"Urban Child Poverty: Does Size Matter?" by Sudha Sivadas and Dr Normaz Wana Ismail from Universiti Putra Malaysia is the winning paper for the Student Research Award competition, sponsored by UNICEF in partnership with DM Analytics Malaysia, as part of the UNICEF Urban Child Poverty and Deprivation Study in Kuala Lumpur.

URBAN CHILD POVERTY:

DOES SIZE MATTER?

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URBAN CHILD POVERTY: DOES SIZE MATTER?

1.1 Background

1.1.1 Urbanisation and Poverty

The rapid growth of urban population in Malaysia has created more demand pertaining to the basic needs of people such as affordable housing, access to healthcare and education, and sanitation facilities among others. Correspondingly, urban poverty and income inequality are more pronounced, despite the country's impressive poverty-reduction track record at the national level. Based on the recent Household Income and Expenditure Report 2016, the bottom 40% of households account for only 16.4% of earnings while the top 20% account for 46.2%. Such persistent inequality is particularly grave in cities where the Gini coefficient is still considerably high at 0.39.

However, this paper aims to look beyond income poverty, at a category of vulnerable people. These people do not fall into the 'poor' category as their income is above the government- defined poverty line. The income earned is sufficient to fulfil their basic socio-economic needs, but there is no additional for a rainy day. In the event of a shock, such as when the main income earner suffers a stroke and is paralyzed, then the household is suddenly 'poor'. As the finances before were only sufficient to fulfil daily needs, this new 'event' makes the household economically vulnerable. Although their income is not below the poverty line, neither are they resilient to avoid poverty - in the event of a catastrophe and have limited opportunities to escape poverty. The World Bank defines this group as the Urban Vulnerable Group (UVG).

The Economic Planning Unit defines the UVG as a group of people who are vulnerable to crisis and economic uncertainties, have low income, low education and are often engaged in low skill and less productive sectors. Malaysia has approximately 1.78 million UVG households[1]. UVG households comprise of low and moderate-income people; single parent; youth; the indigenous population, minorities of Sabah and Sarawak; estate workers and the elderly. Children from these households are also considered vulnerable. To be able to identify and address such 'potential' pockets of urban poverty and ensure resources are appropriately targeted, it is pertinent to adopt a more disaggregated approach. The World Bank, acknowledging that poverty is multidimensional, encompassing income and social poverty; environment-poverty; education; and health, also advocates for a more disaggregated approach.

1.1.2 Urban Child Poverty

The objective of this paper is to investigate 'health poverty' among UVG children, focusing on the prevalence of obesity. Does the size of the child from UVG household matter? Do bigger heavier children mean they have better access to food and nutrition, or the contrary? Health poverty can stem from many factors such as inadequate cash income for getting healthcare; food insecurity and malnutrition; crowded and unhygienic living conditions and exposure to food contamination, air, and noise pollution. The World Health Organisation (WHO) advocates that everyone, everywhere without distinction of age, gender, or race, has the right to nutritionally adequate and safe food and to be free from hunger and malnutrition. Malnutrition, a key health issue among children especially, is indicated by both underweight

[1] Eleventh Malaysia plan, 2016-2020: Anchoring Growth on People. Putrajaya, Malaysia: Economic Planning Unit, Prime Ministers Department, 2015.

and obesity as classified by the Centre for Disease Control 2000 and recommended by the WHO (2007).

Though malnutrition continues to plague most poor countries through severe undernutrition, there seems to be a rising trend in overweight and obesity, stemming from over nutrition. The epidemic of obesity is recognized as one of the most important public health problems facing the world today. Ironically, both over and undernutrition is now present within the same communities in some developing countries (UNICEF 2006). According to WHO, there were 1.5 billion overweight people globally and about 30% of whom were obese in 2010. As of 2016, this number has risen to more than 1.9 billion overweight adults aged above 17 years, where 34% were obese [2]. This upward trend in obesity has triggered greater collaboration between international organisations and governments alike to monitor and address the prevalence of obesity in all populations. Given that obesity is preventable, the deaths, years of life lost and the disability-adjusted life-years (DALYs) worldwide is akin to squandering valuable human capital.

1.1.3 Obesity

Childhood obesity is a global phenomenon and is becoming more prevalent in developing countries like Malaysia. Obesity is a physical condition where body weight increases by consuming more energy than expending it. It impairs health and curtails longevity, leading to severe health risks, namely non-communicable diseases like cardiovascular disease, diabetes mellitus and cancer. It is measured by the Body Mass Index (BMI), which is calculated using the following formula:

[2] "WHO, nutrition experts take action on malnutrition." WHO. Accessed November 24, 2017. http://www.who.int/nutrition/pressnote_action_on_malnutrition/en/.

$$\text{BMI} = \frac{\text{Body weight (kg)}}{\text{Height}^2 \text{ (in metres)}}$$

There are other methods of measurement like the abdominal BMI and measures of central obesity such as waist: hip ratio and waist circumference, which provides more robust indices of the overall obesity-related health risk than BMI. In addition, there are also different guidelines and/or classifications to interpret the BMI, such as by the World Obesity Federation (formerly known as the International Obesity Task Force) and the WHO Obesity Classification. We adhere to the WHO BMI classification for children and adolescents (see Table 1.1.1) for the purpose of this paper.

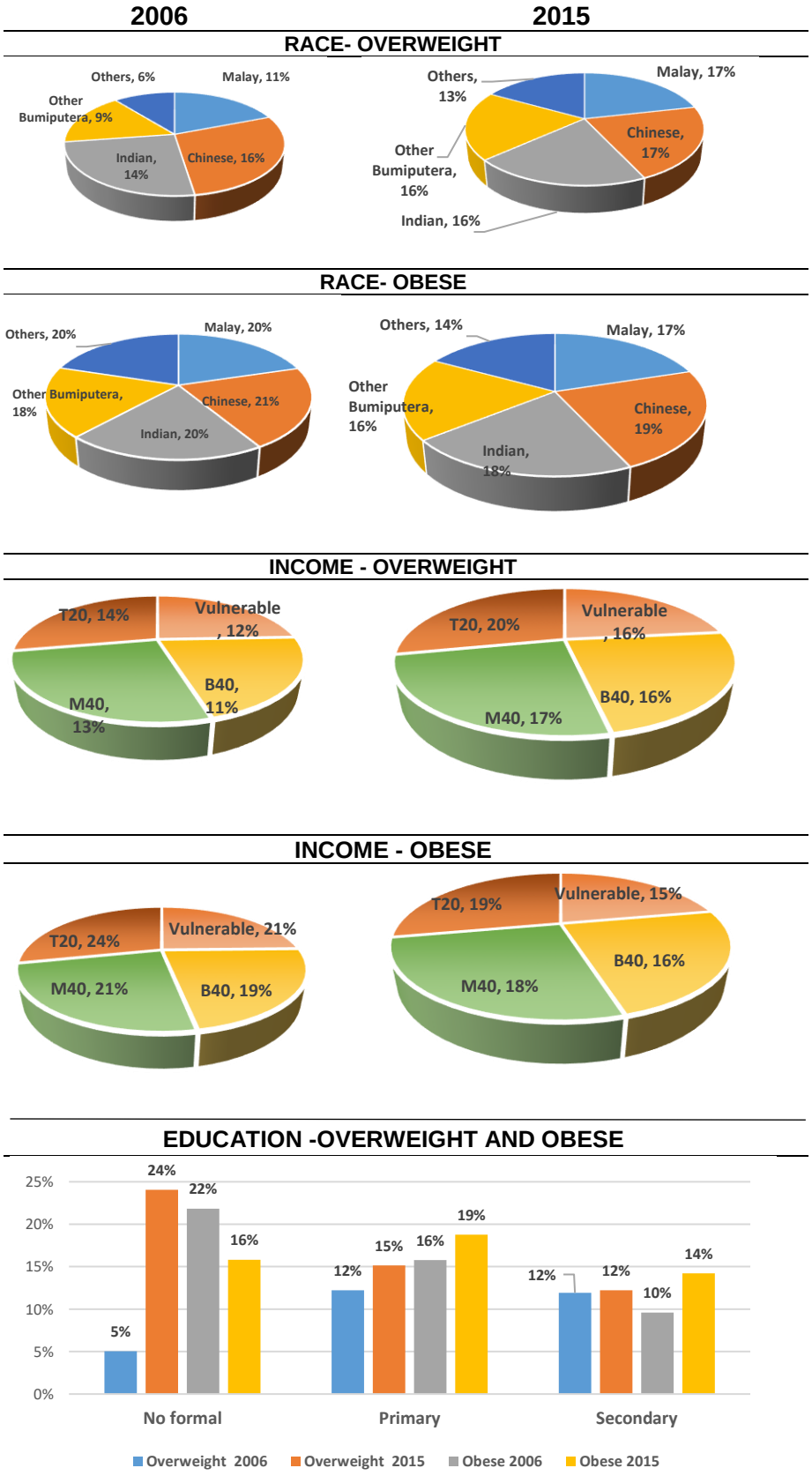
Table 1.1.1: WHO International Classification for Obesity

Classification	BMI - KG/M²
Normal	Median (range: 15.1kg/m^2 at 5 years to 21.7kg/m^2 at 17 years)
Overweight	> Median +1SD (range: 16.6kg/m^2 (5 years) and 24.5kg/m^2 at 17 years)
Obese	> Median +2SD (range: 18.3kg/m^2 (5 years) and 29.5kg/m^2 at 17 years)

Note: SD- Standard Deviation
Source: WHO website (http://www.who.int/growthref/who2007_bmi_for_age/en/).

Overweight and obesity are becoming more prevalent in a rapidly urbanising country like Malaysia. The severity of this issue especially among school-going kids has worsened in the last decade where prevalence of overweight and obesity surpassed targeted thresholds (Ministry of Health 2016). Figure 1.1.1 provides a brief comparison of trends between 2006 and 2015. Based on race, income levels and education categories, overweight depicts the most significant increase between 2006 and 2015. Although obesity registers lower numbers in 2015 compared to 2006, the numbers are nevertheless significant.

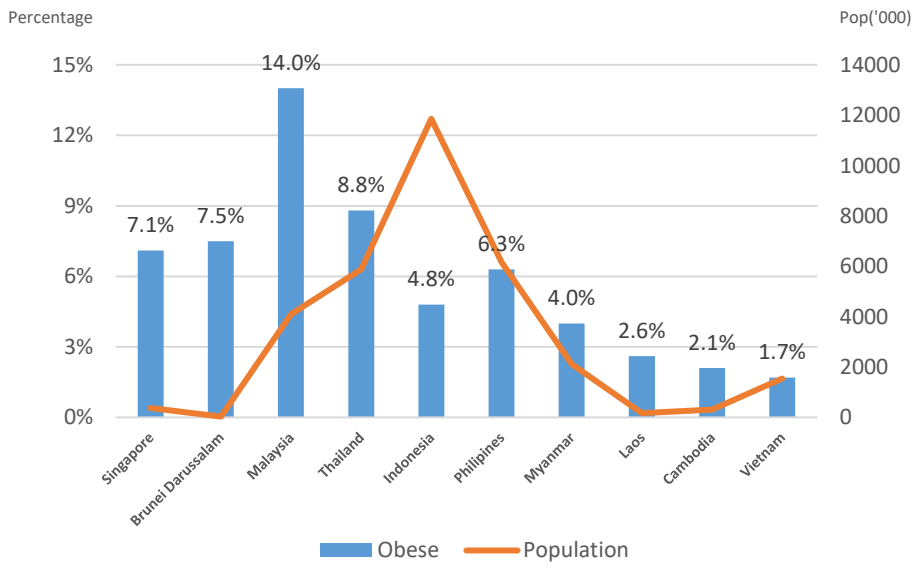
Figure 1.1.1 Malaysia: Overweight and Obesity Prevalence Among Children Aged between 5 and 17 years (2006, 2015)



Source: Author's calculations based on NHMS2006 and NHMS2015

A 2013 advisory report from the Academy of Sciences, Malaysia stated that the prevalence of overweight and obesity among schoolchildren (aged 6–12 years) between the years 2001 and 2008 had increased from 20.7% (1 in 5) to 26.1% (1 in 4). The more recent National Health and Morbidity Survey (NHMS) 2015, conducted by the Ministry of Health Malaysia, reported that the national obesity frequency for children under 18 years was at 11.9%. It further concluded that more than 7% of children under five were overweight. Based on the WHO Country Profile 2008, Malaysia stands heaviest amongst its South East Asian neighbours (Figure 1.1.2).

Figure 1.1.2: South East Asia: Obese Populations, 2008



WHO – Non-communicable Disease: Country Profile 2008

Rapid industrialisation and urbanisation in the past few decades have impacted the lifestyle of all Malaysians. Obesity, resulting from over-consumption high-fat foods, physical

inactivity, and lack of recreational facilities, among others, is synonymous with the urban setting. Changes in dietary habits and sedentary lifestyles have resulted in increased inescapability of non-communicable disease. These changes in diets, patterns of work and leisure often contribute to the causal factors underlying non-communicable diseases even in the poorest countries (National Coordinating Committee on Food and Nutrition 2010). The rapid urbanisation also causes a greater distance between the consumer and producer of fresh produce. Instead, cheaper processed alternatives are more easily available and this negatively impacts the availability of affordable nutritious diet, especially for the urban poor. As we embrace modernity, we also adopt the high-fat and high-calorie western diet which results in more overweight and obese poor people (Popkin, Adair, and Ng 2012; Wang, Monteiro, and Popkin 2002).

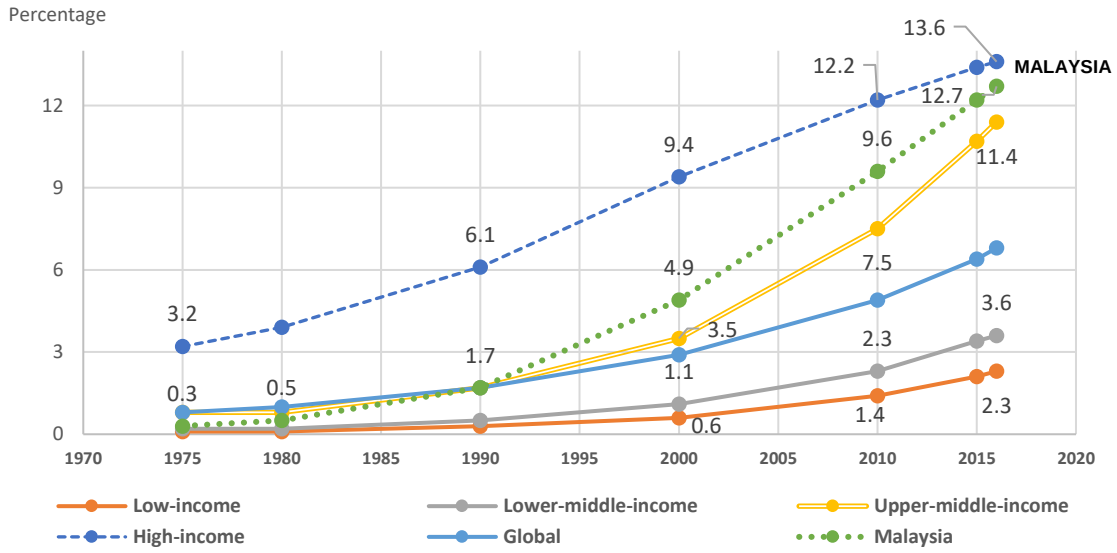
Ghee (2016) found that obesity prevalence in Malaysia accelerated post-1990, where Malaysians generally prefer passive modes of transport and leisure activities that require minimal physical energy. This is also reflected in Figure 1.1.3, which shows that the prevalence of obesity among Malaysian children between the ages 5 and 19 is higher than global prevalence. Corresponding with this fact is the increasingly ubiquitous trend of food-away-from-home[3], which is becoming a major diet component in most rapidly-urbanising countries. The longer work hours and distance from home-to-work compel people to consume food outside their homes (Smith and Subandoro 2007).

Malaysia is no different especially in terms of our fondness to eat out, especially urban dwellers compared to their rural counterparts (Tan 2010). The Department of Statistics reports a steady increase in the food away from home index, the most recent being an

[3] Includes all meals (breakfast and brunch, lunch, dinner and snacks and non-alcoholic beverages), Bureau of Labour Statistics, United States of America.

increase of 3.3% in October 2016. According to Lachat et al. (2012), food away from home is associated with higher energy and fat intake and lower micronutrient intake and this could lead to increased prevalence of obesity.

Figure 1.1.3: Prevalence of obesity among children and adolescents, crude Estimates by World Bank income group, 1975-2016



Source: WHO Data (http://apps.who.int/gho/data/view.main.BMIPLUS2C05-19v?lang=en)

1.2 Literature Review

It is generally accepted that changes in lifestyle and diet are attributed to the theory of nutritional transition. This theory dictates that demographic, economic and social changes play a significant role in population health (Monteiro 2001; Keating, Moodie, and Swinburn 2011). As people become more globalised, modern and urban, the diets and food choices also change significantly. High calorie-fat-sugar laden processed foods are the most affordable and accessible, mainly because there are more supermarkets and fast-food chains, which carry such products in urban areas (Kearney 2010). Higher costs of living in urban areas required women to join the workforce, which then resulted in the growth of food

production industries to meet the demands busy urban lives. The microwave dinners, fast-food, chips, canned and bottled drinks and the list goes on. According to (Grossman 1973), as one becomes more affluent, weight gain symbolizes better health but after a certain threshold of income, the opposite holds true. In developed countries, weight decreases with better income and education while in poorer economies, or among poor sub-populations, weight increases alongside income (Jeffery et al. 1991).

Children who have experienced poverty early are likely to grow into obese adults and face a more dire range of health risks (World Health Organisation 2000). These include increased risk of diabetes, cancer and cardiovascular diseases. A study employing the United States National Health and Nutrition Examination Survey 2005–2008 data found that income and race have a significant impact on obesity, where white kids from lower-income households are heavier (Beckles and Truman 2011; Ogden CL, Carroll MD 2010). Couple that with negative psychosocial effects, the overweight/obese child is practically predestined to face more adverse challenges than the normal-weight child (Lobstein et al. 2015; Keating, Moodie, and Swinburn 2011). This takes a toll psychosocially, especially on children from UVG households, through social isolation, anxiety, and depression.

Poverty coupled with social isolation further aggravates the problem and hinders timely identification and management of such problems. Children from UVG households who are obese, often end up with low self-esteem and low academic attainment and show social anxiety (Kranjac 2015; Grubb, Levine, and Zoorob 2016). Studies in developed countries suggest that such kids upon reaching adulthood, are less likely than their slimmer contemporaries to complete tertiary education and are more likely to live in poverty, shackled by the same cycle as their parents (Grubb, Levine, and Zoorob 2016).

Further to this, a key component for healthy growth and development for children is physical activity (Strong et al. 2005). Not only does it reduce the risk of obesity, regular involvement in sports and physical activities augurs well for the child's academic, social and behavioural skills development. Past studies in developed countries suggested that an increase in energy intake, reduced physical activities and a sedentary lifestyle were factors related to the occurrence of obesity (D. Philipson and Tomas 2002; Lakdawalla and Philipson 2009; U.S. Department Of Health And Human Services Centers for Disease Control and Prevention, n.d.). Lack of physical activity is already a global health hazard and is rapidly increasing in both developed and developing countries, particularly among poor people in large cities (T. Philipson and Posner 1999). People who are physically inactive have a 20% to 30% increased risk of all-cause mortality compared to those who engage in at least 150 minutes of moderate intensity physical activity per week, or equivalent, as recommended by the WHO.

The motivation for physical activity, especially among children, is highly correlated with the environment within which they live and play. Since parents are key influencers a child's physical active status (Strong et al. 2005; Trost and Loprinzi 2011), studies have found that mothers often feel the environment they live in is not conducive or safe for the children to play (Al-Mamun and Adaikalam 2011; Farrell et al. 2014). Conversely, some studies report that although low-income residential areas had better facilities, they are underutilized compared to facilities in higher income areas, mainly due to the perception that these facilities are not safe, attractive and/or conducive (Giles-Corti 2002).

Technology facilitates and simplifies everyday chores and as we prosper and become more urban, technology becomes more affordable and accessible. Such improvements not only reduce the physical strain required for production, but also lowers the cost of production.

Couple that with modern transportation, populations become increasingly inactive, contributing to a sedentary lifestyle. As affluence increased, vehicle and modern household appliance ownership also increased in tandem, further reducing physical exertion. According to (T. Philipson and Posner 1999), cost of consuming food is lower while the cost of expending it increases.

As processed food becomes more widely available, diet becomes more laden with high calories and sugar. Coupled with an inactive lifestyle, the modern diet is the ideal recipe for chronic diseases especially among the poor. A survey among teenagers in Egypt revealed that more than 50% consume one or more sweet carbonated beverages daily while close to 90% did not participate in regular physical exercise (Lobstein et al. 2015). Unsurprisingly, a third of these kids were overweight. An interesting fact is that the environment in which these kids live in also had changed, causing such sedentary lifestyles to thrive. An apt example is the phenomenal growth of 1300% and 250% in the fast food market and carbonated beverage sales respectively.

1.3 Data and method

Data Source

This study is based on secondary data sourced from the 2015 National Health and Morbidity Survey (NHMS 2015), Ministry of Health Malaysia. The NHMS2015 is a cross-sectional population study, involving 10,000 randomly selected households and approximately 35,000 respondents, with approximately 84% response rate. The main scope in the NHMS 2015 include healthcare demand, non-communicable diseases, and its related risk factors. It involves all the states in Malaysia, including the Federal Territories of Kuala Lumpur,

Labuan and Putrajaya. The nationally-representative sample selection was based on the sampling frame provided by the Department of Statistics, Malaysia.

Data analysis

The primary focus of this analysis is children who are overweight or obese and this is defined using the WHO reference table for children and adolescents. The reference table included both gender and age-specific body mass index (BMI) tabulations for underweight, normal, overweight and obese categories. As kids undergo rapid physical growth during this phase, the table is different from the BMI reference used for adults. We limit the scope of this study to a specific cohort of children aged between the years 5 and 17 and subsequently categorize them as either overweight or obese, as shown in Table 1.3.1.

Table 1.3.1 Average BMI (5 to 17 years)

Age	Median	Overweight	Obese
		+1SD	+2SD
5	15.3	16.8	18.7
6	15.4	17.0	19.1
7	15.6	17.4	19.7
8	15.9	17.8	20.5
9	16.3	18.4	21.4
10	16.8	19.1	22.5
11	17.4	19.9	23.6
12	18.1	20.8	24.9
13	18.9	21.8	26.0
14	19.6	22.6	27.1
15	20.3	23.4	28.0
16	20.8	24.1	28.7
17	21.3	24.6	29.2

Source: Authors' calculation guided by the World Health Organisation Growth Reference Charts (http://www.who.int/growthref/who2007_bmi_for_age/en/)

The analysis is structured into two components, general and Probit analysis. The general analysis is based on cross-tabulations in terms of demographic and socio-economic factors for: (1) the overall profile of urban population; (2) truncated data involving only kids aged between 5 and 17 years and; (3) truncated data involving only parents/heads of households with overweight and obese children, tabulating the parents background including education,

occupation, and household income and the likely impact on their children's body weight. Age, marital status, education and occupation are all categorical variables. We also include several dummy variables for gender (male), strata (urban), and for lifestyle-related variables, namely physical activity status (active), the presence of health risks and balanced diet.

The Probit Model

Next, we extend the analysis by employing a Probit estimation, that models obesity as a function demographic, socioeconomic and lifestyle-related factors. This model explores the factors influencing the prevalence of overweight and obesity among urban children, using truncated data limited to only urban parents/heads of households. We model obesity as a function demographic, socioeconomic and lifestyle-related factors, based on the following general equation:

$$O_i = \alpha + \Sigma_{j=1}^{4}\beta_j DF_i + \Sigma_{j=1}^{3}\rho_j SOE_i + \Sigma_{j=1}^{3}\delta_j LFS_i + \varepsilon_i \qquad 1.3\text{-}1$$

where: - The dependent variable, O is proxied by either overweight or obese child, constructed as follows:

- 1: if the urban child is overweight, 0 otherwise; or
- 1: if the urban child is obese, 0 otherwise.

The independent variables include demographic factors (DF), socioeconomic (SOE) and lifestyle-related (LFS) factors, which all refer to the parents/head of households(HOH). The DF are all categorical variables and includes age, race, marital status and household size. Age is grouped into four ranges –0-4; 5-17; 18-59 and above 60. Both the first two categories were dropped for the Probit analysis. Race has five categories, namely Malay,

Chinese, Indian, Other Bumiputeras and Others. Marital status is made up of never married; married and widowed/divorced. Household size is also grouped into four categories – families with less than 2 members, between 2 and 6 members, between 7 and 10 members and lastly exceeding 10 members. We expect that households led by married HOH and those who have larger families will likely have more overweight/obese children. This is based on the assumption that such households will most likely require more than one source of income to cope with the cost of urban living. This may result in food choices that convenient, affordable and accessible, which often is energy-dense instead of a more balanced diet.

The SOE factors include education, income and occupation, are also categorical variables. Education consists of five categories, i.e. no formal education; primary; secondary; tertiary and unclassified. Since we aimed to establish the impact of education on the children's weight, we dropped the fifth category. Income is proxied by three measurements as follows:

- Bottom 40 (B40) group earning below RM3,856;
- Those below the poverty line index (PLI), which is at RM950 (national average); and
- The vulnerable income group (UVG) – households that earn between the PLI (RM950) and 2.5 times PLI (RM2375).

The income threshold enlisted above are all based on the Household Income and Expenditure Survey, 2014[4]. Occupation consists of types of employment -government, private, self-employed, unpaid/homemaker and retiree. We anticipate that both affluence and education will positively influence health awareness and as such the number of overweight/obese children in such households will likely be lower. Conversely, children

[4] Department of Statistics, Malaysia

from the UVG households may not have access to a balanced diet for every meal, which may lead to higher risk of obesity. We also include several dummy variables for the ***LFS*** – related factors, namely presence of health risks (1 for yes) and balanced diet (1 for yes, 0 otherwise). The presence of health risk factor is established based on three risks – diabetes, hypertension and high cholesterol. If the HOH has at least one of these risks, he is considered to have health risk (1 for yes, 0 otherwise).

The balanced diet variable is built from two dummy variables –whether or not respondent eats adequate fruits and vegetables. Based on the Malaysian Dietary Guideline, if the respondent has at least two servings of fruits and three servings of vegetables, its considered adequate. The final ***LFS*** factor is the BMI adult variable, which is a categorical – (1) Underweight -less than 18Kg/M^2; (1) Normal -between 18 and 24.9 Kg/M^2; (3) Overweight – between 25 and 29.9 Kg/M^2; (4) Obese – more than 30 Kg/M^2. We expect the HOH who are overweight/obese, with more health risks and poor dietary habits will likely be positively correlated with the number of overweight and obese children. The Probit analysis is executed using the STATA Statistical software.

1.4 Findings

1.4.1 General Analysis

The NHMS 2015 urban population demographic profile is summarized in Table 1.5.1 (see APPENDIX I). Most respondents are Malays (58.3%), followed by Chinese and Indians at 20.5% and 9.1% respectively. About 47.3% of the respondents are married while 24.1% are

single. Common family size appears to be between two and six members. The socioeconomic variables consist of income groups, education and occupation. For the income groups, we refer to households within the Bottom40, poverty line index (PLI) and the urban vulnerable groups (UVG) income thresholds. Based on Table 1.5.1, we can infer that 54.3% of the total urban population is in the B40 category while 39% live below the PLI and 21.4% fall under the UVG. The national PLI threshold referred to in this paper is RM950/month and households under the UVG earn between the PLI and 2.5 times the PLI[5].

The most common family size is between two and six members, followed by between seven and ten members. As for education, most respondents seem to have completed their secondary education while private sector employees outnumber other sector employment significantly. Key lifestyle-related variables is also summarised in Table 1.5.2 (see APPENDIX I). This contains the dummy variables for diabetes mellitus, hypertension, cholesterol and BMI. Besides that, dietary habit involving fruit and vegetable intake is also included. In general, hyper cholesterol seems to be the biggest risk for the urban population, at above 35%. This is followed by hypertension and diabetes at about 22.7% and 14% respectively. Despite the fact that most of the respondents have embraced an active lifestyle (46%), the dietary habits do not imply a similar trend as fruits and vegetable intake seems sorely lacking. We also find that there are 17.1% and 10.5% overweight and obese urban adults, respectively.

[5] Eleventh Malaysia Plan Strategy Paper, 2015. The Economic Planning Unit defines UVG as a group of people vulnerable to crisis and economic uncertainties, and belong to households with income between the poverty line index (PLI) and 2.5 times PLI.

Truncated data – Children between 5 and 17 years

Prevalence of overweight and obesity

The primary focus of this paper is the children aged between 5-17 living in urban areas, belonging to the vulnerable household group. Based on the NHMS2015 data, there are a total of 6,812 children between the age 5 and 17 years' (Table 1.4.1).

Table 1.4.1 Profile of Children aged 5-17 who are overweight/obese

DEMOGRAPHIC		Total Population	Overweight		Obese	
			No	%	No	%
Age 5 to 17		6812	1149	16.87%	1166	17.12%
Gender:	Male	3373	533	15.80%	611	18.11%
	Female	3439	616	17.91%	555	16.14%
Race:	Malay	4626	794	17.16%	784	16.95%
	Chinese	816	141	17.28%	159	19.49%
	Indian	455	74	16.26%	81	17.80%
	Other Bumiputera	692	110	15.90%	110	15.90%
	Others	223	30	13.45%	32	14.35%
Strata:	Urban	3838	732	19.07%	743	19.36%
	Rural	2974	521	17.52%	490	16.48%
Family Size: <2		14	2	14.29%	2	14.29%
	2-6	5256	899	17.10%	952	18.11%
	7-10	1433	228	15.91%	199	13.89%
	>10	109	20	18.35%	13	11.93%
SOCIOECONOMIC						
Household Income category: B40		4371	713	16.31%	711	16.27%
	UVG	1895	306	16.15%	287	15.15%
	M40	1760	304	17.27%	321	18.24%
	T20	681	134	19.68%	132	19.38%
Education: No formal/unspecified		1776	427	24.04%	281	15.82%
Primary		3800	576	15.16%	713	18.76%
Secondary		1204	147	12.21%	171	14.20%
Tertiary		5	0	0.00%	1	20.00%

Source: NHMS 2015, Authors calculations

Based on gender, there are more obese boys than girls but the opposite is true for the overweight category. Based on race, the Malays and Chinese score higher in the overweight category while in the obese category, the Chinese and Indians are frontrunners. By strata, rural areas have more overweight children but obesity is higher in urban areas. Based on the same table, we can deduce that bigger family size is likely to have a higher number of overweight and obese children. In terms of the socioeconomic background, approximately 15-16% of children from families below the B40 and vulnerable categories are in the overweight and obese categories. Although this figure is lower compared to those in the middle and top-income categories, it is significant nevertheless. As expected from the age cohort, most children are from the primary education category and correspondingly this group is the heaviest too.

Parents/Head of Household

Summary of key variables depicting the characteristics of parents/head of these households is presented in Table 1.4.2. From the demographic factors, gender does not hold any significant difference but race does. We find that households belonging to the 'other Bumiputra' category have a higher percentage of overweight and obese children, followed by Indians and Malays. Bigger families and households led by single parents are more likely to have more overweight/obese children. Single-parent refer to households under the category of widow/widower/divorcee and about 73% of these households belong to the B40 category. In terms of the socioeconomic background, the percentage of overweight and obese children belonging to the vulnerable households are approximately 17% while the other income categories fare a little higher at between 19% and 24%. There is no significant difference in terms of education of the parents/head of households for overweight children. However, obesity seems to be lower in households led by those with a tertiary education.

Different categories of occupation also do not have any significant impact on the weight of children. Reviewing the health/lifestyle-related factors, none of the variables appear to be significantly different except for diabetes and hypertension. It is noteworthy that households with parents/head of households who have diabetes and hypertension have more obese children in terms of percentage compared to the other risks. Although the number of active household heads are more than the non-active, these households appear to have more overweight children.

Table 1.4.2 : Characteristics of Urban Head of Household with Overweight/obese children

Variable		Population	Overweight		Obese	
PARENTS		**Total**	**No**	**%**	**No**	**%**
URBAN		3540	732	20.7%	743	21.0%
Gender	Male	1663	348	20.9%	351	21.1%
	Female	1890	384	20.3%	392	20.7%
Race	Malay	2199	440	20.0%	477	21.7%
	Chinese	608	128	21.1%	110	18.1%
	Indian	338	75	22.2%	79	23.4%
	Other Bumiputra	238	58	24.4%	58	24.4%
	Others	170	31	18.2%	19	11.2%
Age category	18-59	3386	702	20.7%	705	20.8%
	>=60	158	30	19.0%	37	23.4%
Marital Status	Single	12	2	16.7%	3	25.0%
	Married	3423	706	20.6%	710	20.7%
	Widow/er/divorced	114	24	21.1%	30	26.3%
Family Size	2-6	3071	579	18.9%	606	19.7%
	7-10	444	134	30.2%	125	28.2%
	>10	38	19	50.0%	12	31.6%
Household Income Category	B40	1818	360	19.8%	353	19.4%
	PLI	288	62	21.5%	57	19.8%
	Vulnerable	753	135	17.9%	131	17.4%
Education	No formal	588	129	21.9%	119	20.2%
	Primary	1853	395	21.3%	416	22.5%
	Secondary	990	182	18.4%	194	19.6%
	Tertiary	93	19	20.4%	13	14.0%
Occupation	Govt/Semi-govt	629	134	21.3%	140	22.3%
	Private	1229	259	21.1%	245	19.9%
	Self-employed	680	138	20.3%	156	22.9%
	Unpaid/homemaker	753	149	19.8%	150	19.9%
	Retired	78	14	17.9%	15	19.2%
Health risk	Diabetes	739	166	22.5%	181	24.5%
	Hypertension	1155	257	22.3%	295	25.5%
	Hyper cholesterol	2045	430	21.0%	432	21.1%
Lifestyle	Active	2489	522	21.0%	517	20.8%
	Not active	1034	206	19.9%	226	21.9%
	Overweight	1248	268	21.47%	269	21.55%
	Obese	761	200	26.28%	266	34.95%
Diet - Fruit	Adequate	372	83	22.3%	77	20.7%
	Not Adequate	3163	647	20.5%	665	21.0%
Diet-Vegetable	Adequate	371	70	18.9%	70	18.9%
	Not Adequate	3170	662	20.9%	672	21.2%

Source: NHMS 2015, Authors calculations

1.4.2 Probit Results

From the data, frequency of urban children aged between 5 and 17 who are overweight and obese are 20.62% and 20.90% respectively (Table 1.4.3 Dependent Variable Frequency).

Table 1.4.3 Dependent Variable Frequency

	Overweight		Obese	
Frequency	Yes	No	Yes	No
	20.62%	79.38%	20.90%	79.10%

Table 1.4.4 is a summary of coefficients for two models (i.e. the dependent variables overweight and obesity). Each model has been executed with different proxies for income – namely B40, PLI and UVG, represented by categories A, B and C respectively. Comparing the results across all categories, we find that larger families and households headed by overweight/obese adults are more likely to have overweight/obese children. Based on Model 1- B, the type of occupation is likely to influence the weight of children.

Table 1.4.4 Summary of Probit Regression Coefficients

	Model 1 - Overweight			Model 2- Obesity		
Independent Variable	**A**	**B**	**C**	**A**	**B**	**C**
Age category	-0.038	-0.049	-0.044	0.153	0.163	0.145
Race	0.024	0.022	0.025	-0.015	-0.018	-0.017
Family size	0.419**	0.421**	0.414**	0.248**	0.265**	0.255**
Marital status	-0.024	-0.030	-0.020	0.198	0.188	0.194
Occupation	-0.038	-0.042*	-0.035	-0.021	-0.030	-0.024
Education	-0.012	-0.011	-0.019	-0.106**	-0.087**	-0.102**
Income:						
B40	-0.003			-0.113**		
PLI		0.082			-0.050	
UVG			-0.074			-0.174**
Health Risk	-0.011	-0.011	-0.011	-0.023	-0.023	-0.022
Balanced Diet	-0.017	-0.016	-0.021	-0.049	-0.043	-0.053
BMI Adult	0.187**	0.187**	0.187**	0.376**	0.376**	0.374**
Constant	-1.995**	-1.948**	-1.955**	-2.907**	-3.024**	-2.900**
R^2	0.026	0.026	0.027	0.053	0.052	0.0541

*Significance - ** 5% and * 10%.*
Source: NHMS 2015, Authors calculations

Based on the results shown under Model 2 (obese children), we deduce that the more educated the parents/heads of households are, it is likely that their households will have a lower risk of having obese children. Similarly, households under the B40 and UVG income brackets are less likely to have obese children. Lastly, the adult BMI is also significant for Model 2 where the heavier adults are likely to have obese kids.

Table 1.4.5 Marginal and Average Effects Summary Results

Independent Variables	Overweight		Obesity	
	ME	AME	ME	AME
Age category	-0.012	-0.012	0.040	0.040
Race	0.007	0.007	-0.005	-0.005
Family size	0.117**	0.116**	0.071**	0.070**
Marital status	-0.006	-0.006	0.054	0.053
Occupation	-0.010	-0.010	-0.007	-0.007
Education	-0.005	-0.005	-0.028**	-0.028**
Income: Vulnerable Group	-0.021	-0.021	-0.049**	-0.048**
Health Risk	-0.003	-0.003	-0.006	-0.006
Balanced Diet	-0.006	-0.006	-0.015	-0.014
BMI Adult	0.053**	0.052**	0.104**	0.102**

*** Significant at the 5% level.*

Source: NHMS 2015, Authors calculations

Based on the marginal effects results (Table 1.4.5), we conclude that larger households are about 12% and 7% more likely to have overweight and obese kids. Households with heavier adults are approximately 5.3% and 10% more likely to have overweight and obese kids respectively. Families above the UVG category are about 5% more likely to have obese kids while higher educated parents/heads of households have a 3% lower possibility of having obese kids in their households. The average of predicted probabilities for being overweight and obese is about 19.5% and 20.87% respectively. The Probit model correctly predicts 78.98% and 78.85% of the values for overweight and obese while the rest are misclassified.

1.5 Conclusion

In summary, bigger families have a higher percentage of having overweight and obese children. Similarly, individuals with health risk, especially high cholesterol and the self-employed appear to have a higher probability of having overweight/obese children. Households led by single-parents are also more likely to have overweight and obese children. Although the results do not explicitly specify that UVG households are likely to have overweight and obese children, this group cannot be overlooked. Given that most single-parent led households are in the UVG category, suffice to say that the overweight and obesity issue among the UVGs households is becoming more prevalent. This trend is similar to the experience of developed countries during their rapid urbanisation stage. It confirms the notion that obesity not only plagues the affluent, but pervades all levels of society. Though not at alarming levels currently, it should be an indication of future trends if left unheeded. Especially when access to healthy fresh produce is increasingly limited, in terms of availability and affordability, compared to mass-produced, calorie-and energy-dense processed foods.

Therefore, it is imperative that government augments and widens existing prevention efforts, encompassing policies and cooperation beyond the health sectors' scope. The education sector, especially, can play a pivotal role in food choices children make by prescribing specific diets and imposing that all schools adhere to the same. Also, easily accessible and safe recreational facilities should be a norm in all communities, encouraging children to stay active and healthy. Dissemination of timely information to create awareness on the benefits of a healthier lifestyle should be pervasive, especially targeting bigger families in urban areas, including those with health risks and those under the other Bumiputera category.

In terms of policy, stringent food standards in all public schools is long-overdue, which means authorities must move beyond merely prescribing guidelines and daily dietary recommendations. Given that the primary focus of this paper are children between the ages 5 and 17, who are spend the most time in schools and/or in other learning institutions, school food choices can play a pivotal role in improving their health. Despite a plethora of food and dietary- related guidelines for children, the issue of unhealthy food and drinks sold in and around schools is still persistent. Although the blame does not rest squarely on school canteens, being the main daily food supply source make canteens a crucial-role player in promoting healthy eating habits. Given that nutrition requirements and healthy food lists are already available, the standards can be established and executed without delay. Both the Ministry of Health and the Ministry of Education should work in concert, acting swiftly to prohibit unhealthy food sales in schools and imposing stiff penalties on those who disregard the standards or refuse to cooperate.

Beyond that, it is crucial to realise that health is the responsibility of each individual, family, community and NGOs alike, beyond the purview of the relevant authorities. For instance, if parents can play their role in creating awareness and educating their children on the importance of healthy eating and balanced diet, perhaps half the battle is already won. Related campaigns by NGOs, local authorities and even consumer groups should be multi-pronged, aimed at driving home the message that a healthy lifestyle gives rise to a healthier and prosperous nation.

To say the least, the size of the child does matter, especially when overweight and obesity plight imposes serious risks and costs, not only to the individual's health and wellbeing but also to the community and the nation as a whole.

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Conflict of interest We declare that we have no competing interest.

APPENDIX I

Table 1.5.1 Demographics profile of the NHMS 2015 - Urban

VARIABLE		URBAN	
DEMOGRAPHIC		Observations	%
Age category	0-4	1524	9.0%
	5-17	3838	22.7%
	18-59	9668	57.3%
	>59	1850	11.0%
Gender	Male	8134	48.2%
	Female	8746	51.8%
Race	1_Malay	9840	58.3%
	2_Chinese	3465	20.5%
	3_Indian	1534	9.1%
	4_Other Bumiputera	1071	6.3%
	5_Others	970	5.7%
Marital Status	Single	4065	24.1%
	Married	7977	47.3%
	Widow/widower/Divorcee	962	5.7%
Family Size	Less than '<2	962	5.7%
(members)	Between '2-6	13644	80.8%
	Between '7-10	2066	12.2%
	Above '>10	208	1.2%
SOCIOECONOMIC			
Household Income	Bottom40	9166	54.3%
	PLI	6591	39.0%
	UVG	3613	21.4%
Education	No Formal Education	871	5.2%
	Primary	4417	26.2%
	Secondary	6053	35.9%
	Tertiary	3276	19.4%
Occupation	Govt/Semi-govt	1457	8.6%
	Private	4198	24.9%
	Self-employed	1818	10.8%
	Unpaid/homemaker	1733	10.3%
	Retired	513	3.0%

Source: NHMS 2015, Authors calculations

Table 1.5.2 Demographics profile of the NHMS 2015 –Urban

VARIABLE	**URBAN**	
LIFESTYLE	Observations	%
Diabetes	2368	14.0%
Hypertension	3833	22.7%
Hyper cholesterol	5943	35.2%
Lifestyle		
Active	7766	46.0%
Not active	4182	24.8%
Diet Fruit Adequate	1228	7.3%
Diet Fruit Not Adequate	10232	60.6%
Diet Vegetable Adequate	1181	7.0%
Diet Vegetable Not Adequate	10295	61.0%
Health risk		
Adult BMI		
Under (<18)	526	3.1%
Normal (18-25)	3802	22.5%
Overweight (25-29)	2887	17.1%
Obese (>30)	1771	10.5%

Source: NHMS 2015, Authors calculations

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