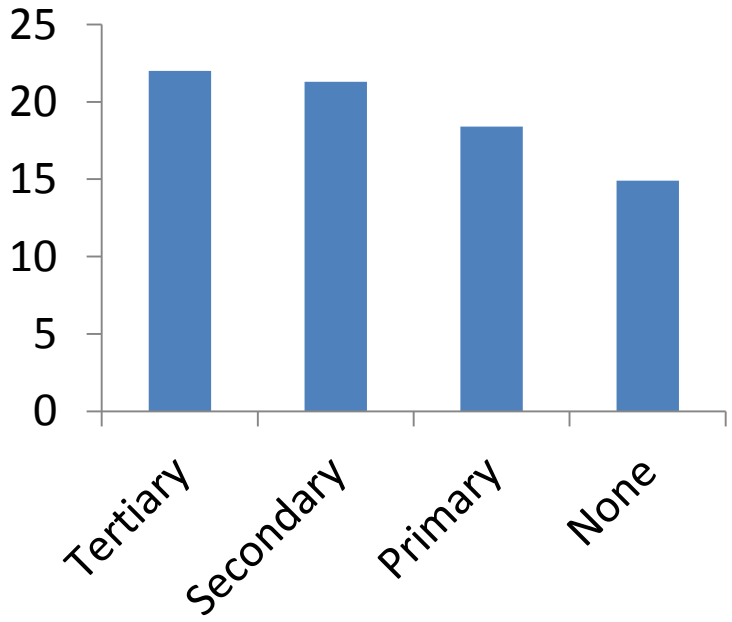
- **13** had overweight children

Sosio-Economic Status

Prevalence Of Overweight Child By Household Income



Prevalence Of Overweight Child By Guardian Education Attaintment



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Factors associated with Overweight Children in Malaysia

Variable	Category	Crude Odd Ratio	95% CI Lower	95% CI Upper	*p*- value	Adjusted Odd Ratio	95% CI Lower	95% CI Upper	*p*- value
Age (Year)		1.12	1.08	1.15	<0.001	1.15	1.11	1.2	<0.01
Residence									
	Urban	1.53	1.33	1.74	<0.001	1.16	1.01	1.36	<0.05
	Rural	1							
Gender									
	Male	1.25	1.11	1.41	<0.001	1.23	1.08	1.41	<0.05
	Female	1							
Ethnicity									
	Malay	1							
	Chinese	1.55	1.38	1.84	<0.001	1.45	1.19	1.77	<0.01
	Indian	1.52	1.19	1.92	<0.001	0.99	0.6	1.65	0.964
	Other Bumi's	0.58	0.36	0.95	<0.05	0.88	0.69	1.13	0.33
	Others	0.74	0.6	0.92	<0.01	1.25	0.97	1.61	0.088
Guardian BMI status									
	Overweight	2.19	1.9	2.53	<0.001	2.16	0.87	2.52	0.75
	Non-overweight	1							
Household income (RM)									
	≥5000	2.82	2.01	3.97	<0.001	1.85	1.23	2.76	<0.01
	4000-4999	2.84	1.87	4.31	<0.001	1.84	1.18	2.87	<0.01
	3000-3999	2.48	1.75	3.52	<0.001	1.61	1.1	2.36	<0.01
	2000-2999	2.63	1.92	3.61	<0.001	1.75	1.24	2.47	<0.01
	1000-1999	2.26	1.68	3.05	<0.001	1.66	1.2	2.29	<0.01
	700-999	1.62	1.16	2.26	<0.001	1.25	0.88	1.77	0.213
	400-699	1.21	0.87	1.68	0.24	0.99	0.65	1.4	0.941
	<400	1							
Guardian education									
	No formal education	1							
	Primary	1.29	0.97	1.7	0.076	1.07	0.79	1.46	0.648
	Secondary	1.54	1.17	2.01	<0.05	1.2	0.8	1.5	0.55
	Tertiary	1.6	1.15	2.23	<0.01	0.99	0.67	1.46	0.952

LOGISTIC REGRESSION RESULT

1 Out of the variables included, other Bumi's and other ethnic groups are found to not be statistically significant in affecting the odds of being overweight in univariable analysis.

2 Urbanite children were more likely to be overweight (16% more) compared to the rural children when other factor in held.

3 Boys: 23% were more likely to be overweight compared to girls when other factor in held.

4 Chinese :45 % likely to be overweight compared to Malays when other factors in held.

5 Those from higher income household had higher odd to have overweight children compared to lower income household when other factors in held.

6 There is no association between overweight children and

- Guardian Education Attainment
- Guardian BMI status

DISCUSSIONS

- 1 out of 5 of our children were overweight- comparable with Singapore and Thailand however higher than Indonesia and Vietnam ,developed countries reach up to 35%.

- clearly shown that same pattern had occurred in rapidly developing countries in Asia.

- rapid development of Malaysia have improved the quality of life of a Malaysian citizen and thus resulted in better access and greater affordability to various food resources and luxurious activities, which in turn has also resulted in changes of dietary habits and lifestyle.

•Majority of guardians working in the urban areas have long working hours and hence are unable to prepare home-made meals for their children, resulting in greater tendency of having meals with higher energy and saturated fat at the hawker stalls and fast-food restaurants.

•Consistent with the findings from other Asian country studies, wealthier families were more prevalent in having overweight children , the present finding was inconsistent with those of a developed country where household income and overweight children showed an inverse relationship.

• In essence, in a developed country, those within the higher income bracket tend to purchase expensive healthy food while the rich quarter in a developing country purchased food beyond their need.

CONCLUSION

- In conclusion, the prevalence of overall overweight among Malaysian primary school-age children (7-12 years) was high (19.9%).
- The wealthy, Chinese, urban, and male children were more likely to be overweight.
- These findings provide evidence-based information for relevant stakeholders and policy makers in the planning and implementation of strategic interventional programme in combating overweight among school-age children in Malaysia.

Limitations

- This study was a cross-sectional study; therefore, causal and effect relationships could not be measured directly.
- Energy intake and physical activity was not considered in this study, resulting in an inability to examine the contribution of energy intake and energy expenditure to the overweight status.

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ACKNOWLEDGEMENT

The authors would like to thank the Director General of the Ministry of Health, Malaysia for permission to publish this paper. The authors also would like to thank National Health Morbidity Survey III team for their hardship and effort in completing the study. The main study was granted by the Ministry of Health, Malaysia, Research Fund NMRR - P42-251-170000-00500 (005000099)

Thank You

This paper had been published at Asia Pacific Journal Clinical Nutrition (APJCH) in 2013

Suggestion of Citation:

Balkish Mahadir, Siti Zuraidah, Rashidah Ambak, Syafinaz Sallehuddin, Hatta Bin Mutalip, Riyanti Saari, Norhafizah Sahril, Hamizatul Akmal Abdul Hamid (2013). *Overweight Among Primary School-Age Children in Malaysia*. *Asia Pac J Clin Nutr* 22(3):408-415

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